

NOTES RELATING TO THE FLORA OF BHUTAN: XLIII. SCROPHULARIACEAE (PEDICULARIS)

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Problems of infrageneric classification in *Pedicularis* L. (*Scrophulariaceae*), and the phytogeography of the genus in the *Flora of Bhutan* area, are discussed. Six new species and one new variety of *Pedicularis* L. are described. *Pedicularis garckeana* Prain ex Maxim. is separated from *P. ser. Robustae* Prain as the new, monospecific series *Garckeanae* R. R. Mill (Sikkim and adjacent Xizang). Six of these new taxa are endemic to Bhutan (*P. dhurensis* R. R. Mill *sp. nov.*, *P. longipedicellata* P. C. Tsoong var. *lanocalyx* R. R. Mill var. *nov.*, *P. melalimne* R. R. Mill *sp. nov.*, *P. microloba* R. R. Mill *sp. nov.*, *P. sanguilimbata* R. R. Mill *sp. nov.* and *P. woodii* R. R. Mill *sp. nov.*) and one (*P. yarilaica* R. R. Mill *sp. nov.*) occurs in N Bhutan and S Xizang. The type material of *Phtheirospermum auratum* Bonati (= *Pedicularis aurata* (Bonati) H. L. Li) is shown to be a mixed gathering; the name is lectotypified and an emended description of *P. aurata* given. Several other names are lectotypified. Three sectional names originally proposed by Yamazaki (each 'based' on invalid 'names' of groups earlier recognized as subreges by Tsoong) are validated as *P. sect. Asthenocaulus* [P. C. Tsoong ex] R. R. Mill, *P. sect. Nothosigmantha* T. Yamaz. ex R. R. Mill, and *P. sect. Rhizophyllastrum* T. Yamaz. ex R. R. Mill, while a fourth invalid section ('*P. sect. Brachystachys* (P. C. Tsoong) T. Yamaz.') is here recognized and described as *P. sect. Brevispica* R. R. Mill, *sect. nov. Pedicularis sect. Cryptorhynchus* T. Yamaz. and *P. sect. Elephanticeps* T. Yamaz. are provided with emended descriptions. The nomenclature of *P. pennelliana* P. C. Tsoong and related taxa of the *P. gracilis* Wall. ex Benth. complex is discussed.

Keywords. Bhutan, China, lectotypification, new series, new species, nomenclature, orthography, *Pedicularis*, phytogeography, Tibet, Xizang.

INTRODUCTION

This is the second of two papers dealing with novelties relating to the *Scrophulariaceae* treatment published in *Flora of Bhutan* Volume 2 Part 3 (2001). The first paper (Mill, 2000) dealt with genera other than *Pedicularis*. In the present paper, six new species and one new variety of *Pedicularis* are described from the *Flora of Bhutan* area, as well as one new series in the genus. Matters of nomenclature and typification are also dealt with. For these, the *Saint Louis Code* (Greuter *et al.*, 2000) has been followed.

The genus *Pedicularis* L. is the largest in the *Scrophulariaceae* as traditionally defined, and one of the largest angiosperm genera, with probably at least 800 species world-wide and 76 in the *Flora of Bhutan* area; it is thus comparable in size, both on a world basis and in Bhutan and Sikkim, to *Rhododendron* L. (*Ericaceae*). (The

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global figure of '350+' given by Mabberley, 1997: 535, is much too low unless a very broad concept of species is taken.) Together with the other hemiparasitic and parasitic *Scrophulariaceae* (in the broad sense), such as *Euphrasia* L. and *Striga* Lour., *Pedicularis* has recently been transferred to *Orobanchaceae* on the basis of cpDNA and morphological data (de Pamphilis *et al.*, 1997; Judd *et al.*, 1999). However, the long-accepted 'conventional' family limits of *Scrophulariaceae* are used in *Flora of Bhutan*, even though the family as traditionally delimited is now regarded as being paraphyletic. If accepted as a member of *Orobanchaceae*, *Pedicularis* would also become the largest genus of that family. Acceptance of such a treatment would, however, seem premature. Freeman & Scogin (1999) found that, when using cp *trnL* (UAA) intron sequences to infer the phylogeny of *Scrophulariaceae*, some genera traditionally put in the tribe *Pedicularieae*, such as *Castilleja* Mutis ex L.f. and *Cordylanthus* Nutt. ex Benth., formed a well-supported and defined clade separate from the rest of the family, but that *Pedicularis* itself was far removed from these. Moreover, different methods of tree analysis yielded very different results. In a maximum parsimony tree, *Pedicularis* was aligned in a clade which also included *Digitalis* L., *Mimulus* L. and *Veronica* L., whereas in a neighbour joining tree based on the same data, *Pedicularis* seemed to have a closer relationship with the tribes *Cheloneae* and *Antirrhineae*. Neither of these alignments is consistent with a transference to *Orobanchaceae*.

The *Pedicularis* flora of Bhutan and Sikkim not unexpectedly comprises elements from both Nepal and China (see section on phytogeography, below) and thus it seems appropriate to use the same classification, so far as is possible (there being significant differences at the infrageneric levels between Yamazaki's treatment for Nepal and the *Flora of China* account). Hence, both section and series names will be employed (as was done for Nepal by Yamazaki). This necessitates a discussion on the use of infrageneric ranks in *Pedicularis* (see below) and the typification and/or validation of some of them later in this paper. For each new species here described, the section and series to which it is assigned is indicated in parentheses. All specimens cited have been seen by the author unless indicated by *n.v.* (*non vidi*=not seen).

PHYTOGEOGRAPHY OF *PEDICULARIS* IN THE *FLORA OF BHUTAN AREA*

The main centre of diversity of *Pedicularis*, by far, is in China where 352 species were recognized for *Flora of China* (Yang Han-bi *et al.*, 1998) but where more certainly remain undiscovered, unrecorded or overlooked. Some 30 taxa now known to occur in China by the present author (who was one of the two Western co-authors for the *Flora of China* account of the genus) were not included in the final published version of the *Flora of China* account. A few of these are undescribed taxa, and several are overlooked Chinese endemics such as *P. bodinieri* Vaniot ex Bonati (from Guizhou province). Some, however, are species that transgress into southernmost China from adjacent parts of the eastern Himalayas. Two examples of the latter are *P. collata* Prain from Nepal, Chumbi (i.e. the Chumbi Valley of southernmost

Xizang, China; its flora is treated in *Flora of Bhutan* as the valley projects southwards between Sikkim and western Bhutan), Sikkim and Bhutan, and *P. regeliana* Prain, from Chumbi, Sikkim, Bhutan and SE Xizang, which is the only member of *P. ser. Regelianae* T. Yamaz. and thus adds an additional series as well as an extra species to the *Pedicularis* flora of China. In addition to these, there are at least a dozen species presently thought to be endemic to N Burma which may also occur in adjacent Yunnan province (China), although as yet there are no known confirmed records from the Chinese side of the mountains. Examples include *P. myriantha* H. L. Li and *P. nobilis* Bonati. Careful searches along the China/Burma border may reveal that at least some of these also occur within China. Thus the true figure for China is probably closer to 400 species than the published 352. Along the eastern Himalayas the number of species gradually decreases westwards, with 76 species in the *Flora of Bhutan* area (including the five new ones described here), 63 recognized in Yamazaki's revision of the genus in Nepal (Yamazaki, 1988), and 35 species in Pennell's now out-dated revision of the West Himalayan species (Pennell, 1943), to which flora several species of the genus have since been added.

