

Pinguicula lippoldii nova spec. and *Pinguicula toldensis* nova spec. – two endemic *Pinguicula* species (Lentibulariaceae) from East Cuba new to science

S. Jost Casper

Summary: The blue, violet, pink, or reddish flowering *Pinguicula* specimens from the most eastern mountain ranges of Cuba are poorly understood by botanists, plant friends, and horticulturists and mostly classified as *P. benedicta* Barnhart. Based on the study of recent gatherings of living and dried specimens, again two new species of the *Pinguicula benedicta*-group (sect. *Homophyllum*) are described: *P. toldensis* Casper nova spec., gathered by J. Gutiérrez (La Habana), E. Köhler (Berlin), R. Mangelsdorff (Frankfurt/Main), and K. Zoglauer (Berlin) and cultivated in the botanical garden of Jena (128–131 BGJ), and *P. lippoldii* Casper nova spec., documented by voucher specimens and photographs from the type locality. Microcharacters of the non-glandular hair indument of the corolla (illustrated by SEM-microphotographs) and colour photographs from the original sites and of cultivated plants were additionally used for characterisation. A distribution map is provided for the two endemic species which are restricted to the Nipe-Sagua-Baracoa mountain region.

Keywords: *Pinguicula toldensis* Casper nova spec., *Pinguicula lippoldii* Casper nova spec., *Pinguicula benedicta*-group, Lentibulariaceae, East Cuba (Oriente), Greater Antilles, protologue

During recent years five new *Pinguicula* species from Cuba were described (CASPER & URQUIOLA CRUZ 2003; CASPER 2003, 2004), four of them – *P. bissei* Casper, *P. caryophyllacea* Casper, *P. infundibuliformis* Casper, and *P. jaraguana* Casper – from the eastern mountain ranges of the island (Provincias de Holguín and Guantánamo de la región oriental de Cuba).

The following descriptions of two species new to science result from another revision of herbarium and living material gathered during the field trips of the ‘Proyecto Flora de Cuba’ (PFC) between 1966 and 1985 and additionally during excursions recently made by Jorge Gutiérrez (La Habana), Ralph Mangelsdorff (Frankfurt/Main), Egon Köhler, and Kurt Zoglauer (both Berlin) between 2003 and 2005.

The two new species belong to sectio *Homophyllum* (CASPER 1963, 1966). Especially *P. toldensis*, with respect to the appearance of its corolla, is amazingly very similar to the heterophyllous *P. gypsicola* Brandegees from México (*Orcheosanthus*-group). Only its rosette leaves, however, are totally different in shape and development.

Our paper enlarges the number of new *Pinguicula* species from eastern Cuba up to six. Including the western Cuban species *P. cubensis* Urquiola et Casper (CASPER & URQUIOLA 2003), between 2003 and 2007 seven new *Pinguicula* species have been described. Now thirteen *Pinguicula* species are known from Cuba.

The herbarium specimens studied are deposited in Berlin (B), La Habana (HAJB, HAC-LS) and Jena (JE). Photocopies of the whole material are deposited in the photo collection of JE.

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Pinguicula lippoldii Casper nova spec.

Holotype

det. et nom. 1. August 2006
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HERBARIUM HAUSSKNECHT, JENA

Flora de CUBA No. 30754

Pinguicula benedicta Barnhart

Prov. ORIENTE
Mayari Arriba: Sierra del Cristal,
camino entre Los Moreiros (=Batista) y La Zanja,
500 - 600 m

1976 26 de febrero
leg. J. Bisse, L. González, J. Gutiérrez, H. Manitz
det. 2001,19.11. S.J. Casper

Plate 1: *Pinguicula lippoldii*. Copy of the type PFC 30754 (JE); photograph by Rosemarie Stimper.

Pinguicula lippoldii sp. nov. and *Pinguicula toldensis* sp. nov. from Cuba

Results

*Pinguicula lippoldii*¹ Casper **nova spec.** – fig. 1 (distribution map without localities in the Cuchillas de Moa); plts. 1–3; pl. 4, fig. 3.

Type: Cuba, prov. Holguín [Prov. Oriente], Sierra del Cristal: Mayari Arriba, camino entre Los Moreiros [= Batista] y La Zanja, 500–600 m; leg. 1976, 26 de febrero, J. Bisse, L. González Géigel, J. Gutiérrez & H. Manitz PFC 30 754 (JE – **holotype**; B, HAJB – **isotypes**) – Originally determined and nominated *P. benedicta* Barnhart (pl. 1).

'Iconotype': H. Manitz, 26.02.1976, film 27-16; photo collection JE (pl. 2, figs. D–F).

Specimens seen:

Cuba, Prov. Santiago de Cuba/Holguín [Prov. Oriente]: Sierra [del] Cristal, camino entre Los Moreiros [= Batista] y la Zanja; abril 1970, leg. J. Bisse PFC 15 965 (B, HAJB, JE). — Cuba, Prov. Santiago de Cuba, Mun. Segundo Frente [= Mayari Arriba]: Sierra del Cristal, arroyos y cañadas en la falda sur de la Loma el Gallego (al norte de Batista), bosque de galería, suelo silíceo; 1985, 29. (28.?) IV., leg. A. Álvarez de Zayas, C. Beurton, M. A. Díaz, H. Dietrich, M. E. Duharte Góngora, J. Gutiérrez, E. Köhler, L. Lepper, R. Rankin, C. Sánchez PFC 56 980 (B, HAJB, JE).

Specimens related to *P. lippoldii* studied in addition²:

Cuba, Prov. Santiago de Cuba [Prov. Oriente]: Sierra [del] Cristal: falda sur de la Sierra, cabezadas del río San Miguel, 600–800 m; 1968, abril, leg. J. Bisse y E. Köhler PFC 8 182 (B, HAJB, JE). — Cuba, Prov. Santiago de Cuba, Mun. Segundo Frente [= Mayari Arriba]: Sierra del Cristal, subida al Pico del Cristal, por el suroeste, charrascos de altura, suelo esquelético (ultrabásico); 30. Abril 1985, leg. A. Álvarez de Zayas, C. Beurton, M. A. Díaz, H. Dietrich, M. E. Duharte Góngora, J. Gutiérrez, R. Rankin, C. Sánchez PFC 57 209 (B, HAJB, JE). — Cuba, Prov. Santiago de Cuba [Oriente]: Sierra de(l) Cristal, Ravin de la branche nord de Río Levisa [Levisa], 15. Déc. 1922, leg. E. L. Ekman 15 956 (HAC-LS). — Cuba, Prov. Holguín, Mun. Moa: Arroyo Jaragua, 1979, 25. II. leg. J. Bisse, M. A. Díaz, H. Dietrich, J. Gutiérrez, P. Herrera, E. Köhler, L. Lepper, J. Miklos, U. Rändel, H. Schaarschmidt PFC 39 912 (B, HAJB, JE). — Cuba, Prov. Guantánamo, Mun. Yateras: Palenque, orillas del arroyo Frijol cerca Bernardo, charrascos sobre serpentina, ~500 m; 1983, 17. V. leg. I. Arias, C. Beurton, J. Bisse, H. Dietrich, J. Gutiérrez, E. Köhler, L. Lepper, R. Rankin PFC 49 746 (B, HAJB, JE). — Cuba, Prov. Holguín, Mun. Moa: Cuchillas de Moa, alrededores de la Mina Mercedita, cabezadas del río Jiguaní, charrascos a orillas de arroyos serpentina, 1985, 19 de abril, leg. A. Álvarez de Zayas, R. Berazaín, C. Beurton, H. Dietrich, J. Gutiérrez, E. Köhler, Á. Leiva, L. Lepper, R. Oviedo, C. Panfet, R. Rankin, A. Urquiola PFC 56 240 (B, HAJB, JE).

Photographs seen:

Cuba, [Holguín], Sierra de(l) Cristal, Osthänge [eastern slopes], Batista, Wasserfall [waterfall], 800 m, H. Stenzel, 29.03.1997, film 10: 212 (colour); photo collection JE (pl. 2, figs. A–

1 The epithet has been chosen in honour of the late Dr Hans Lippold, who continued together with Dr Johannes Bisse in the German-Cuban cooperation of studying the flora of Cuba in 1966.

2 The taxonomical position of some of the specimens listed subsequently is somewhat doubtful; see annotations.

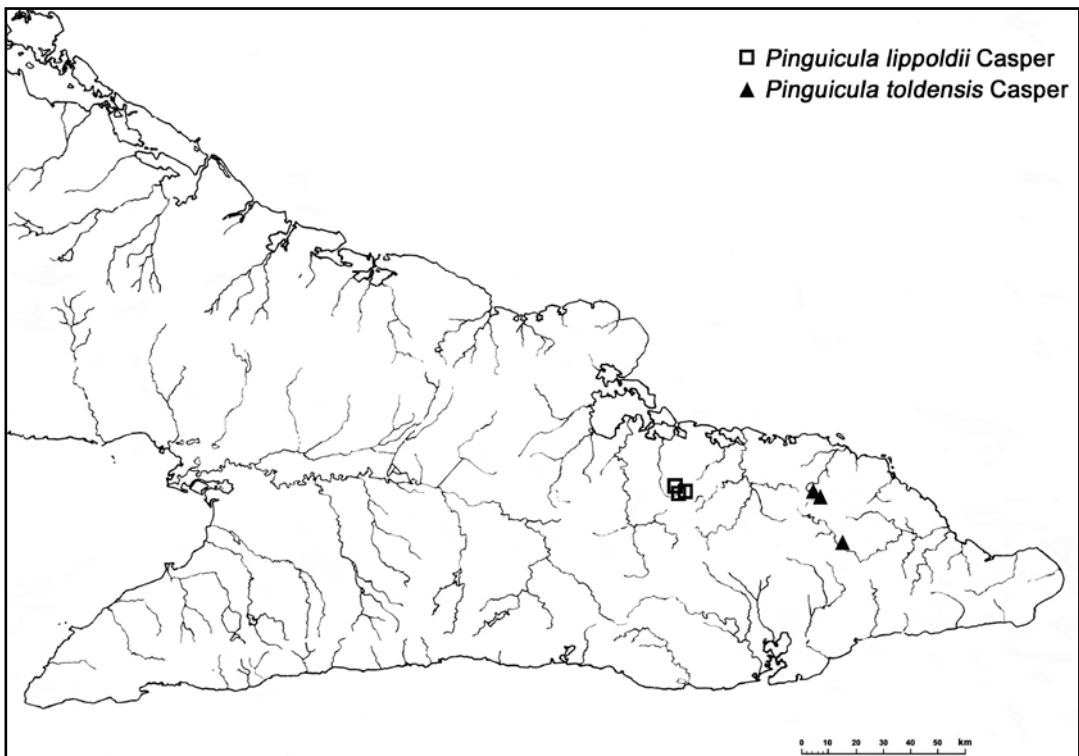


Figure 1: Distribution of *Pinguicula lippoldii* and *Pinguicula toldensis*. – Drawings: Rosemarie Stimper.

C). — Cuba, Holguín, Sierra de(l) Cristal, ladera sur del Pico [del] Cristal, camina hacia el Pico, charrascal sobre roca, lugar pandanoso, H. Stenzel, 07.04.1999, film 13: 067 (colour); photo collection JE (pl. 4, fig. 3). — Cuba, Sierra Moa [= Cuchillas de Moa], Arroyo Jaragua, wasserüberrieselter Hang, Ms Dr H. Dietrich, 79-32/34 (colour); Dr L. Lepper, film 19 (black-and-white); both referred to PFC 39912, photo collection JE.

Diagnosis:

Herba perennis, rosulata. *Folia* 6–8(–12) radicalia rosulata solum adpressa integerrima; lamina laete viridia, ~20–35(–40) mm longa, ~7–10 mm lata, ambitu oblonga vel spathulata vel ovato-oblonga, margine non involuta sed revoluta juventute plana; basin versus in petiolum breve angustata; superne pilis glanduliferis stipitatis et sessilis multum vestita. *Hibernacula* nulla. *Scapus* 1(–2), erectus, (4–)7–9(–10) cm altus, teretes, viridis vel ruber, glandulis stipitatis sparse obsitus, maturitate fructus glabrescens, uniflorus. *Flores* mediocres, ~15–22 mm. longi (calcar recurvato excluso). *Calyx* bilabiatus, viridis vel fuscus; labium superum trilobum lobis ovato-oblongis ~2,5 mm longis ad dimidium longitudinis divisus, labium inferum ad ~ $\frac{7}{8}$ longitudinis indivisum ~2,5–4 mm longum apice subtruncatum vel quadridenticulatum (duplicato-dentatum). *Corolla* bilabiata explanata (subrotata) lobis rubris oblongis vel spathulato-(ob)ovatis apice rotundatis inter se non tegentibus(?) non pilosis; labium superum bilobum, lobis spathulato-obovatis ~8 × 7 mm, labium inferum trilobum, lobis lateralibus obovato-oblongis ~9 × 8 mm lobo medio spathulato vel obovato-oblongo ~12 × 10 mm. *Tubus* ruber, infundibuliformis ~(5–)7–9 mm longus, fauce ~10 mm latus, parum incurvatus sine palato intus pilosus pilis multicellulatis uniseriatis vestitus. *Calcar* longitudine tubum aequans vel paulo superans, ~6–9(–10) mm longum, ~1.5 mm crassum,

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Pinguicula lippoldii
Casper nova spec.

Plate 2: *Pinguicula lippoldii*. A–C Photographs by H. Stenzel, film 10-212; photo collection JE. — A Natural habitat. Cuba, Sierra del Cristal, Batista, March 1997 ($\sim\frac{1}{5}$:1). — B (detail of A) Specimen showing the spatulate-oblong rosette leaves ($\sim\frac{1}{2}$:1). — C (detail of A) Specimen showing the pink corolla ($\sim\frac{2}{3}$:1). — D–F Photographs by H. Manitz, film 27-16; photo collection JE. — D Type locality. Cuba, Sierra del Cristal, Mayari Arriba, entre Los Moreiros and La Zanja; 26.02.1976 ($\sim\frac{1}{5}$:1). — E (detail of D) Specimen showing the spatulate-oblong rosette leaves; the corolla fallen off the scape (left side) showing the outspread lobes, the red tube and the whitish spur ($\sim\frac{1}{2}$:1). — F (detail of D) Corolla lobes pink, at throat white, outspread ('rotate'; $\sim\frac{1}{2}$:1).

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apice parum saccatum obtusum cum tubo angulum subrectum formans vel ad lateram ventralem tubi recurvatum, albido-viride; intus pilis vestitum. *Capsula* subglobosa, maturitate lobis calycis persistentibus inclusa. Semina brunnea, $\sim 600 \times 350 \mu\text{m}$.

Differt a *Pinguicula* speciebus *benedicta* dictis laminis foliorum ambitu oblongis vel spatulatis margine non involutis sed revolutis; calycis distincte bilabiatis labio infero fere indiviso apice

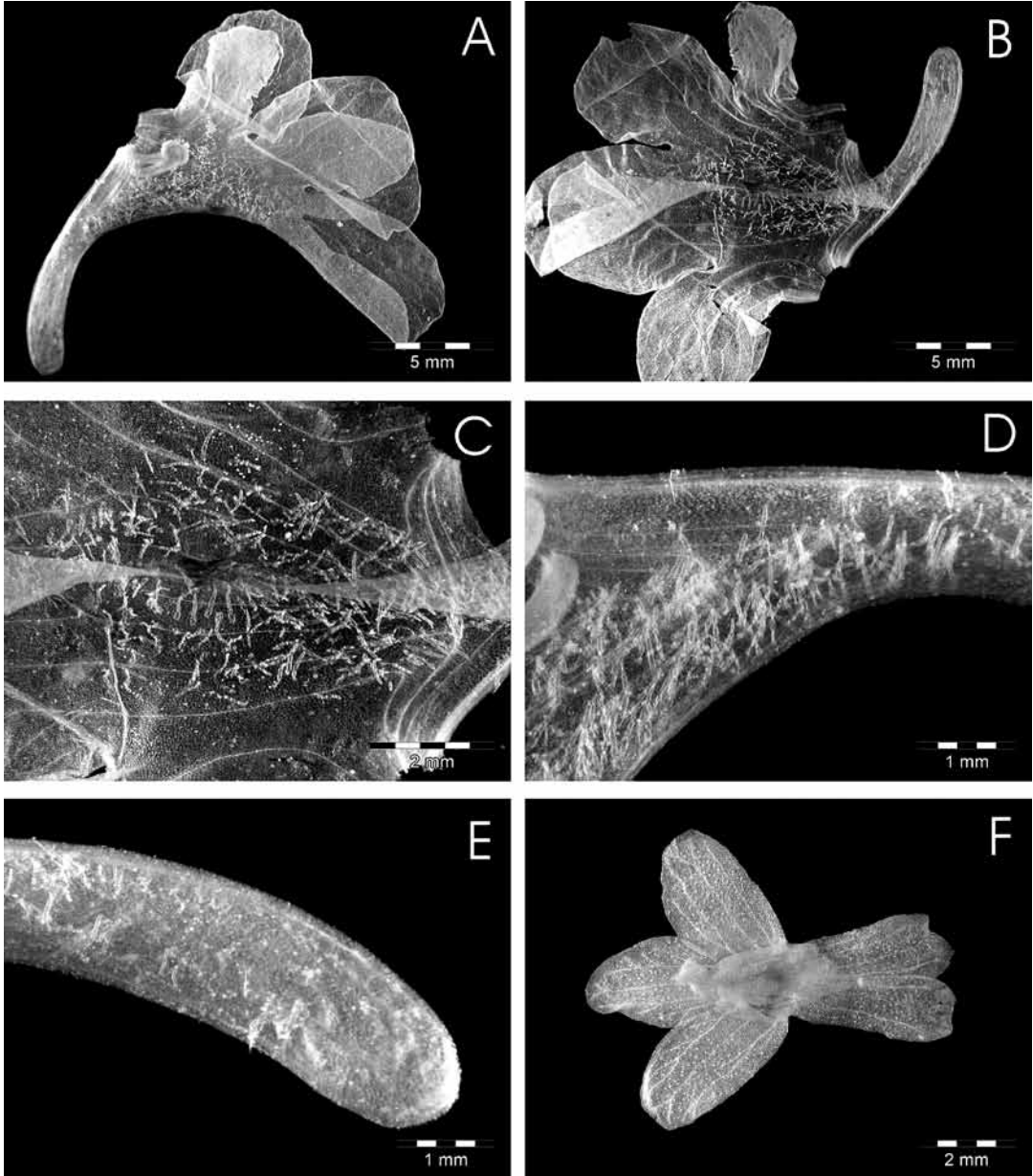


Plate 3: *Pinguicula lippoldii*. A–F Stereo-microphotographs of the flower (corolla, calyx) after preparation in alcohol by Rosemarie Stimper. — A Corolla, side view. — B Corolla opened, outspread, tube region showing pattern of non-glandular hairs. — C (detail of B) Corolla, tube with pattern of non-glandular hairs. — D Corolla, tube, side view, inner surface (ventral) with non-glandular hairs. — E Corolla, spur, side view, inner surface with non-glandular hairs. — F Calyx (and stigma-ovule-complex) showing the distinctly three-partite upper lip and the nearly undivided lower lip at margin minutely doubly toothed.