Endemism of *Pedicularis* in the *Flora of Bhutan* area is high. Of 82 taxa in 76 species, 19 are endemic to Bhutan, five to Sikkim, and one to Chumbi (*P. tenuicaulis* Prain; records of this species from Bhutan, Sikkim and Nepal, as cited in *Flora of China*, all require confirmation); two each are endemic to (Sikkim+Chumbi) and (Bhutan+Sikkim), and one each to (Bhutan+Chumbi) and (Bhutan+Sikkim+Chumbi). This gives a total of 31 *Pedicularis* taxa endemic to the *Flora of Bhutan* area, of which 25 are species, giving c.33% species endemism. Endemism is much higher in Bhutan than in Sikkim despite Bhutan's close phytogeographic affinities in its northern parts with southern Xizang (Tibet). The endemism figure for Bhutan may, however, decrease when the flora of Arunachal Pradesh state (NE India, adjacent to eastern Bhutan) becomes better known; conversely, more species may be added to the Bhutan flora when its south-east part is better explored. One species at present known definitely only from Arunachal Pradesh but which could be present in eastern Bhutan is *P. flagellaris* Benth. The low endemism of Sikkim probably results from the fact that the political boundary between Sikkim and Nepal does not coincide with a natural phytogeographic boundary. A further seven *Pedicularis* species (*P. albiflora* Prain, *P. clarkei* Hook.f., *P. gibbera* Prain, *P. instar* Prain, *P. paradoxa* (Prain) T. Yamaz., *P. pauciflora* (Prain ex Maxim.) Pennell, *P. trichodonta* T. Yamaz.) are 'subendemic' to the *Flora of Bhutan* area, just extending into eastern Nepal. Conversely, five species that are known only from E Nepal (*P. cornigera* T. Yamaz., *P. tamurensis* T. Yamaz., *P. terrenoflora* T. Yamaz.) or E and C Nepal (*P. oxyrhyncha* T. Yamaz., *P. pseudoregeliana* P. C. Tsoong) might occur across the border in Sikkim and should be searched for in our area. All five are presently assumed to be endemic to Nepal (Yamazaki, 1988).

INFRAGENERIC CLASSIFICATION

The genus *Pedicularis* is badly in need of a modern, world-wide revision. Infrageneric classifications of the genus have been numerous but none covers both the entire

distribution and all currently known species of the genus, with the result that the hierarchy of names between genus and species is a nomenclatural minefield posing many traps for the unwary. Matters are made particularly complex because little or no attempt has been made by later botanists to lectotypify any of the earlier sections or series named by workers such as Bunge, Ledebour, Bentham, or Prain. The original circumscriptions of these infrageneric taxa frequently differ greatly from how they are now understood, as a consequence of later transfers, segregations, or amalgamations. Brief summaries (without typifications) of all the earlier infrageneric hierarchies, from Steven (1823) to Li (1948, 1949), are given by Tsoong (1955b); a similar summary was provided earlier by Bonati (1910).

The rank of series has been widely used throughout the range of the genus but comparatively few species have previously been assigned to sections by recent authors. The rank of section was used, in a variety of senses, by some of the early students of the genus such as Bunge (1841, 1843), Bentham (1835, 1846), Ledebour (1849), and Regel (1870). Bentham (1846), for example, consistently used section to denote a rank immediately *lower* than series, the reverse of current usage (so contrary to Arts. 4.2 and 5.1) and so his sectional names are invalid under Art. 33.5. Other early authors recognized what would today be called 'sections', but they instead used the word 'tribe', again contrary to Arts. 4.2 and 5.1; examples include the systems of Steven (1823) and Maximowicz (1888). Bonati (1910) used a system comprising divisions, tribes and series; the divisions and tribes may perhaps be regarded as hierarchically equivalent to subgenera and sections respectively although again the usages of the ranks of division and tribe are contrary to Arts. 4.2 and 5.1. The names of all such misplaced ranks are invalid under Art. 33.5.

Prain (1890) also used the rank of section, although this is not immediately obvious from the taxonomic part of his monograph. There, he used one of the traditional symbols for section, namely §§, and not the word 'section'. For this reason most later authors do not seem to have realized that these names of Prain's are in fact those of sections and they appear to have been largely neglected (one exception being Tsoong, 1955b: 110, who did correctly recognize that Prain was using the rank of section). The nomenclatural implications of this have not yet been fully worked out. Prain (1890), however, explicitly used the word 'section' on p. 22 of the introduction in the same work, for the names denoted by the § symbol in the taxonomic conspectus. In order that it becomes common knowledge, the conventions and indentations used in Prain's conspectus are set out below, in accordance with his usages of division, section, subsection and series on p. 22 together with other internal textual evidence:

I.-LONGIROSTRES [heading non-indented, roman numeral followed by dash then name all in capitals, description on new line] denotes division. ('Division' was used by Prain in a different sense to that of the present *Code*, to denote an infrageneric rank higher than section, which may perhaps be considered equivalent to subgenus; it is incorrect under Arts. 4.2 and 5.1.)

§ SIPHONANTHAE. [heading indented, § sign, followed by name in small capitals,

followed by dot; description on a new line] denotes section. These names were not typified; some but not all may be typified by applying Art. 22.6.

A.—*Eusiphonanthae*:— Description... [heading non-indented, roman letter, dash, name in italic followed by colon leading immediately to description on same line] denotes subsection.

1. Rhinanthoides. [heading indented, Arabic numeral, name in roman followed by dot, then by species list followed by description, on further-indented new lines] denotes series, the lowest infrageneric rank recognized by Prain. Prain's series names were all derived from the name of a constituent species and thus may be typified by that name by application of Art. 22.6.

The main users of the rank of section, in its modern sense (ICBN Art. 4.1), within *Pedicularis* have been Li (1948, 1949) for the then known species of China, Hurusawa (1947, 1948a,b, 1949) for the Japanese species, and Yamazaki (1988) for the Nepal species. It should be noted that Li's and Hurusawa's treatments were published more or less at the same time. Li's revision appears to be by far the better known, and it is also far more thorough. He dealt with the opposite- and whorled-leaved species, which he called group *Cyclophyllum* H. L. Li, in his first part (published 6 December 1948) and the alternate-leaved species (groups *Allophyllum* H. L. Li and *Poecilophyllum* H. L. Li) in his second part (12 August 1949). (The name *Cyclophyllum* was first used, at sectional rank, by Bunge, 1843; the other two names were coinages by Li.) Hurusawa (1947, 1948a,b, 1949), in his rather neglected series of seven papers (nos. 2, 4 and 6 being entirely in Japanese) which classified the Japanese species in a world context, treated groupings of series based on the same primary character as used by Li (leaf phyllotaxis) but in the reverse of the order followed by Li. Thus, paper 3 (June 1948) of his series of seven commenced his taxonomic sequence with subgen. *Sceptrum* Bunge emend. Hurus. (an alternate-leaved group), while paper 5 (December 1948) dealt with subgen. *Rhynchophorum* Hurus. (composed of further alternate-leaved sections and series, such as *P.* ser. *Lachnoglossae* Prain). Paper 7, published in October 1949, concluded the alternate-leaved species of subgen. *Rhynchophorum* by giving synopses of *P.* sect. *Hyporthorrhynchae* (Prain) Bonati (which Hurusawa incorrectly spelled '*Hypoorthorrhynchae*') and *P.* sect. *Siphonantha* Bunge; it also treated all the rather few Japanese whorled-leaved taxa, belonging to the two sections *P.* sect. *Axillares* Hurus. and *P.* sect. *Orthorrhynchae* Prain. Consequently, and fortunately, there is less chance of a Hurusawa sectional name supplanting a probably better-known one of Li's than it might have been had the two authors treated the genus in the same taxonomic sequence. Hurusawa used more ranks than Li, recognizing subsections and subseries in addition to the subgenera, sections and series that Li used. Hurusawa's classification adopted some of Prain's sectional names. However, because it covered such a small proportion of the genus as a whole, it is difficult to equate Hurusawa's sections with those of Li, particularly because, unlike Li, Hurusawa only enumerated

the subsidiary infrageneric taxa without giving full listings of the species that each contained. Li did not, unfortunately, formally typify any of his infrageneric names, although the names of the series can all be typified by applying Art. 22.6 because they were consistently derived from the name of a constituent species. With one exception (sect. *Brachychila* H. L. Li), however, the names of his sections cannot be typified in this way. Hurusawa sometimes did typify the sectional names he used, but not always, so that the majority (including some of his own new names) were not typified. One instance where there is a potential conflict between different names used by Li and Hurusawa for a similarly circumscribed infrageneric taxon is that of *P.* sect. *Hyporrhyncholophae* Hurus. (1947, 1948b) and *P.* sect. *Brachyphyllum* H. L. Li (1948). The complicated typification of these names is unravelled in a later section of this paper where it is concluded that, taxonomically, both names can be used provided that their types are regarded as belonging to different sections.