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truncato vel truncato-quadridenticulato; corollis subbilabiatis lobis valde explanatis; calcaribus longitudine tubum subaequantibus cum tubo angulum subrectum formanti vel ad lateram ventralem tubi recurvato.

Distributio: In montibus Cubae orientalis (provinciae Santiago de Cuba et Holguín) Sierra del Cristal et Cuchillas del Moa dictis, usque ad 1,000 m supra mare, endemica (fig. 1, area distributionis³).

Habitatio: Crescit prope rivulis in locis lapidosis ophiolithicis (serpentinis) simulque permanente humidis (pl. 2, figs. A, D).

Description:

Perennial rosulate herbs, in flower up to 8 cm, in fruit up to 10 cm tall. *Rhizome* short, with many relatively strong roots. *Leaves* ~6–8(–12), rosulate, simple, yellowish green, in outline oblong to spatulate with parallel margins (pl. 2, figs. B, E), ~25–32(–40) mm long, ~7–10 mm wide, base shortly attenuate, margins entire, not involute, slightly (~1 mm) revolute (i. e. rolled back slightly towards the lower surface), upper surface densely covered with sessile and stalked glandular hairs. *Scapes* 1(–2), erect, ~(4–)7–9(–10) cm tall, ~½ mm in diameter, one-flowered, greenish to reddish, sparsely covered with sessile and stalked glandular hairs, later on nearly glabrous, in flower and fruit nearly up straight (pl. 2, figs. A, C–D, F). *Flowers* two-lipped, ~15–22 mm long (reflexed spur excluded), lobes outspread, bent outwards, pink. *Calyx* two-lipped, greenish to purple, sparsely covered with glandular hairs; the upper-lip deeply three-lobed, lobes ovate or spatulate or oblong, at apex rounded, ~2.5 mm long, the lower-lip at apex more or less truncate or minutely doubly toothed, at most up to ~⅛ of its length denticulate, ~2.5–4 mm long (pl. 3, fig. F). *Corolla* two-lipped, pink, outspread, nearly rotate (seen from above similar in appearance as the corollas in the *Orcheoanthus*-group; pl. 2, fig. F), the lobes of different length, the middle lobe of the lower-lip always distinctly longer than the lateral and upper lobes, oblong to spatulate, rounded at the apex, spreading, not covering themselves, at the throat with multicellular uniseriate hairs pointed by an inconspicuous cap cell (pl. 3, fig. B); tube funnel-shaped, without palate; at throat, in tube and spur particular zones beset with characteristic patterns of white hairs of different shape and size (pl. 3, fig. C), ~(5–)7–9 mm long; spur greenish-white, continuous with the tube, reflexed (i. e. bent backwards often at more than 90°), relatively long, ~6–9(–10) mm long, over its whole length equal wide, at the apex blunt, rounded. *Pollen* grains not observed. *Capsules* subglobose, at maturity not longer than the calyx and ± enclosed by the persistent calyx lobes. *Seeds* brown, tiny, ~600 µm long, ~350 µm wide, with ~8–10 longitudinal rows of foveolate, rectangular to polygonal-rounded exotesta cells; shape ± cylindrical to ellipsoidal with a short but distinct micropylar appendage (chalazal appendage lacking).

Distribution: An endemic species in the mountains of Sierra del Cristal and (probably) of Cuchillas del Moa (Eastern Cuba, provinces Santiago de Cuba and Holguín) in altitudes about 600 to 1,000 m a. s. l. (fig. 1, distribution map⁴).

Habitat:

It grows near streams in places rocky and moist (pl. 2, figs. A, D).

3 Localities in the Cuchillas de Moa are not shown (see annotations).

4 See footnote 3.



Plate 4: *Pinguicula toldensis* and *P. lippoldii*. — 1 *Pinguicula toldensis*, Holguín, Macizo del Toldo, 21.06.1998; flowers white and lilac; photograph H. Stenzel, film 12-197 ($\sim\frac{1}{2}$:1). — 2 *Pinguicula toldensis*, Holguín, Sierra de Moa, Alto de Galinga y Loma del Toldo, 21.IV.1981; corollas pink; photograph Dr Helga Dietrich, film 81/12 ($\sim\frac{3}{4}$:1). — 3 *Pinguicula lippoldii*, Santiago de Cuba/Holguín, Pico [del] Cristal, 07.04.1999; flowers pink-violet with broadly rounded, touching or slightly covering corolla lobes; the rosette leaves longer than wide, spatulate; photograph H. Stenzel, film 13-067 ($\sim\frac{3}{4}$:1).

Annotations:

The flowers are distinctly outspread (pl. 2, fig. F), distinctly pink and relatively large, the base of the corolla lobes is white. The throat is white and hairy (pl. 2, fig. F). The funnel-shaped tube is, seen from the outside, red. The spur is as long as the tube, greenish-white (rarely purple) and bent backwards about 90° and often more than 90°. The leaves of the rosette are oblong to spatulate to ovate-oblong, distinctly longer than wide (pl. 1). Their margins are often slightly (about 1 mm) rolled back towards the lower surface; their upper surface is densely covered by stalked and sessile glandular hairs.

The voucher PFC 56 980 requires special attention. The voucher deposited in B as *P. benedicta* (the corresponding HAJB voucher I have not seen) shows three non-flowering specimens, one of them a rosette built of spatulate-oblong leaves, the other two built of broadly oblong to ovate ones. The differences in the foliage are striking.

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The voucher of the same number deposited in JE shows two rosettes: one flowering, with obovate leaves measuring ~20 mm × 12 mm and less, a second no flowering, with distinctly spathulate-obovate leaves measuring ~25–32 mm × 7–10 mm.

The questions are: Do the specimens of PFC 56 980 originate from only one collection event? Or has it to be regarded as specimen mixtum? In view of the informations available an unambiguous answer is impossible. Therefore, we separated the original vouchers into the *P. lippoldii*-like specimen as number PFC 56 980 and into the two '*benedicta*' specimens as number PFC 56 980a. Further studies in the field will be necessary.

The voucher no. 15 956 collected by E. L. Ekman in 1922 in the Sierra del Cristal (ravin de la branche nord da Río Lebisa) named *Pinguicula benedicta* Barnh. and deposited in the Herbario del Colegio de la Salle, Vedado-Habana (HAC-LS), contains only one single flowering specimen. The rosette leaves are ± obovate-oblong, not spathulate. It remains doubtful whether it belongs actually to *P. lippoldii*.

In addition, we must discuss some samples of so-called *P. benedicta* the taxonomical rank of which remains uncertain.

PFC 8 182 (B, HAJB, JE), a collection number which represents material already collected in 1968 by J. Bisse and E. Köhler, could belong to our new species. But I am hesitating to determine the specimens in question as *P. lippoldii* because of the deviating shape of the rosette leaves. They are not really spathulate-oblong as in our new species, however, but more or less broadly ovate.

The well known fact, that in *Pinguicula* we have to expect the possibility of changing leaf shape during individual development requires caution. Living material would be necessary to study the (possible) morphological changes which the plants undergo during their development.

In PFC 57 209, collected on 30 April in the immediate neighbourhood of the place of collection PFC 56 980, a similar situation occurs. The specimens look like *P. lippoldii* but they are distinguished by their leaf shape: In outline the leaves are ovate-oblong and not really spathulate-oblong, maximum ~19 mm long, their margins are slightly (~1 mm) involute (i. e. rolled up).

I emphasized *P. lippoldii* to be an endemic species of the Sierra del Cristal. However, when studying the specimens gathered in the Moa-Baracoa mountains the taxonomical situation around the new species becomes even more complicated.

On 25 February 1979, mounting the Sierra Moa [= Cuchillas de Moa] from the South, J. Bisse and companions detected a *Pinguicula* population in the reach of Arroyo Jaragua (PFC 39 912; B, HAJB, JE). The dried specimens show spathulate-oblong rosette leaves and long-spurred corollas of the *P. lippoldii*-type.