The recent treatment of the genus for China (Yang Han-bi *et al.*, 1998) only used series, because not all species had been assigned to sections. Tsoong, in the *FRPS* account (Tsoong, 1963) on which the *Flora of China* treatment was mainly based, used a less familiar hierarchy of greges, subgreges and series. This system was first outlined by him in a series of three papers (Tsoong, 1955b, 1956a,b); the third of these, like the others, ended with the indication '(To be continued)' but no further parts appear to have been published. The greges and subgreges are not acceptable under Art. 4.2. Tsoong used no other ranks but, because in earlier publications (Tsoong 1956a,b) he clearly used the 'ranks' grex and subgrex to mean simply 'group' and 'subgroup' respectively, they would appear not to be formal ranks even though they formed part of a hierarchical system, and they should be deemed inadmissible under Art. 4.3 because their use may result in confusion or error. Moreover, the names of all the greges and subgreges, and of all the numerous new series that Tsoong recognized in *FRPS*, lacked Latin descriptions, either in *FRPS* (Tsoong, 1963) or in his three earlier papers (Tsoong, 1955b, 1956a,b). Consequently, all these names were invalid when published. The series names, but not those of the two 'higher ranks', were validated by Yang Han-bi (1995).

Four of the invalid subgrex names of Tsoong were taken up by Yamazaki (1988) at the rank of section. Yamazaki did not seem to be aware of the invalidity of Tsoong's names because he based his new sections on them without comment. Because these four sections all include species treated in *Flora of Bhutan*, their names are validated in the present paper. The name of one of them has been changed to avoid confusion with a species bearing the same epithet as the original section name but which is not a member of that section.

NEW OR EMENDED INFRAGENERIC NAMES

Four sectional names are validly published below for the first time; three were previously used by Yamazaki (1988; see discussion above). One new series (*Garckeanae*) is described and two names originally published by Yamazaki are given emended

descriptions as those in the protologues were identical, perhaps because of a type-setting error (see discussion below).

Pedicularis sect. **Asthenocaulus** [P. C. Tsoong ex] R. R. Mill, **sect. nov.**

Syn.: [*P. grex Cyclocladus* P. C. Tsoong subgrex *Asthenocaulus* P. C. Tsoong, Fl. Reipubl. Popular. Sin. 68: 85 (1963), nom. inval. (Art. 36.1)].

[*P. sect. Asthenocaulus* (P. C. Tsoong) T. Yamaz., Rev. Pedic. Nepal 120 (1988) nom. inval. (Art. 32.1(c), with non-permissible change of orthography (Art. 60) and with emendation; see below].

Herbae plerumque (?an semper) perennes. Folia opposita petiolata lamina lineari-oblonga usque ovato-oblonga pinnatifida usque pinnatisecta. Inflorescentia plerumque racemosa nodis 2–4 bifloris floribus inferioribus saepe solitariis axillaribus. Calyx tubulosa pilosa usque villosa, lobo posteriore setaceo. Corolla rosea usque purpurea tubo recto calyce 2–4-plo longiore tota vel in parte inferiore piloso; galea ad medium valde decurva, in rostrum tenue sensim attenuata rostro ad apice truncato; labium inferius magnum galeam subaequilongum vel longius trilobatum lobo medio orbiculari eis lateralibus reniformibus usque semiorbicularibus marginibus glabris vel ciliatis. Filamenta antica sparse pilosa (*P. flexuosa*) vel omnia glabra (ceteris).

Included series: *P. ser. Flexuosae* Prain, Ann. Roy. Bot. Gard. (Calcutta) 3: 73 (1890, p.p. min., excluding *P. moupinensis* Franch., *P. keiskei* Franch. & Savat.; ?excluding etiam *P. chumbica* Prain, *P. tenuicaulis* Prain), ?*P. ser. Pectinatae* Prain (see below).

Type: *P. flexuosa* Hook.f. (also type of *P. ser. Flexuosae* Prain: Art. 22.6).

Neither Tsoong (1963) nor Yamazaki (1988) provided a Latin description for what they respectively called *P. subgrex Asthenocaulus* P. C. Tsoong and *P. sect. Asthenocaulus* (P. C. Tsoong) T. Yamaz., although Tsoong (op. cit. 9, 1963) did supply a Chinese description for his subgrex; this does not constitute valid publication under Art. 36. Tsoong (1963) included only one series within '*P. subgrex Asthenocaulus*', namely *P. ser. Flexuosae* Prain. However, Prain (1890) had included five species in that series: *P. flexuosa* Hook.f., *P. moupinensis* Franch., *P. chumbica* Prain, *P. tenuicaulis* Prain and *P. keiskei* Franch. & Savat. Of these five, all except the type of the series (*P. flexuosa*: Art. 22.6) have subsequently been removed to other series: *P. moupinensis* Franch. as the type of *P. ser. Moupinenses* P. C. Tsoong ex H. B. Yang (Tsoong, 1963, series name invalid; Yang Han-bi, 1995), *P. chumbica* Prain and *P. tenuicaulis* Prain to *P. ser. Debiles* Prain by Tsoong (1963; treatment followed by Yang Han-bi *et al.*, 1998), and *P. keiskei* Franch. & Savat. as the type of *P. ser. Keiskeanae* [Hurus. ex] T. Yamaz. (Hurusawa, 1949, invalid; Yamazaki, 1993). As Tsoong restricted *P. ser. Flexuosae* to the single species *P. flexuosa*, and also because he treated *P. ser. Flexuosae* as an accepted taxon and not a synonym of *P. sect. Asthenocaulus*, the original description by Prain (1890), which presumably covered all five original species, cannot be used to validate *P. sect. Asthenocaulus* by

application of Art. 41.2(b). Yamazaki (1988) once again broadened *P. ser. Flexuosae* by the inclusion of two Nepal endemics (*P. annapurnensis* T. Yamaz., *P. oxyrhyncha* T. Yamaz.) and the NW Himalayan species *P. porrecta* Wall. ex Benth.

Tsoong (1963) consistently spelled the name of his new subgenus *Asthenocaulus*, which is derived from Greek *astheno-*, weak (itself derived from *a-*, not and *sthenos*, strong), and Latin *caulis*, stem: hence, ‘weak-stemmed’. Why Yamazaki changed the spelling to *Astenocaulus* is a mystery, and incorrect, not only under the *ICBN* (Art. 60.1) but also because his change alters the etymology to a word derived from Greek *a-*, not, *steno-*, narrow and Latin *caulis*, i.e. ‘broad-stemmed’. Such a derivation is quite inappropriate to the weak-, slender-stemmed plants of *P. ser. Flexuosae*, the only series originally included by Tsoong.

The position of *P. chumbica* and *P. tenuicaulis* is doubtful, some authors grouping both of them in *P. sect. Orthorrhynchae* Prain (as members of *P. ser. Debiles* Prain) and others treating both as members of *P. sect. Asthenocaulus ser. Flexuosae*. Neither was treated by Yamazaki (1988) as they do not occur in Nepal, but using his key to series and species, *P. chumbica* keys to *P. ser. Flexuosae* while *P. tenuicaulis* keys to *P. ser. Debiles*, the dichotomy that separates them being one of corolla tube length relative to the calyx. Both differ from *P. flexuosa* and the other species included by Yamazaki (1988) in *P. ser. Flexuosae*, in having the calyx cleft in the upper 1/3. Their characters have not been used in drawing up the present description of *P. sect. Asthenocaulus*, which is based on the four species included in *P. ser. Flexuosae* by Yamazaki (1988). For reasons discussed below, the characters of the members of *P. ser. Pectinatae* have also not been used to prepare the description of *P. sect. Asthenocaulus*.

Yamazaki (1988: 120) emended *P. sect. Asthenocaulus* by the inclusion of *P. ser. Pectinatae* Prain in addition to *P. ser. Flexuosae*. Whether or not *P. ser. Pectinatae* should be included in *P. sect. Asthenocaulus*, as by Yamazaki (1988: 123), is questionable. *Pedicularis ser. Pectinatae* was originally grouped in *P. sect. Orthorrhynchae* Prain by Prain (1890), whose classification of it was followed by Limpricht (1924) and Hurusawa (1949). Li (1948) transferred *P. ser. Pectinatae* to *P. sect. Orthosiphonia* H. L. Li, a placement also adopted by Tsoong (1963, using the rank of grex instead of section for *Orthosiphonia*). Yamazaki (1988) removed *P. ser. Pectinatae* from *P. sect. Orthosiphonia* to *P. sect. Asthenocaulus*, where it does not fit well either. Its members are robust tall herbs that are hardly ‘weak-stemmed’ and the morphology of the calyx and corolla, particularly the beak of the galea, is very different from the species of *P. ser. Flexuosae*. I therefore prefer, meantime, to restrict *P. sect. Asthenocaulus* to the members of *P. ser. Flexuosae*. Further research to establish the correct sectional placement of *P. ser. Pectinatae* is needed.

Pedicularis sect. Brevispica R. R. Mill, **sect. nov.**

Syn.: [*P. grex Dolichophyllum* subgenus *Brachystachys* P. C. Tsoong, Fl. Reipubl. Popular. Sin. 68: 304 (1963) nom. inval. (Art. 36.1; also see Art. 4.2, 4.3)].

[*P. sect. Brachystachys* T. Yamaz., Rev. Pedic. Nepal 105 (1988, as ‘(P. C. Tsoong) T. Yamaz.’) nom. inval. (Art. 32.1)].

Herbae perennes radicibus carnosis. Folia caulina opposita petiolata lamina lineari-oblonga vel oblongo-lanceolata pinnatisecta vel pinnatifida. Inflorescentia breviter racemosa vel subcapitata pauciflora floribus oppositis. Calyx campanulatus usque tubuloso-campanulatus glaber vel sparse pilosus quinquentatus lobo posteriore lineari integro ceteris distaliter dilatatis et dentatis. Corolla rosea vel purpurascens tubo recto calyce minus quam duplo longior glabro vel sparse piloso; galea recta vel apicem versus paulo arcuata dentibus ventralibus duobus vel nullis, haud rostrata; labium inferius magnum galeam brevius vel paulo longius trilobatum lobo medio orbiculari eis lateralibus reniformibus. Filamenta antica hirsuta vel omnia glabra.

Included series: *P. ser. Collatae* Prain, *P. ser. Ophiocephalae* Prain.

Type: *P. collata* Prain (also type of *P. ser. Collatae* Prain: Art. 22.6).

Yamazaki (1988) changed the status of *P. grex Dolichophyllum* P. C. Tsoong subgrex *Brachystachys* P. C. Tsoong to *P. sect. Brachystachys* (P. C. Tsoong) T. Yamaz., but Tsoong's subgrex name was invalidly published, lacking a Latin description (although there was one in Chinese) or an indication of type. Tsoong included only one series (*P. ser. Collatae* Prain) in 'subgrex *Brachystachys* P. C. Tsoong' but he did not mention its type (*P. collata* Prain). For this reason, and because *P. ser. Collatae* was treated by Tsoong as an accepted taxon within subgrex *Brachystachys*, Art. 41.2(b) cannot be used to validate subgrex *Brachystachys* (and thus *P. sect. Brachystachys*) by Prain's Latin description of *P. ser. Collatae*. Thus, the status of Yamazaki's section name is analogous to that of *P. sect. Asthenocaulus*, which I have validly published above. However, in the present case, I have decided not to take up the name *Brachystachys* for the section, as there is already a species having that epithet, *P. brachystachys* Bunge from Siberia, which belongs to one of the alternate-leaved sections, not to the infrageneric taxon called '*Brachystachys*' by Tsoong and Yamazaki, which is opposite-leaved. Instead, I have named the section *Brevispica* which has the same meaning, in Latin, as the Greek *Brachystachys* ('short spike'), there being surprisingly no *Pedicularis* species bearing that epithet. The precise sectional position of the Siberian species *P. brachystachys* Bunge is unclear because Vvedensky, who wrote the *Pedicularis* treatment for the *Flora URSS* (Vvedensky, 1955, translated 1997), used the very outdated infrageneric classification of Bunge in Ledebour (1849). Vvedensky considered *P. brachystachys* to belong to what he called '*P. ser. Incarnatae* Vved.' (invalid, and including *P. proboscidea* Maxim., which under Art. 22.6 is the type of *P. ser. Proboscideae* Maxim.) and classed it in *P. sect. Rhyncholopha* Bunge. The most recent placement of this group is that of Tsoong (1963), who grouped *P. ser. Proboscideae* within *P. 'subgrex Neosceptrum* P. C. Tsoong', which like all his subgreges was invalidly published. *Pedicularis brachystachys* is no close relation to the species of either *P. ser. Collatae* Prain or *P. ser. Ophiocephalae* Prain, the two series included by Yamazaki in 'sect. *Brachystachys*' and by me in *P. sect. Brevispica*.

Pedicularis sect. **Nothosigmantha** T. Yamaz. ex R. R. Mill, **sect. nov.**

Syn.: [*P. grex Sigmantha* P. C. Tsoong subgrex *Nothosigmantha* P. C. Tsoong, Fl. Reipubl. Popular. Sin. 68: 195 (1963) nom. inval. (Art. 36.1)].

[*P. sect. Nothosigmantha* (P. C. Tsoong) T. Yamaz., Rev. Pedic. Nepal 107 (1988) nom. inval. (Art. 32.1) as 'stat. nov.' but with emendation by Yamazaki].

Herbae perennes. Folia radicalia numerosa caespitosa persistentes caulina 4-verticillata vel inferiora opposita; lamina lineari-lanceolata pinnatisecta. Inflorescentia terminalis racemosa primo subcapitata demum proximaliter spiciformis nodis 4-floris. Calyx urceolato-campanulatus vel tubuloso-campanulatus villosus antice profunde fissus, lobis 3 vel 5. Corolla alba, rosea vel lutescens tubo recto vel demum in calyce decurvo calyce subaequali vel brevior; galea ad medium decurva in rostrum breve sensim angustata rostro ad apicem truncatim acuto; labium inferius galea brevius vel aequans trilobatum lobo medio orbiculari eis lateralibus reniformibus usque late orbicularibus. Filamenta basaliter sparse pubescentia vel omnia tota glabra.

Included series: *P. ser. Cheilanthifoliae* Maxim. *Pedicularis ser. Graciles* Maxim. is excluded (see discussion).

Type: *P. cheilanthifolia* Schrenk subsp. *cheilanthifolia*; also type of *P. ser. Cheilanthifoliae* Maxim. (Art. 22.6).

Tsoong (1963) included only one series, *Cheilanthifoliae* Maxim., in his concept of 'subgrex *Nothosigmantha* P. C. Tsoong'. This was not published with a Latin description so, like other subgrex 'names' of his, cannot be used as the basis for Yamazaki's name, which is here provided with a validating description. Yamazaki (1988), when changing the status of the latter to sectional rank, emended Tsoong's circumscription by including in *P. sect. Nothosigmantha*, *P. ser. Graciles* Maxim. This had earlier been classified quite differently, by Li (1948) within *P. sect. Orthosiphonia* H. L. Li (as one of 10 series) and then by Tsoong within 'grex *Cyclocladus* P. C. Tsoong subgrex *Cyclocladus* P. C. Tsoong', a group (the name of which is invalid) which encompassed four series (*P. sers. Coniferae* Maxim. ex Forbes & Hemsl., *Graciles*, *Longicaules* Prain, and *Melampyriflorae* Prain) of the 10 that had previously been grouped by Li (op. cit.) in *P. sect. Orthosiphonia* H. L. Li, plus one other (*Salviiflorae* Prain) that had been treated by Li (op. cit.) as the only series of *P. sect. Macrocladus* H. L. Li. The species of the two series included by Yamazaki in *P. sect. Nothosigmantha* are very different in their habit, those of *P. ser. Cheilanthifoliae* being rather caespitose, less than 25cm tall, with numerous, typically decumbent to ascending, stems and congested inflorescences of whitish or bicoloured flowers whose galea is only shortly beaked. Species of *P. ser. Graciles* on the other hand are rather tall very 'weedy' annuals with lax many-flowered racemose inflorescences and the galea of the corolla has a long, slender, somewhat down-curved beak. In *Flora of China* (Yang Han-bi et al., 1998), *P. ser. Graciles* and *P. ser. Cheilanthifoliae* were widely separated, as series nos. 24 and 56 respectively; *P. ser. Graciles* was grouped

near to *P. ser. Salviiflorae*, *Melampyriflorae*, *Longicaules* and *Coniferae* (following the views of Li, 1948, and particularly Tsoong, 1963). The present author believes that Yamazaki was incorrect to transfer *P. ser. Graciles* to *P. sect. Nothosigmantha*. The description here provided to validate the latter name is therefore based only on the characters of species of *P. ser. Cheilanthifoliae*, following Tsoong's original circumscription of his 'subgex *Nothosigmantha*'. As for the sectional placement of *P. ser. Graciles*, the most pragmatic solution is to follow the views of Li and treat it as a member of *P. sect. Orthosiphonia*; to do otherwise would require the valid publication of a name for the group that Tsoong segregated as 'gex *Cyclocladus* subgex *Cyclocladus*', and to do that at the present time seems premature. Other taxa, such as *P. ser. Molles* P. C. Tsoong and *P. ser. Denudatae* Prain, within *P. sect. Orthosiphonia* are annual like the species of *P. ser. Graciles*, and the section is characterized by straight corolla tubes (hence its name, *Orthosiphonia*), whereas *P. ser. Graciles* does not sit well beside the only other series of *P. sect. Nothosigmantha* (*ser. Cheilanthifoliae*) which has a curved corolla tube (agreeing with the derivation of the sectional name *Nothosigmantha*).