Helga Dietrich wrote about this detection in her diary (diario 1979: 59) that they found "on the watered slope hundreds of flowering specimens of *Pinguicula albida* (Oriente-type?) [= *Pinguicula jaraguana* Casper; PFC 39 913] and *P. benedicta*, the first white-, the second red-flowering".⁵ There exist photographs from this locality. Helga Dietrich (colour) and Dr Lothar Lepper (black-and-white) took photographs which show *P. lippoldii*-like individuals. Their leaves are somewhat different from those of the Sierra del Cristal plants. They are more succulent and densely crowded.

5 Original German text: "Am wasserüberrieselten Hang blühten hunderte Exemplare von *Pinguicula albida* (Oriente-Typ) and *P. benedicta*, die erste weiß-, die zweite rotblühend".

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Herbarium Haussknecht (JE)

Pinguicula toldensis Casper nove spec.

Holotype

det. et nom. 1. August 2006
S. Jost Casper

23.03.05 Hoa → Toldo
Sierra de Hoa
Alto de Calvina / El Toldo
ca. 890 m
N 20° 31,753
W 74° 54,530
PFC 83298
Pinguicula benedicta

Pinguicula benedicta Bonnier

20 05 rev.
Herbarium Haussknecht, Jena

Jost Casper

HERBARIUM HAUSSKNECHT, JENA

Flora von Caba
Pinguicula benedicta PFC 83298
Sierra de Hoa, Alto de Calvina /
El Toldo ca 890 m; N 20° 31,753'
W 74° 54,530'
23.03.2005
leg. K. Zyganski [exsicc. Jost Casper]

Mp G 217 16 V 10 20



Plate 5: *Pinguicula toldensis*. Copy of the type PFC 83298 (JE).

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However, from the pictures it does not become clear whether the differences are significant or not.

On the following day, 26 February 1979, the group got off downwards into the valley of río Aserrio. By the way they found an "... unknown tiny *Drosera* [*Drosera moaensis*], a *Pinguicula* (according to Casper only *P. benedicta*, but this is very dubious after having seen the living plants!!) ... " (PFC 40009; cf. Helga Dietrich, diario 1979: 62–63).

Moreover, on 19 April 1985, A. Álvarez de Zayas and companions collected *Pinguicula* in the 'cabezadas del río Jiguaní, alrededores de la Mina Mercedita'. The original voucher (PFC 56240 – B, HAJB, JE) is clearly a specimen mixtum: it contains specimens of *Pinguicula jaraguana* Casper (CASPER 2003: 144; after separation PFC 56240) and of a taxon quite similar to *P. lippoldii* (after separation PFC 56240a).

As LEPPER & GUTIÉRREZ (1988) pointed out, in 1987 the plant hunters took their way from the north and northwest to the rainy slopes of the central part of Sierra del Cristal. They went from El Quemado along the street Mayari-Sagua de Tanamo southwards into the deeply eroded valley of río Cabonico. They pitched their camp in a 'Cafetal' above El Culebro. In the region north of the central range they found a rich mosaic of vegetation zones and a vertically distinct zonation: mountainous rain forests about 700 m, the *Pinus cubensis* – zone at about 1,100 m moving into a low bushy forest, and the 'charrasco di altura' (in German 'Höhencharrasco') above 1,100 m on serpentine skeleton soils.

The populations in the Sierra del Cristal were discussed in BISSE et al. (1975: 383–384 and distribution map, fig. 6). The authors suggested, that the taxon which they believed to be *P. benedicta* would represent one of the very few floral elements occurring in the Sierra del Cristal as well as in the Moa-Baracoa mountains. Now, this statement has to be partially corrected: The collection numbers PFC 8451 and 15965 reported by them do not belong to *P. benedicta* but to *P. lippoldii*.

*Pinguicula toldensis*⁷ Casper, **nova spec.** – pl. 4, figs. 1–2; plts. 5–11; fig. 1 (distribution map).

Type: Cuba; Prov. Holguín, Mun. Moa: Cuchillas de Moa, Alto de Calinga, parte alta de la Meseta del Toldo, ~890 m. N 20°31.753', E 74°54.530'; 2005, 23. III. leg. J. Gutiérrez, H. Hilger, E. Köhler, (R. Mangelsdorf), K. Zoglauer PFC 83298 (JE – **holotype**; HAJB, B – **isotypes**) – as *Pinguicula benedicta*.

'Iconotype': K. Zoglauer, Meseta del Toldo, 23.03.2005, DSL 0677, 0694, 0695; photo collection JE (pl. 6, figs. 2–4).

Cultures: 128–131 BGJ.

6 Original German text: ...fanden ... eine winzige *Drosera*, die noch zu beschreiben ist, eine *Pinguicula* (die nach Casper nur *P. benedicta* sein soll, was aber nach Kenntnis der Lebendpflanzen stark anzuzweifeln ist !!)...

7 The epithet is derived from Loma [= Meseta] del Toldo, a mountain chain situated in the Alto de la Calinga (montañas de Nipe-Sagua-Baracoa), province Holguín, 17 km SSE of Moa; N 20°30', E 74°55'; altitude of the summit (Pico del Toldo) 1,175 m a.s.l.

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Pinguicula lippoldii sp. nov. and *Pinguicula toldensis* sp. nov. from Cuba

Other specimens seen:

Prov. Holguín [Prov. Oriente], Mun. Moa: charrascales en el altiplano de la Sierra de Moa, ~600–900 m alto, monte nublado, 07.01.1969, J. Bisse & H. Lippold PFC 11 850 (B, HAJB, JE) – as *Pinguicula benedicta* Barnh. in Britton. — Prov. Holguín, Mun. Moa: Cuchillas de Moa, entre Alto de la Galinga y ladera oeste de la Loma del Toldo, charrascos di altura sobre laterita ~800 m, 1981, 21. IV. J. Bisse, M.A. Díaz, H. Dietrich, L. Lepper, B. Mory y C. Sánchez PFC 44 646 (B, HAJB, JE) – as *Pinguicula benedicta*. — Prov. Holguín, Mun. Moa: Cuchillas de Moa, entre Revuelta de los Chinos y la base del Pico del Toldo, ~800–900 m, charrascales, suelo esquelético (ultrabásico), 1985, 20. IV. leg. A. Álvarez de Zayas, R. Berazaín, C. Beurton, H. Dietrich, J. Gutiérrez, E. Köhler, Á. Leiva, L. Lepper, R. Oviedo, C. Panfet, R. Rankin & A. Urquiola PFC 56 413 – (B, HAJB, JE). — Prov. Holguín, Mun. Moa: Cuchillas de Moa, subida (desde norte) al Pico del Toldo, charrascos con pinos dispersos, suelo esquelético ultrabásico, 1985, 21. IV. leg. A. Álvarez de Zayas, R. Berazaín, C. Beurton, H. Dietrich, J. Gutiérrez, E. Köhler, Á. Leiva, L. Lepper, R. Oviedo, C. Panfet, R. Rankin, A. Urquiola PFC 56 354 – (B, HAJB, JE).

Photographs seen:

Cuba, Holguín, Sierra Moa [= Cuchillas de Moa], Alto de Galinga y Loma del Toldo, 21.04.1981, H. Dietrich, film 81/12 (colour), (pl. 4, fig. 2); L. Lepper, film 5, 1981 (black-and-white); L. Lepper, film 8, 1985 (black-and-white); – all referred to PFC 44 646. — Cuba, Holguín, Sierra de(l) Moa, Macizo del Toldo, carretera para Moa, bosque de galería a lo largo de unas cascadas, 21.06.1998, H. Stenzel, film 12: 295–297 (colour); (pl. 4, fig. 1). — Cuba, Holguín, Meseta del Toldo, Mina El Piloto, orillas del Río Piloto, serpentina, N 20°27'25", E 74°53'55", 16.06.1996, H. Stenzel, film 10: 280 (colour). — Cuba, Guantánamo, Yateras, Pico Galán, bosque de galería en la falda norte, serpentina, 02.05.1999, H. Stenzel, film 13: 159 (colour). – All photographs: photo collection JE.