Pedicularis sect. Rhizophyllastrum T. Yamaz. ex R. R. Mill, **sect. nov.**

Syn.: [*P. gex Rhizophyllum* P. C. Tsoong subgex *Rhizophyllastrum* P. C. Tsoong, Fl. Reipubl. Popular. Sin. 68: 308 (1963) nom. inval. (Art. 36.1)].

[*P. sect. Rhizophyllastrum* (P. C. Tsoong) T. Yamaz., *Rev. Pedic. Nepal* 139 (1988) nom. inval. (Art. 32.1) as 'stat. nov.' but with emendation and orthographic change by Yamazaki].

Herbae perennes ± acaulescentes vel interdum scaposae. Folia plerumque maximam partem basalia, caulina ubi praesentia alterna (raro subopposita); lamina ovato-elliptica usque lineari-lanceolata pinnatifida usque pinnatisecta. Inflorescentia breviter spicatae vel racemosae usque capitatae vel interdum flores axillares (raro suboppositi: *P. ser. Mychophilae*) pauci. Calyx saepe sed non semper antice fissus, lobis 5, 3 vel 2. Corolla plerumque rosea usque purpurea concolor, raro bicolor vel alba lutescensve tubo calyce 1–6-plo (plerumque 1–3-plo) longiore plerumque erecto raro ad apicem flexo, saepe apicem versus dilatato; galea falcata vel apicem versus ad angulum 90° flexa, interdum valde dilatata, erostrata vel rostrata; labium inferius trilobatum patens vel cucullatum lobo medio saepe lateralibus brevior. Pubescentia filamentorum varia.

Included series: *P. ser. Albiflorae* P. C. Tsoong ex H. B. Yang, *P. ser. Asplenifoliae* Prain, *P. ser. Franchetianae* Prain, *P. ser. Merrillianae* P. C. Tsoong ex H. B. Yang, *P. ser. Mychophilae* P. C. Tsoong ex H. B. Yang, *P. ser. Neolatitubae* P. C. Tsoong ex H. B. Yang, *P. ser. Odontophorae* P. C. Tsoong ex H. B. Yang, *P. ser. Paucifoliatae* Prain, *P. ser. Pseudomacranthae* P. C. Tsoong ex H. B. Yang, *P. ser. Roseae* Maxim., *P. ser. Wilsoniae* H. L. Li.

Type: *P. asplenifolia* Floerke ex Willd. (also type of *P. ser. Asplenifoliae* Prain: Art. 22.6).

Tsoong's concept of subgenus *Rhizophyllastrum* included 11 series (listed above). The names of *P. sers. Albiflorae* P. C. Tsoong, *Merrillianae* P. C. Tsoong, *Mychophilae* P. C. Tsoong, *Neolatitubae* P. C. Tsoong, *Odontophorae* P. C. Tsoong and *Pseudomacranthae* P. C. Tsoong were all invalid when originally published because they lacked Latin descriptions (Art. 36.1); all were later validated by Yang Han-bi (1995). Many of these 11 series (nos. 91–101 in the *Flora of China* treatment), which embrace a total of at least 36 species, are composed solely of Chinese endemics.

Yamazaki dealt with a much smaller geographical area and only three series were included: *Asplenifoliae* Prain, *Filiculae* H. L. Li and *Perpusillae* P. C. Tsoong. The latter two had not been included in Tsoong's subgenus and represent Yamazaki's emendation. Thus, to be consistent with Tsoong's original circumscription of the subgenus, it is desirable that Yamazaki's sectional name be typified by the type of *P. sers. Asplenifoliae* Prain, which by applying Art. 22.6 is *P. asplenifolia* Floerke ex Willd.

Had Tsoong's '*P. subgenus Rhizophyllastrum*' been validly published, Yamazaki's change of spelling to *Rhizophyllastrum* when he changed Tsoong's subgenus to a section would not have fallen within what one is permissible to correct under *ICBN* Art. 60, even though *Rhizophyllastrum* is philologically more correct. As both 'names' were invalid when published, I have used *Rhizophyllastrum*, after the models of *Cephalorhizum* sect. *Sarcophyllastrum* Rech.f. (*Plumbaginaceae*) and *Chaerophyllastrum* Heister ex Fabr. (*Umbelliferae*), the only other generic or infrageneric plant names so formed that are listed in *Index Kewensis* (there being none at all ending *-phyllastrum*).

Pedicularis L. series **Garckeanae** R. R. Mill, **ser. nov.** (sect. *Phanerantha* H. L. Li).

A serie *Robustis* Prain galea rostro valde circinato, habitu caulescenti floribus numerosis in racemo terminali disposita differt. A serie *Longifloris* Prain tubo corollae calyce minus quam duplo longiore recedit.

Type: *P. garckeana* Prain ex Maxim., Bull. Acad. Imp. Sci. Saint-Petersbourg sér. 3, 32: 529 (1888), based on [CHINA, S XIZANG] 'Himalaya orientali: Chumbi, ad Be-ong-chin (hb. Calcutt.!)'. The specimen (CAL-*n. v.*) was gathered by King's collector. Two specimens presently included in the type folder at K, from Chumbi, Bootang, 4 vii 1884, *King's collector* 515, and Chumbi, Tanka-La, 5 miles N of Chumbi, 9 vii 1878, *Dungboo* s.n., are not type material; only the latter was cited by Prain (1889) but, crucially, neither was cited by Maximowicz in his protologue, which was published slightly earlier than Prain's own accounts of the species (Prain, 1889: 267 and 1890: 122).

Caulescent perennials. *Leaves* pinnatifid. *Flowers* several, in a terminal raceme. *Corolla tube* not more than twice as long as the calyx, puberulent; beak of galea strongly coiled, forming an almost complete circle, its apex bifid; all lobes of lower lip of corolla entire and glabrous-margined.

A monospecific series restricted to Sikkim and adjacent southern Xizang (China). Its single species, *P. garckeana* Prain ex Maxim., appears to be local as little material has been seen. *Pedicularis garckeana* has been consistently included in *P. ser. Robustae* Prain ever since that series was first described (Prain, 1890; Bonati, 1910; Limpricht, 1924; Tsoong, 1963; Yang Han-bi, 1995). However, it does not fit well within it. The other species of *P. ser. Robustae* (*P. elwesii* Hook.f., *P. nepalensis* Prain, *P. daltonii* Prain, *P. robusta* Hook.f.) are all less caulescent, with the inflorescence normally reduced to only 1 or 2 flowers (instead of the raceme of 7–15 flowers that characterizes *P. garckeana*), and the beak of the galea of *P. garckeana* is very strongly coiled (not straight or almost so). The species seems to form a connecting link between *P. ser. Robustae* and *P. ser. Longiflorae* Prain, which also has the inflorescence reduced to very few flowers or only one. However, in all species of *P. ser. Longiflorae* the corolla has a very slender tube that is more than twice as long as the calyx, and the middle lobe of the lower lip is emarginate in many species (including the two occurring in the *Flora of Bhutan* area: *P. longiflora* Rudolph and *P. siphonantha* D. Don) although this is not a constant diagnostic feature as some species in China (where *P. ser. Longiflorae* is exceptionally well represented by 18 species, of about 21 world-wide) have entire lower lips as in *P. garckeana*. Most species of *P. ser. Longiflorae* also have calyces with either 2 or 3 lobes; the presence of 5 calyx lobes, as in *P. garckeana*, is an unusual and sometimes species-inconstant condition (i.e. a typically 3-lobed species such as *P. leptosiphon* H. L. Li of Sichuan province (China) and Yunnan may occasionally have a 5-lobed calyx: Yang Han-bi *et al.*, 1998). Hence *P. garckeana* is here excluded from *P. ser. Robustae* and elevated to a monospecific series, of which there are many others in the genus (e.g. 32 of the 112 recognized in *Flora of China*: Yang Han-bi *et al.*, 1998). This act makes *P. ser. Robustae* a more natural group that is also easier to key out and to recognize in the field.

Pedicularis sect. **Elephanticeps** T. Yamaz., Rev. Pedic. Nepal 124 (1988) and **P.** sect. **Cryptorhynchus** T. Yamaz., op. cit. 125 (1988).

Other than the insertion of the word *corollarum* in ‘*Galea corollarum rostrata*’ within the description of *P. sect. Elephanticeps*, instead of ‘*Galea rostrata*’ in the corresponding description of *P. sect. Cryptorhynchus*, the Latin descriptions purporting to validate these two sections are exactly the same. The addition of ‘*corollarum*’ in one of them is of no diagnostic significance. Consequently neither description is diagnostic for its section. Closer comparison of the two diagnoses with the English descriptions of the two species concerned (*P. integrifolia* Prain, type of sect. *Elephanticeps* and *P. ludlowiana* P. C. Tsoong, type of *P. sect. Cryptorhynchus*) reveals that what appears to have been a typesetting error has combined diagnostic characteristics of both sections in the two descriptions. Thus, one of the characters (“*labium inferum amplissimum*”) applies only to *P. sect. Cryptorhynchus* (in which the corolla lower

lip of *P. tamurensis* is described by Yamazaki as very large) and not to *P. sect. Elephanticeps* (in which it is not), whereas another (“*Inflorescentia ... floribus oppositis*”) applies only to *P. sect. Elephanticeps*, and not to *P. sect. Cryptorhynchus* in which the flowers of the type, *P. ludlowiana*, were described by Tsoong as being alternate, as were those of the only Nepalese species of *P. sect. Cryptorhynchus*, *P. tamurensis* T. Yamaz. *Pedicularis ludlowiana* of *P. sect. Cryptorhynchus* has most leaves radical and only a few cauline ones, usually two pairs, which are opposite as described, and bipinnatisect or bipinnatipartite; *P. tamurensis* has pinnatisect leaves. Thus both species of *P. sect. Cryptorhynchus* differ from *P. integrifolia* in having dissected, not undivided, leaves. Surprisingly, the undivided leaves of *P. integrifolia* were not used by Yamazaki as one of the diagnostic characters of *P. sect. Elephanticeps*, and another useful character (staminal filaments all villous in *Elephanticeps*, all glabrous in *Cryptorhynchus*) was not used at all in either section.

ICBN Art. 32.2 states that “a diagnosis of a taxon is a statement of that which in the opinion of its author distinguishes the taxon from others”. Because the existing descriptions of these two sections are identical, it is not clear whether either of them validates the respective name under the terms of this Article. Therefore, both to clear up the confusion in Yamazaki’s work and also to unequivocally render both names valid, replacement Latin diagnoses for both sections (each of which embraces a single series in Yamazaki’s revision) are provided below. Elements of Yamazaki’s original descriptions that correctly apply to one or other section are preserved without alteration.

Pedicularis sect. Elephanticeps T. Yamaz., Rev. Pedic. Nepal 124 (1988), descr. emend. hoc loco: Caules ascendentes plurimi. Folia plerumque caulina, opposita, haud divisa. Inflorescentia terminalis spicato-racemosis, floribus oppositis. Galea corollarum longe rostrata; labium inferum rostro brevior lobis omnibus subaequalibus.

Only series: *P. ser. Integrifoliae* Prain.

Type: *P. integrifolia* Prain.

The name *Elephanticeps* (‘elephant’s head’) refers to the shape of the galea and its beak, which resemble the head of an elephant, the long beak being the ‘elephant’s trunk’.

P. sect. Elephanticeps Yamazaki comprised the single series *P. ser. Integrifoliae* Prain. This was one of only two series previously included by Li (1948: 349, 351) in *P. sect. Holophyllum* H. L. Li, for which no type was designated. The other was *P. ser. Salicifoliae* Bonati comprising the single Chinese endemic species, *P. salicifolia* Bonati. Yamazaki’s removal (whether knowingly or not) of *P. ser. Integrifoliae* from *P. sect. Holophyllum* means that the latter now comprises only the single series *Salicifoliae*. In order to preserve current usage of the two sectional names, *P. sect. Holophyllum* H. L. Li is here lectotypified by *P. salicifolia* Bonati.

Pedicularis sect. **Cryptorhynchus** T. Yamaz., Rev. Pedic. Nepal 125 (1988), descr. emend. hoc loco: Caulis rigidus erectus. Folia plerumque caulina opposita, laminis pinnatisectis, bipinnatipartitis vel bipinnatisectis. Inflorescentia terminalis spicato-racemosis, floribus alternis. Galea rostrata; labium inferum corollae amplissimum galeam obtegens lobis lateralibus eo mediano multo majoribus.

Only series: *P. ser. Ludlowianae* P. C. Tsoong, Acta Phytotax. Sin. 3: 288 (Jan. 1955).

Type: *P. ludlowiana* P. C. Tsoong.

The name *Cryptorhynchus* ('hidden beak') refers to the very large lower lip that covers the galea.

NEW SPECIES AND INFRASPECIFIC TAXA

Pedicularis melalimne R. R. Mill, **sp. nov.** (sect. *Lasioglossa* H. L. Li ser. *Craspedotrichae* H. L. Li). **Fig. 1B.**

A *P. clarkei* Hook.f. corolla flava (haud alba vel pallidissime rosea), segmentis foliorum magis remotis (usque ad 5mm distantibus, non 1–3mm), costa folii dense pubescenti, calycis venis intercalaribus indistinctis ad sinus currentibus (haud nullis), margine labio inferiore undulata differt. A *P. mucronulata* P. C. Tsoong caule altiore (60–80cm, non 40–60cm), foliis caulinis multo majoribus 70–120 × 15–22mm (non 30–55 × 2–11mm) pinnatifidis (haud pinnatisectis) segmentis paucioribus 8–14-jugis (non 15–22-jugis) multo magis remotis 2–5mm (non 0.5–1(–1.5mm) distantibus latioribus et plerumque longioribus (2.5–8 × 3–5mm, non 1–4 × 1–2mm), inflorescentia densa (haud laxiuscula), tubo corollae calyce paullo brevior (haud longiore) recedit.

Type: BHUTAN. Upper Kulong Chu district, Shingbe (Me La), 13,000ft (3963m), 22 viii 1949, flowers yellow, marsh, *F. Ludlow, G. Sherriff & J. H. Hicks* 21058 (holo. BM, iso. E).

Stout perennial with thick, branched rootstock. *Stem* 1, 60–80cm, unbranched, very shortly pubescent below, pilose with c.5 lines of longer hairs above. *Radical leaves* absent. *Cauline leaves* alternate, linear-oblong in outline, 70–120 × 15–22mm, subacute-mucronate, base amplexicaul, coarsely pinnatifid with 8–14 pairs of segments; segments 2–5mm apart, ovate-triangular, 2.5–8 × 3–5mm, subacute, doubly acute-serrate with 3–4 pairs of mucronate teeth, midrib densely and minutely pubescent, with sparse punctate hairs on either side above (confined to central area, not on pinnae), glabrous beneath. *Inflorescence* a long, dense spike c.16cm. *Lower bracts* c.30mm, with broad asymmetrical base c.10mm and long caudate apex c.20mm, pinnatifid to c.1/4 and with teeth along apical edge of basal portion; upper bracts shorter, ovate without long-caudate apex, middle and upper bracts strongly tinged red. *Calyx* membranous, not cleft, c.16mm, with 5 strong veins running to apices of teeth and very weak intercalary veins to sinuses, crisply adpressed-villous with greyish