Diagnosis:

A speciebus affinis praecipue differt: *Scapis* 1–2, erectis, ~ (80–)140–220(–280) mm altis (in Cuba magnitudine pro genere maxima), unifloris. *Foliis* rosulatis, rosula ~ (15–)20–35(–62) mm in diametro; laminis herbaceis sicco membranaceis ambitu obovatis vel (ob)ovato-rotundatis vel (ob)ovato-oblongis, ~ (8–)15–25(–35) mm longis, ~ (8–)15–20 mm latis, marginibus integerrimis debile (~1 mm) involutis; *radicibus* adventitiis robustis numerosis. *Calyce* bilabiato, castaneo vel purpureo; labio supero ad basin fere trilobato, lobis late ovatis, inaequalibus; labio infero bilobo, lobis brevibus usque ad $\frac{7}{8}$ longitudinis connatis. *Corollis* decolorato lilacinis, (roseis, obscure pallidis), explanatis 15–25 mm in diametro (calcaribus excluso) quinquefidis bilabiatis, lobis labii superi 2, lobis ~6–9 mm longis longitudine circa $\frac{1}{2}$ lobum medium labii inferi aequantibus,

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Plate 6: *Pinguicula toldensis*. 1–4 Photographs by Dr Kurt Zoglauer; photo collection JE. — 1 View over the charrasco di altura of the Meseta del Toldo; the locus classicus is situated on the left side of the path near the two dark spots in the central part of the photograph; 23.03.2005 (Zoglauer CD7-DSC 0910). — 2 Specimen in its natural habitat with its faded lilac two-lipped corolla. The shadow on the stone reflects the five-partite corolla (Zoglauer DSC 0677; ~7:1). — 3 Corolla, front view; the corolla lobes not covering, outspread, i. e. the lobes in nearly the same level, the lobes of the upper lip oblong, much shorter than the lower lip lobes; the lobes of the lower lip spatulate, the middle lobe larger than the lateral lobes (Zoglauer DSC 0694; ~3:1). — 4 Corolla pink, side view, spur 'handleformed' (Zoglauer DSC 0695; ~3:1).

oblongis, apice obtusis divergentibus (angulum $\sim 30^\circ$ – 90° formantibus) non tegentibus (raro contiguus); lobis labii inferi 3; lobis lateralis 2, lobis ~ 10 – 13 mm longis, longitudine $\frac{2}{3}$ – $\frac{3}{4}$ lobum medium labii inferi aequantibus, anguste oblongis vel anguste spathulatis apice rotundatis divergentibus (cum lobis superis angulum $\sim 70^\circ$ – 110° formantibus, cum lobo medio angulum $\sim 45^\circ$ – 60° formantibus) non tegentibus (raro contiguus); lobo medio late oblongo vel spathulato apice rotundato, ~ 12 – 15 mm longo, supra sectione medio latissimo (~ 6 – 9 mm). *Tubo* brevi, infundibuliformi. *Calcari* elongato longitudine corollae lobum medium subaequali (12 – 15 mm longo) apicem versus turgido valde arcuato cum tubo angulum $\sim 90^\circ$ – 180° formanti, tubo subtriplo longiore. *Capsula* globosa, ~ 4 mm in diametro, maturitate lobis calycis persistentibus inclusa.

Distributio: Cuba orientalis, provincia Holguín, Cuchillas de Moa, Loma del Toldo; endemica (fig. 1, area distributionis).

Habitatio: In locis montanis humidis, $\sim (500$ – $)800$ – 1000 m supra mare, in formatione 'charrasco di altura' dicta (pl. 6, figs. 1, 2).

Description:

Perennial rosulate herb, scapose, with runners (?). *Rhizome* short, with many adventitious stout and long roots. *Rosettes* of 8–14 leaves, not really erect; the lower leaves more or less appressed to the soil (pl. 6, fig. 2), $\sim (15$ – $)20$ – 35 (– 62) mm in diametre, leaf blades bright green, flat, thin (dried membranous), simple, $\sim (8$ – $)15$ – 26 (– 35) mm \times $(8$ – $)15$ – 20 mm, in outline obovate to orbicular-ovate (the broadest part above the middle) with entire margins scarcely (~ 1 mm) involute, at base tapering gradually into the short, 4–10 mm long petiole (pl. 7, fig. 2), mid rib depressed, upper surface densely covered with sessile and stipitate glandular hairs. *Scapes* 1–2, before flowering strongly curved, during flowering erect (pl. 6, fig. 2; pl. 7, fig. 1), $\sim (80$ – $)140$ – 180 mm tall, during fruiting straight-up, elongated, up to ~ 220 (– 280) mm tall, ~ 1 mm thick at top below the calyx, ~ 2 mm thick at base, one-flowered (pl. 6, fig. 2; pl. 7, fig. 1), reddish-green to reddish-brown, scantily covered with sessile and stipitate glandular hairs especially below the calyx and at base, adult becoming glabrous. *Flower* outspread widely opened, two-lipped (pl. 6, figs. 2–4; pl. 7, figs. 3–4), faded lilac to blue, sometimes pink or dull white. *Calyx* two-lipped (pl. 7, fig. 5), dark reddish-brown (chestnut brown) to purple, much darker than the rest of the corolla, extus covered with glandular hairs; the three sepals of the upper-lip divided to nearly their bases, oblong-ovate, at apex more or less rounded or somewhat truncate, the middle lobe larger or smaller than the lateral lobes, ~ 2.5 – 3.5 mm long; the lower-lip nearly undivided, to nearly $\frac{7}{8}$ of its length connate (sometimes 'fringed'), ~ 6 mm long. *Corolla* two-lipped, the two lips in nearly the same level, i. e. forming an angle of about 170° – 180° (pl. 6, fig. 3; pl. 7, fig. 4), $\sim (12$ – $)15$ – 20 (– 25) mm in diametre, the two lobes of the upper-lip oblong, at apex rounded, ~ 6 – 9 mm long, much smaller than the lobes of the lower-lip, not covering, rarely touching, bent upwards to $\sim 90^\circ$, dark violet longitudinally veined at base (pl. 6, fig. 4); lower-lip three-lobed, the three lobes usually not covering (pl. 6, figs. 2–4; pl. 7, figs. 3–4), rarely slightly touching, the lateral ones narrowly oblong (the sides almost parallel) to slightly obovate to narrowly spatulate (the broadest part above the middle), ~ 10 – 13 mm long, shorter than the middle lobe, forming an angle of about 60° – 120° with the upper lobes; the middle lobe mostly broadly oblong to oblong-obovate (pl. 6, figs. 2–3; pl. 7, fig. 3), sometimes broadly obovate to broadly spatulate (from a narrow base enlarging gradually into a broad rounded upper part), ~ 12 – 15 mm long; with

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Pinguicula toldensis
nova spec.

Cult. 128 BGJ – Photographs
Rosemarie Stimper

Plate 7: *Pinguicula toldensis*. 1–6 Photographs by Rosemarie Stimper; photo collection JE. — 1 Specimen sample number 128 BGJ; scape straight upright ($\sim 1/2:1$). — 2 (detail of 1) Leaf rosettes ($\sim 7/8:1$). — 3 (detail of 1) Corolla, front view; typical five-partite shape ($\sim 2.5:1$). — 4 (detail of 1) Corolla, side view; all of the corolla lobes in the same level; spur 'handleformed' ($\sim 3:1$). — 5 (detail of 1) Corolla, back view; calyx and scape reddish-brown ($\sim 3:1$). — 6 Capsule enclosed by the calyx lobes ($\sim 5:1$).

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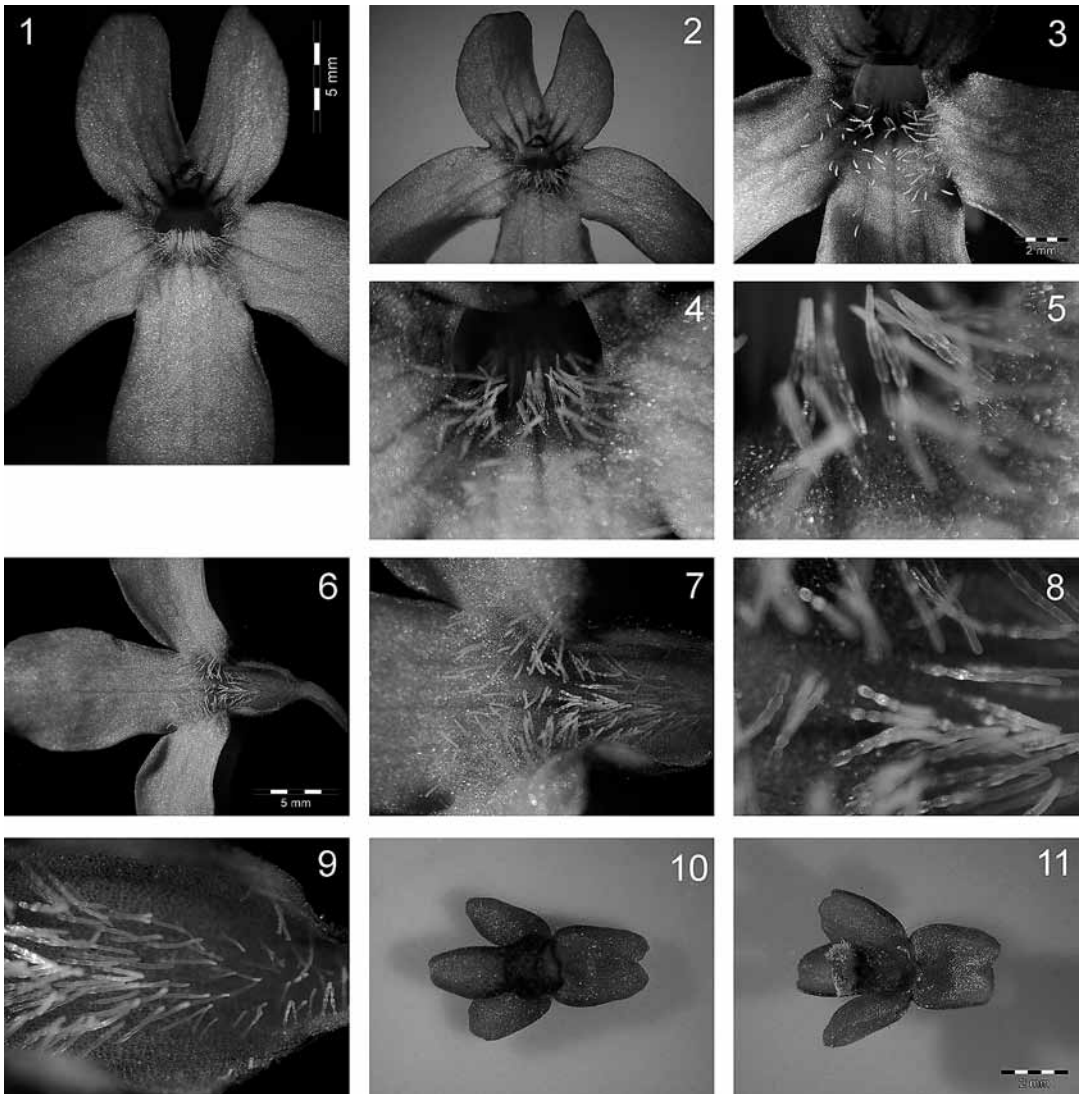