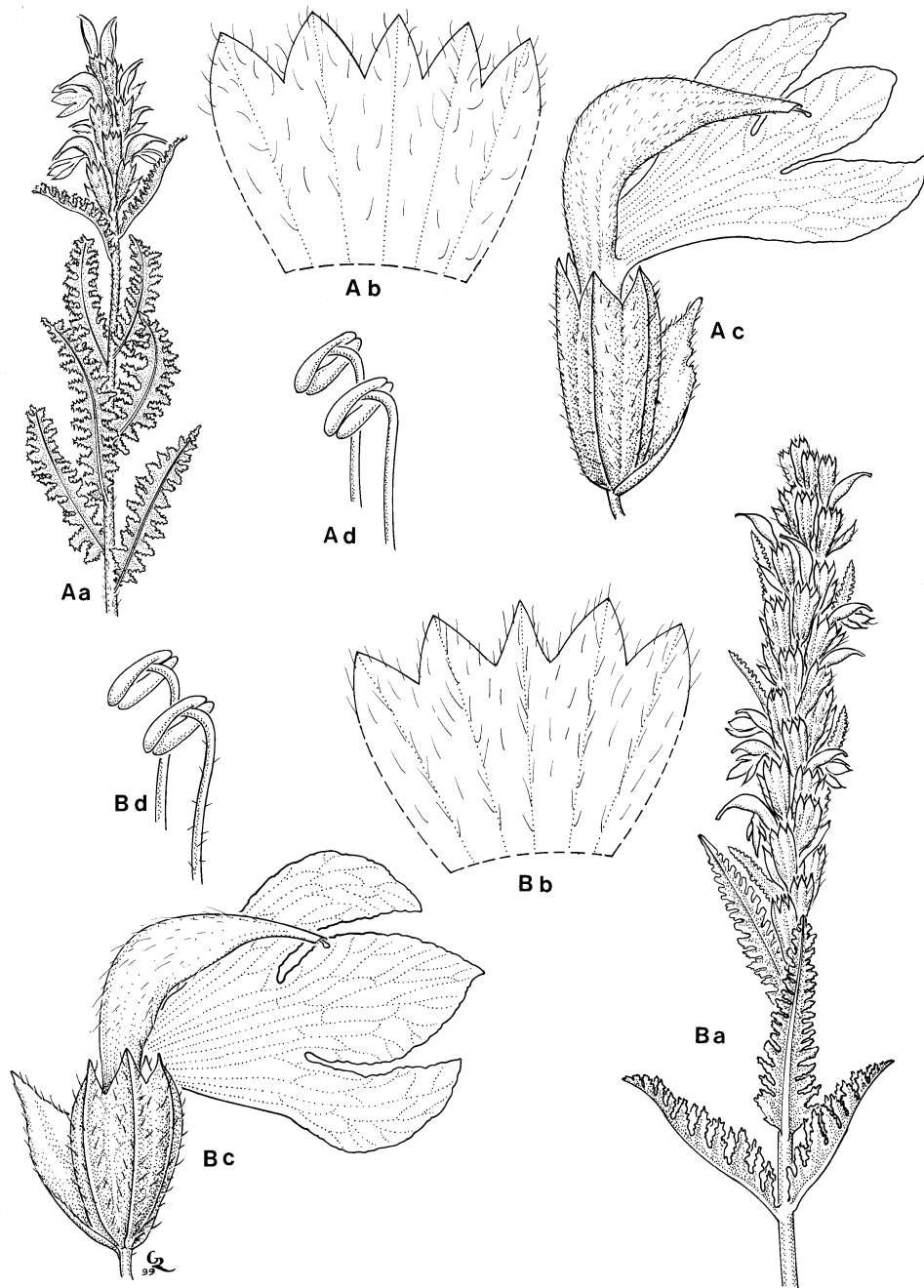


FIG. 1. *Pedicularis sanguilimbata* R. R. Mill: Aa, habit (upper stem and inflorescence) $\times 1$; Ab, calyx opened out $\times 4$; Ac, undissected flower $\times 3.5$; Ad, anthers and filaments $\times 8$ (all from Cooper 4304). B. *P. melanimne* R. R. Mill: Ba, habit (upper stem and inflorescence) $\times 1$; Bb, calyx opened out $\times 3.5$; Bc, undissected flower $\times 3.5$; Bd, anthers and filaments $\times 8$ (all from Ludlow, Sherriff & Hicks 21058). Drawn by Glenn Rodrigues.

hairs; teeth 5, posterior tooth lanceolate, $c.2 \times 1.5$ mm, others deltoid, $c.3 \times 3$ mm, acute, remotely and very shallowly denticulate. *Corolla* yellow, $c.27$ mm; tube $c.14 \times 2$ mm, slightly shorter than calyx, straight, abruptly becoming slightly broader ($c.3$ mm) above middle, sparsely pilose; galea with erect part $c.6$ mm, gently curved, anther-bearing part smoothly curved horizontally forwards, $c.7 \times 2.5$ mm, densely appressed cream-villous dorsally, gradually tapered to a short pale beak $c.3$ mm with obliquely truncate apex; lower lip stipitate, $c.12 \times 8$ mm, lateral lobes elliptic, $c.4 \times 1.5$ mm, middle lobe ovate-elliptic, $c.6 \times 3.5$ mm, margins undulate, densely ciliate. *Anterior filaments* hairy. *Capsule* unknown.

Endemic to Bhutan; known only from the type gathering which was collected in a marsh at $c.3960$ m. Flowering in August.

The epithet has been coined from the type locality (Me La) and Greek *limne*, a marsh, referring to the habitat of the type collection. The BM specimen was determined as *P. clarkei* by Tsoong in 1950 whereas the E specimen determined as *P. ?aff. mucronulata* by Grierson & Long in November 1978. While obviously closely allied to both these species, and to the new species *P. sanguilimbata* R. R. Mill (described elsewhere in this paper), it is not conspecific with any of them.

Li (1949: 66) established *P. ser. Craspedotrichae* H. L. Li (whose type is *P. craspedotricha* Maxim. from Sichuan: Art. 22.6) for about 10 species from China. They were formerly included in *P. ser. Tristes* Benth. but distinguished from the members of that series by their beaked corollas, unclleft calyx with 5 serrate teeth, lower lip of corolla often denticulate, and anterior filaments hairy. These are all characters possessed by this and the next species, which are both accordingly assigned to *P. ser. Craspedotrichae*. *Pedicularis clarkei*, which superficially closely resembles all these members of *P. ser. Craspedotrichae*, belongs to the closely allied *P. ser. Imbricatae* P. C. Tsoong ex H. B. Yang (Yang Han-bi *et al.*, 1998; type, *P. imbricata* P. C. Tsoong); Yamazaki (1988) included *P. clarkei* in *P. ser. Craspedotrichae* also but may have been unaware of Tsoong's series, which at that time had in any case not been validly published.

***Pedicularis sanguilimbata* R. R. Mill, sp. nov.** (sect. *Lasioglossa* H. L. Li ser. *Craspedotrichae* H. L. Li). **Fig. 1A.**

A *P. mucronulata* P. C. Tsoong foliis caulinis ambitu apicaliter acutis (haud obtusis) segmentis paucioribus (10–14-jugis, non 15–22-jugis) plerumque magis distantibus (1–2.5mm, non 0.5–1(–1.5)mm), lobo mediano labii inferioris majore $13\text{--}14 \times 10\text{--}11$ mm (non $10\text{--}11 \times c.6.5$ mm), lobis lateralibus $c.3 \times 3$ mm, mediano minoribus (haud majoribus $c.6 \times 2$ mm), marginibus loborum longe ciliatis (haud glabris) differt.

Type: BHUTAN. Upper Kuru Chu district: Singhi Kurted, 12,500ft (3810m), tall yellow-flowered bracts blood edges, *R.E. Cooper* 4304 (holo. E, iso. BM).

Robust but rather slender perennial. *Stem* 1, $c.60$ cm, unbranched, subglabrous

below, with 4–5 lines of short deflexed hairs above. *Radical leaves* absent. *Cauline leaves* alternate, narrowly oblong in outline, 30–35 × 6–8mm, acute, base cordate-amplexicaul, deeply pinnatisect with 10–14 pairs of segments, midrib not very prominent beneath; segments of middle leaves 1–2.5mm apart, oblong-ovate in outline, 2.5–4.5 × 1.5–2.5mm, acute, doubly acute-serrate with 2–3 pairs of teeth, with scattered short white hairs on lamina (including pinnae) above, glabrous beneath. *Inflorescence* a lax spike, rather short and few-flowered. *Bracts* c.9 × 2.5mm, rather narrowly ovate, villous, blood-red on margins, abruptly narrowed to short, caudate glabrous apex c.2mm. *Calyx* membranous, barrel-shaped, 11–15mm, with 5 very strong ribs running to tips of teeth and no intercalary veins, long-pilose; teeth 5, triangular, subequal in length but 2 posterior broader than 3 lower, 2.5–3 × 1–2mm, finely denticulate. *Corolla* yellow, 22–32mm; *tube* 12–15mm, subequalling calyx, almost straight, slightly constricted at top of ovary, minutely pilose above constriction but glabrous below; *galea* with erect part 4.5–6mm, anther-bearing part horizontal and directed forwards, buff-villous dorsally, gradually narrowed to indistinct, short, broadly conical beak c.2mm with broad, obtuse apex; *lower lip* stipitate-cuneate, obovate in outline, 10–11 × c.6.5mm, 3-lobed, the lobes all directed forwards, lateral lobes c.6 × 2mm, larger than narrowly elliptic, acute middle lobe c.4.5 × 1.5mm, margins glabrous, those of laterals undulate or almost denticulate. *Stamens* inserted near middle of tube; *filaments* all glabrous; *anthers* c.2 × 1.6mm, thecae obtuse at base. *Capsule* unknown. *Habitat* not indicated. *Altitude* 3800m. *Flowering* July–August.