Plate 8: *Pinguicula toldensis*. 1–9 Corolla; 10–11 calyx. Preparation and stereomicrophotographs by Rosemarie Stimper. — 1–2 Corolla front view. — 3–4 Corolla, front view, basal part of corolla lobes and throat entrance (ventral) with whitish non-glandular hairs. — 5 Detail of 4 showing the right two longitudinal rows of hairs. — 6–8 Corolla lower lip, transitional zone to the tube; — 7 (detail of 6) showing the ‘cross’ hairs in front of the tube entrance, — 8 (detail of 7) longitudinal directed multicellular hairs in the distal part of the tube. — 9 Longitudinal directed multicellular hairs in the central and shorter ones in the proximal part of the tube; at the entrance of the spur cross directed hairs. — 10 Calyx view from the back; — 11 view from ventral with stigma-ovule-complex.

single whitish hairs at base (pl. 8, fig. 3; pl. 9, fig. 1); tube funnel-shaped, ~7–9 mm long, without palate, however at the throat dark violet longitudinally veined, with at (dull) white hairy two- or three-part spot (pl. 8, figs. 4, 5); in its middle section with white multi(7–12)cellular uniseriate hairs pointed by a single acute to obtuse cap cell (pl. 9, figs. 8, 9); spur ~12–15 mm long, much longer than the tube, nearly as long as the middle lobe of the corolla lower lip, relatively thick (~1 mm in diameter, slightly, up to ~1.5 mm, swollen towards the apex), continuous with the tube however heavily deflected to incurved (‘handleformed’; pl. 6, fig. 4; pl. 7, fig. 4), longitudinally dark veined, obtuse, rounded at the swollen apex; the inner surface covered with multicellular

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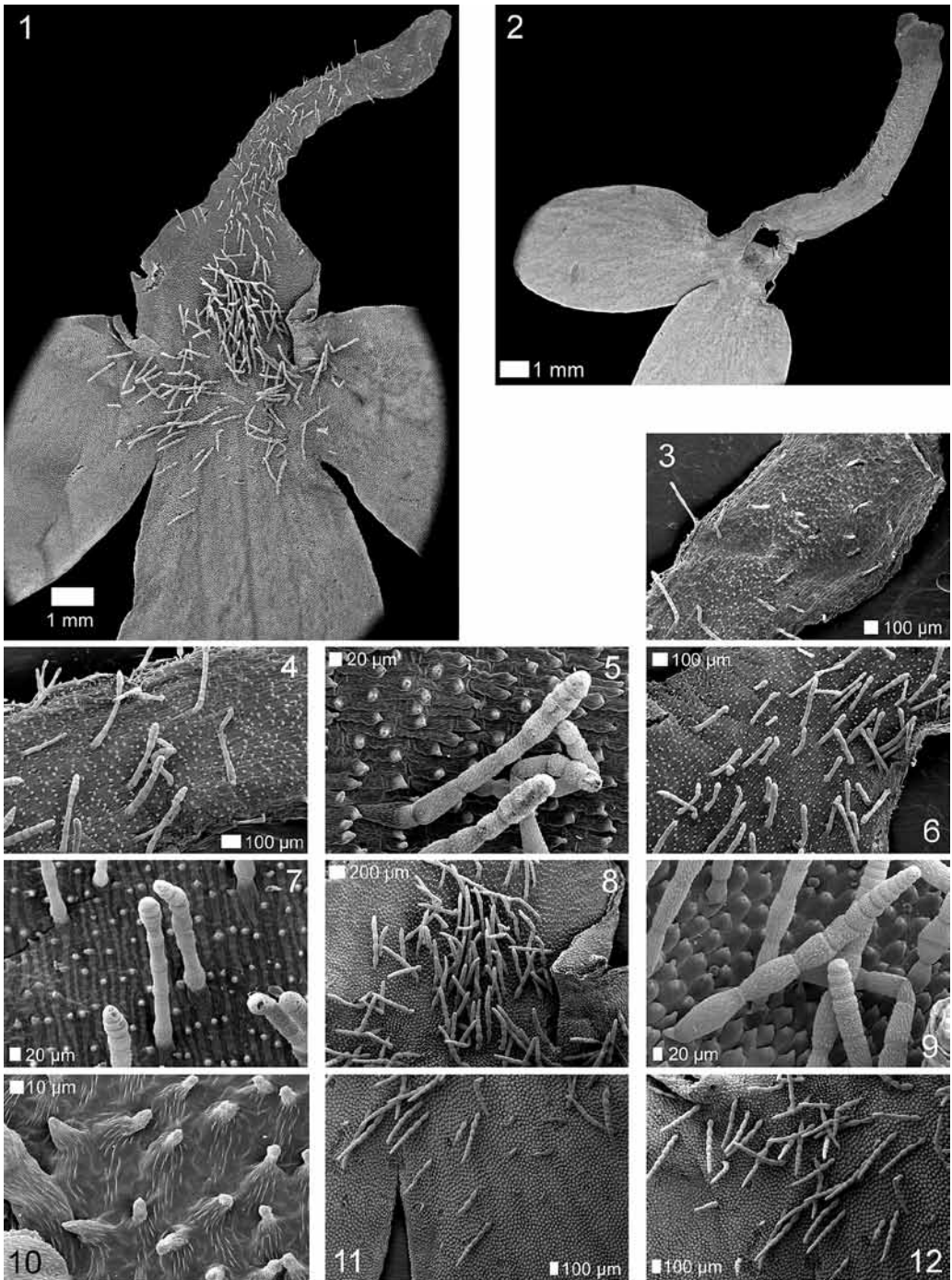


Plate 9: *Pinguicula toldensis*. 1–12 Corolla; preparation and scanning-microphotographs by Ingemarie Herrmann and Rosemarie Stimper; photo collection JE. — 1 Corolla, lower lip with pattern of non-glandular hairs in spur, tube, and on the basal parts of lower lip lobes. — 2 Corolla, upper lip, non-glandular hairs lacking. — 3 Spur, near the tip; scattered short non-glandular hairs. — 4 Spur, central part, multicellular non-glandular hairs pointed by a rounded cap cell. — 5 Detail of 4. — 6 Transitional zone between spur and tube; non-glandular hairs like those ones in the spur. — 7 Detail of 6. — 8 Tube, central part ventral; reach of densely crowded multicellular non-glandular hairs directed backwards. — 9 Detail of 8; hairs longer than in the tube but of similar shape. — 10 Tube, epidermal cells with short outgrowths. — 11 Corolla lower lip, lateral (left; cf. 1) and middle lobe separated from each other; with scattered non-glandular hair covering. — 12 Corolla lower lip, lateral lobe (left; cf. 1) with non-glandular hair covering.

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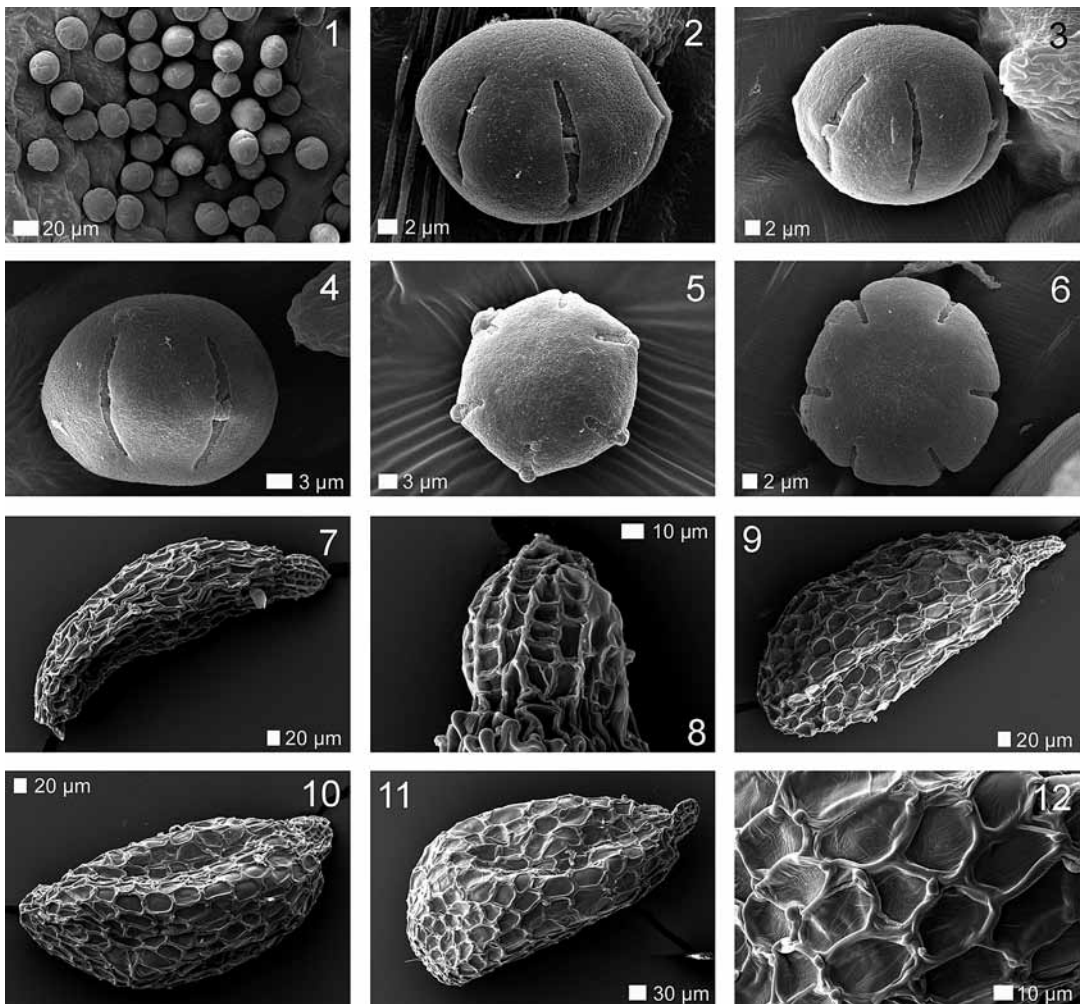


Plate 10: *Pingicula toldensis*. 1–12 Pollen grains and seeds, preparation (critical point drying) and SEM microphotographs by Ingemarie Herrmann and Rosemarie Stimper. — 1 Bulk of pollen grains. — 2–4 Pollen grains in equatorial view. — 5–6 Pollen grains in polar view; stephano-6-colporate. — 7–12 Seeds: 7, 9, 10, 11 general view, micropylar appendage on the right end; 8 micropylar appendage, detail; 12 detail of foveolate exotesta surface (seed coat).

uniseriate hairs pointed by a cap cell (pl. 9, figs. 3–5). *Pollen grains* stephano-6-colporate (pl. 10, figs. 1–6). *Capsule* globular, in culture ~4 mm in diameter (not fully developed?), enclosed by the persistent calyx; pl. 6, fig. 6), up straight. Seeds very small, with one micropylar appendage (pl. 10, figs. 7–11) and with longitudinal rows of honey-combed (foveolate) exotesta cells (pl. 10, fig. 12).

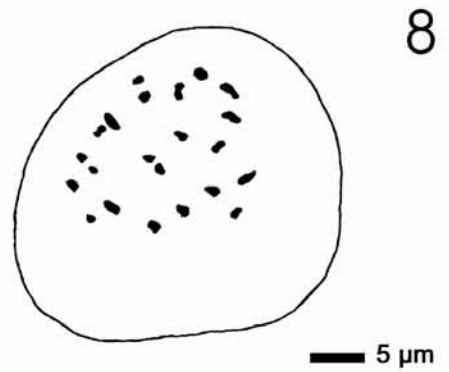
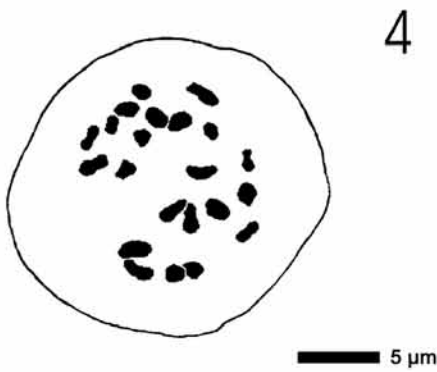
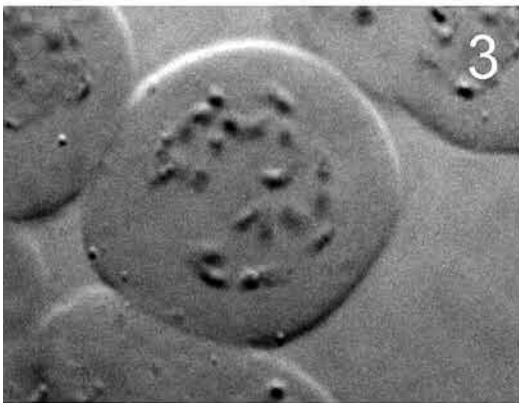
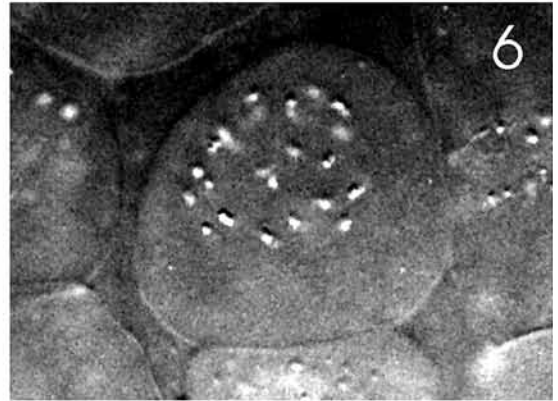
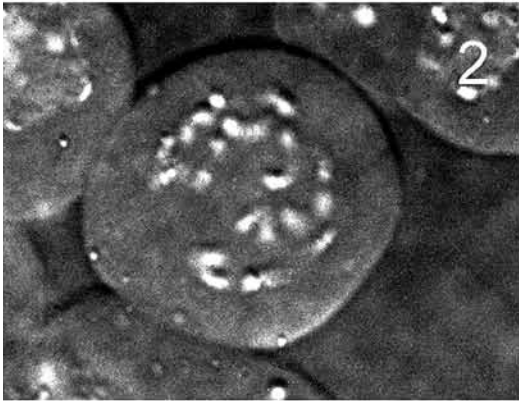
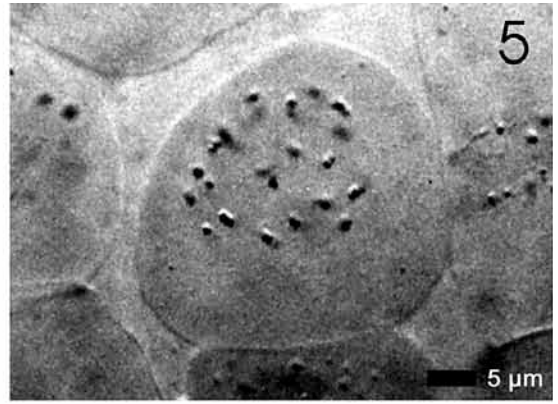
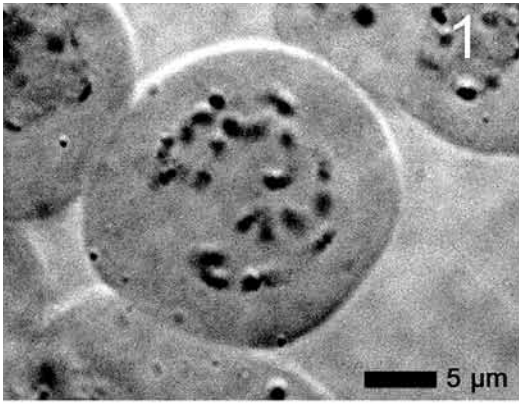
Chromosome number: $2n = 22$ (pl. 11, figs. 1–8).

Distribution: An endemic species of the mountainous region of eastern Cuba (province Holguín, Cuchillas de Moa) called Loma del Toldo.

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Plate 11: *Pingicula toldensis*, 128 BGJ, root tip tissue. 1–8 Photocopies of two somatic metaphase plates in different modes (in each column from top to bottom: black-white, white-black, DIC, drawing); $2n = 22$. – Preparation, microphotographs, and drawings: Rosemarie Stimper.

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Habitat: It grows in damp places in altitudes between (500–)800 m and 1,000 m a.s.l. in pine woods called ‘charrascos di altura’.

Annotations:

Pinguicula toldensis is the most imposing East Cuban *Pinguicula* species. It differs markedly from the other *P. benedicta*-like taxa by its height. So far, the bulk of specimens collected was identified as *P. benedicta* Barnhart.

The development between flower bud and anthesis takes three to four weeks. At first, the scape is heavily rolled up, the terminal flower bud is bent downwards. Afterwards, the scape straightens up, elongates, putting up the flower. Anthesis lasts about ten days (in green house culture). At maturity, the scape reaches its maximum height. The capsule is put up.

The variability seems to be considerably. Scape height reaches from 80 mm to a maximum of 280 mm (in fruit). Size of the rosette leaves varies between ~15 mm and 35 mm and its shape from obovate to ovate-orbicular. Lilac, reddish, pink or white flowers can be found within one population (pl. 4, fig. 1). The diameter of the outspread corolla (spur excluded) measures 15 mm to 25 mm.

The distinct three-partite widely opened corolla looks amazingly like a small flower of *P. gypsicola* of section *Orcheosanthus* (pl. 6, fig. 2): In front view it is widely opened (outspread). The corolla lobes in their entirety remember a leaf with incisions partly divided into five spreading segments very unequal in size: the spreading two lobes of the upper lip are distinctly shorter than the lateral ones, the latter, however, are distinctly shorter than the dominating strongly spatulate middle lobe (pl. 6, fig. 3, pl. 7, fig. 3). In side view the two lips appear to be in about the same level (pl. 6, figs. 3, 4; pl. 7, fig. 4). The dark veined stout spur is heavily incurved (‘handleformed’; pl. 6, fig. 4; pl. 7, fig. 4).

The calyx of the flower is very variable in its shape. ‘Normally’ developed calyces with typical three-lobed upper-lips can be observed. The lobes themselves are regularly formed, i. e. they are deeply divided, oblong and at the apex rounded or retuse. The lobes of the lower-lip are not typically divided; often they are connate, i. e. they appear as a single lobe with a truncate or ‘fringed’ apex. Totally aberrant calyces are also found: the apices of the lobes of the upper- and lower-lip for several times are divided irregularly; the sections are relatively short (up to $\frac{3}{8}$ of the length of the lobes).

Herbarium studies pointed out that *Pinguicula toldensis* seems to be restricted to the upper parts of the mountain chain of Sierra Nipe-Sagua-Baracoa. However, I am not convinced that this statement reflects the real distribution. Further field observations are necessary to study the morphological variability, population structure and distribution of the species.

Specimens only known to me by colour photographs (Macizo del Toldo, H. Stenzel film 295–297 [pl. 4, fig. 1]; Pico Galán, H. Stenzel film 13: 159) should be verified by future collections.

Obviously, the first plantlet was collected by H. Bisse and H. Lippold. In his ‘Tagebuch’ [diary] (Lippold 1968/69: 19), Lippold reported about an excursion undertaken at the end of 1968 and at the beginning of 1969 into the mountains of Sierra Moa [= Cuchillas de Moa] south of the town Moa. They climbed the ‘Gran Plana’ (Alto Plano) south of Yamaguay meeting a strange bushy vegetation intermingled by single *Pinus* [*Pinus cubensis*] above 800 m [called ‘charrasco’

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by him]. Here, on January 6, 1969, among other plants they detected *Pinguicula* (PFC 11 850) and *Utricularia*.

Twelve years later, in April 1981, H. Bisse headed again an expedition into the mountain region south of the town Moa. The group aimed to climb Pico del Toldo, but they did not reach it. In her 'Tagebuch Cuba' (1981: 13, manuscript), Helga Dietrich reported that they climbed the crest of the Cuchillas de Moa, called Loma Galingo (sic!). By the way, at an altitude between 400 m and 600 m, they found the epiphytic *Pinguicula lignicola*. From about 800 m upwards the highest zones were covered by a formation called 'charrasco di altura'. Entering, they met a heavily watered tropical 'Flachmoor' [low-moor bog], with a little unknown *Drosera* flowering white-pink [*Drosera moaensis*], an *Utricularia* and a new, blue-violet flowering *Pinguicula*, that, as the vouchers and the photographs show, was nothing else than our *Pinguicula toldensis* (PFC 44 646).

In 1985, the 'plant hunters' tried again to mount the summit of Pico del Toldo (Helga Dietrich, 'Diario 1985'; sine pagina). On April 4, 1985, they found the epiphytic *Pinguicula lignicola* in lower altitudes and over there many new taxa, among them a new blue-flowering *Pinguicula* (PFC 56 413). On the following day they came to a small flat territory in an altitude between 800 m and 900 m, where they found again the blue-violet flowering *Pinguicula* (PFC 56 354), a tiny faded *Drosera* [*Drosera moaensis*], and a tiny yellow flowering *Utricularia*. The group reached the summit.

Of the excursion in 1985 a printed report exists (LEPPER & GUTIÉRREZ 1988: 120) which is nearly identical with the entries in the diary kept by H. Dietrich. We learn that the group started on April 18, 1985, from La Breña and got to the vegetation zone of *Pinus cubensis* (Pinares) in an altitude about 800 m on April 20, 1985. Here, *P. lignicola* was found and a 'perhaps new *Pinguicula*' species was detected. On the following day they climbed across the NW-ridge to the summit of Pico del Toldo. In the most upper vegetation zone above 800 m they found again the *Pinguicula* they had collected on the day before. In fact, on these two occasions they found *P. toldensis*.

Acknowledgements

Thanks are expressed to Prof. Dr Egon Köhler, PD Dr Kurt Zoglauer (both from Berlin) and Dr Ralph Mangelsdorff (Frankfurt/Main) who, at my request, collected living and dried specimens of *Pinguicula*, and took colour photographs of the habitat and the plants in their natural site during their field work in the Province Holguín in 2004 and 2005. Living material of *Pinguicula toldensis* was made available to me. It was successfully cultivated in the botanical garden of Jena (BGJ 128–131) by M. Wolf and prepared for our studies by Rosemarie Stimper. To Ms Dr Helga Dietrich, Dr Hermann Manitz, Dr Lothar Lepper, Ms Karin Lippold (all of Jena), Dr Ralph Mangelsdorff (Frankfurt/Main), Dr Hagen Stenzel, and Dr Kurt Zoglauer (both from Berlin) I am indebted for providing me with colour and black-and-white photographs from the natural sites, with annotations made during their excursions in Cuba as well as for corrections especially of the geographical aspects and for valuable discussions. The LM- and SEM-preparations and microphotographs I owe to the kindness and skill of Ms. Rosemarie Stimper (Jena, Institut für Spezielle Botanik der FSU) and Ms. Ingemarie Herrmann (Jena, Institut für Elektronenmikroskopie der FSU).

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References

- ALAIN H. (1957): Melastomataceae a Plantaginaceae. – In: LEON H. & ALAIN H.: Flora de Cuba Vol. IV. Dicotiledóneas. – Contr. Ocas. Mus. Hist. Nat. Colegio “De la Salle” **16**: 1–556. [Lentibulariaceae pp. 473–475]
- BISSE J., LIPPOLD H. & CASPER S. J. (1975): Beiträge zur Kenntnis der westindischen *Pinguicula*-Arten. – Wiss. Z. Friedrich-Schiller-Univ. Jena, Math.-Naturwiss. Reihe **24**(4): 377–385.
- BRITTON N. L. (1920): Descriptions of Cuban plants new to science. – Mem. Torrey Bot. Club **16**: 57–118. [*Pinguicula benedicta* Barnhart, J.H. p. 210]
- CASPER S. J. (1963): Gedanken zur Gliederung der Gattung *Pinguicula* L. – Bot. Jahrb. Syst. **82**(3): 321–335.
- CASPER S. J. (1966): Monographie der Gattung *Pinguicula* L. – Biblioth. Botanica (Stuttgart) **127/128**: 1–209, 16 pls.
- CASPER S. J. (2003): Two new *Pinguicula* species (Lentibulariaceae) from East Cuba (Cuba oriental). – Haussknechtia **9**: 141–155.
- CASPER S. J. (2004): Two new *Pinguicula* species (Lentibulariaceae; *P. benedicta*-group) from the eastern mountain range of Cuba (Greater Antilles) with reddish flowers. – Wulfenia **11**: 1–13.
- CASPER S. J. & URQUIOLA CRUZ A. J. (2003): *Pinguicula cubensis* (Lentibulariaceae) – a new insectivorous species from western Cuba (Cuba occidental). – Willdenowia **33**: 167–172.
- ERNST A. (1961): Revision der Gattung *Pinguicula*. – Bot. Jahrb. Syst. **80**(2): 145–194.
- HOWARD R. A. (1988): Charles Wright in Cuba 1856–1867. – Alexandria: VA.
- LEPPER L. & GUTIÉRREZ J. (1987): Informe sobre la expedición botánica des Proyecto Flora de Cuba. – Revista Jard. Bot. Nac. Univ. Habana **8**(2): 53–71.
- LEPPER L. & GUTIÉRREZ J. (1988): Bericht über die botanische Sammelexpedition 1985 des ‘Flora-Cuba-Projektes’. – Wiss. Z. Friedrich-Schiller-Univ. Jena, Naturwiss. Reihe **37**: 111–127.
- SHAFFER J. A. (1910): Botanical exploration in the mountains of northeastern Cuba. – J. New York Bot. Gard. **11**: 202–221.
- SHAFFER J. A. (1912): Botanical exploration in Oriente, Cuba. – J. New York Bot. Gard. **13**: 92–99.
- TEMPLE P. & PANFET VALDES C. (1998): The *Pinguicula* of the Caribbean. – In: SCHLAUER J. & MEYERS-RICE B. [eds.]: Proc. Second Confer. ICPS, Bonn, Germany, May 30–June 1, 1998: 9–10 (Abstract).

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