Endemic to N Bhutan; known only from the type gathering from Upper Kuru Chu District. The epithet *sanguilimbata* pertains to the blood-red edges of the bracts. No habitat was indicated on the field label; the other species of *P.* ser. *Craspedotrichae* in our area (except *P. melalimne* described above which was collected in a marsh) are plants of open, bouldery hillsides, steep banks, cliffs, and similar habitats, above c.2500m (chiefly 3500–4300m). *Pedicularis sanguilimbata* therefore probably grows in similar places.

The type was determined as ‘cf. *P. mucronulata* Tsoong’ by Grierson & Long in 1978. *Pedicularis mucronulata* P. C. Tsoong is known only from the type which was collected in Upper Kuru Chu District, Bhutan. Two other specimens had tentatively been referred to it but closer examination has shown that neither of them can be placed in the species. They have been described here as the two new species *P. melalimne* and *P. sanguilimbata*.

***Pedicularis microloba* R. R. Mill, sp. nov.** (sect. *Rhizophyllastrum* T. Yamaz. ex R. R. Mill ser. *Asplenifoliae* Prain). **Fig. 2A.**

A *P. cooperi* P. C. Tsoong labio inferiore corollae integro glabro (haud undulato piloso) lobo mediano minimo, galeae rostro brevi (3–3.5mm, non 5–5.5mm) conico (haud marginibus parallelibus), corolla distincte minore (25–28mm, non 32–35mm), pedicellis a caudice exorientibus longioribus (8–14mm, non minus quam 4mm),

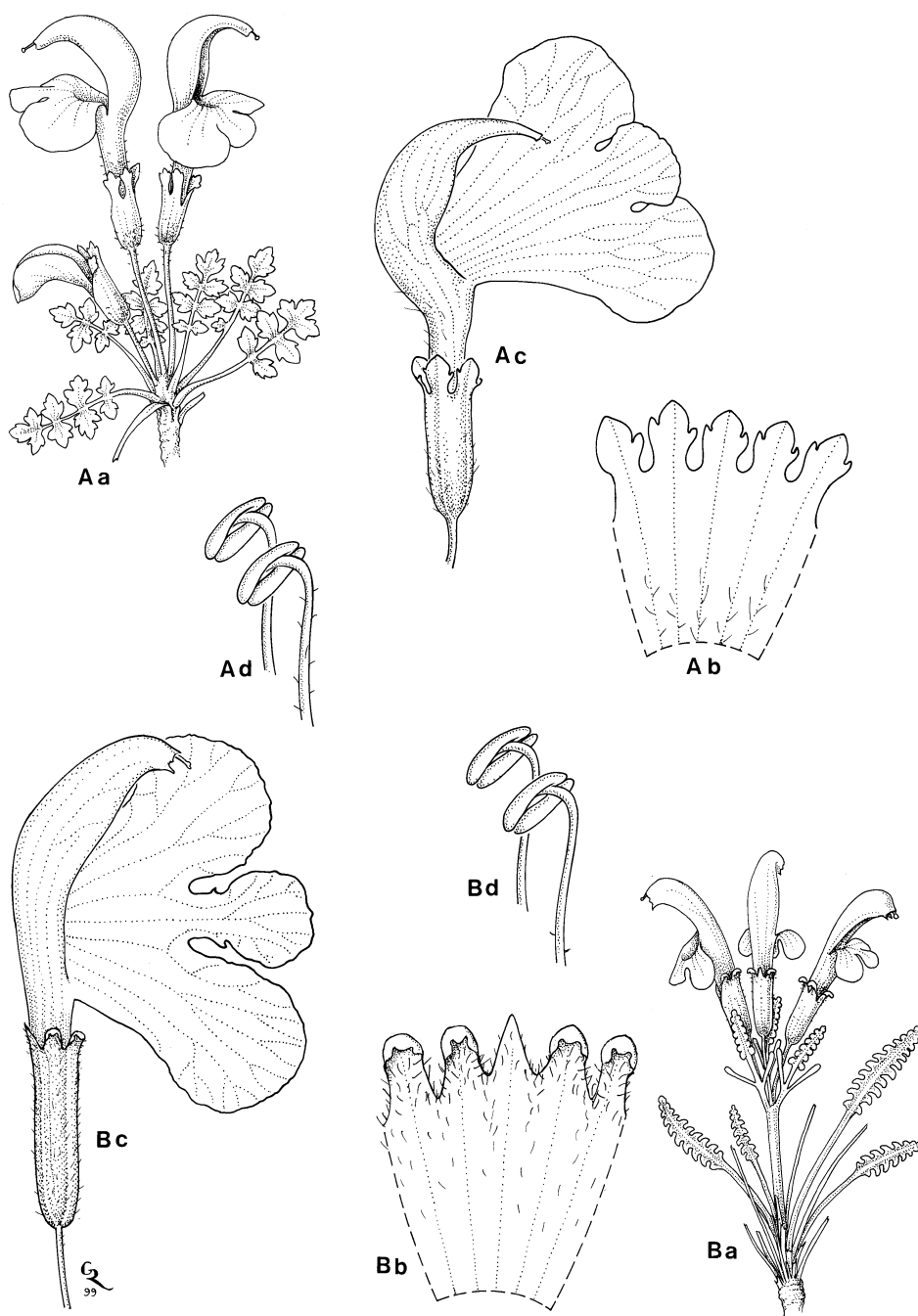


FIG. 2. *Pedicularis microloba* R. R. Mill: Aa, habit $\times 2$; Ab, calyx opened out $\times 5$; Ac, undissected flower $\times 4$; Ad, anthers and filaments $\times 15$ (all from Cooper 2744). B, *P. yarilaica* R. R. Mill: Ba, habit $\times 2$; Bb, calyx opened out $\times 4$; Bc, undissected flower $\times 3.5$; Bd, anthers and filaments $\times 15$ (all from Ludlow, Sherriff & Hicks 16422.) Drawn by Glenn Rodrigues.

bracteis nullis (haud praesentibus foliaceis), calyce cylindrico-campanulato (non anguste cylindrica) tota longitudine simili (6.5–8mm) sed tubo longiore (5–6mm, non 3–3.5mm) in partem inferiorem secus venis parce piloso (haud omnino glabro), tubo pilis longis sparsis tectis (haud linea breviter pubescenti proviso), lobo mediano labii inferioris indistincto et parvo 2×2.5 mm (non c.6 \times 5 mm), stamina ad summum tubi corollae (haud basin versus) inserta, filamentis anticis villosis (haud totis glabris) distincta. A *P. longipedicellata* P. C. Tsoong radicibus fibrosis tenuibus (haud fusiformibus), petiolis brevioribus 5–7mm non 10–30mm longis, lamina ovata vel oblongo-ovata (non lineari-ob lanceolata) 4–10 \times 2–5mm (non 10–30 \times 3.5–8.5mm), pedicellis brevioribus 8–14mm longis (non 20–70mm), calyce brevior (6.5–8mm, non 12–14mm) dentibus haud trisectis, corolla brevior (25–28mm, non 33–43mm), galeae parte erecta dimidio minore (4mm, non 8mm longa), ea antherifera haud papillosa, labii inferioris marginibus glabris (haud pilosis) valde recedit. A *P. sikkimensis* Bonati habitu acaulescenti (haud caulescenti), pedicellis ex caudice exorientibus bracteis nullis, tubo corollae ad anthesin multo brevior 9–11mm longo (non 20–25mm) facile distinguitur.

Type: BHUTAN. Thimphu district, Phajudin, 3960m, 5 viii 1914, *R. E. Cooper* 2744 (holo. BM, iso. E).

Almost acaulescent, low perennial; roots rather slender, fibrous, slightly fleshy near crown. *Stems* \pm absent. *Leaves* all radical, numerous, forming a loose tuft; petioles 5–7mm, glabrous; lamina ovate or oblong-ovate, 4–10 \times 2–5mm, pinnatisect with 3–5 pairs of ovate to suborbicular, incised-lobate mucronate segments; both surfaces glabrous. *Flowers* few; pedicels arising \pm from crown, 8–14mm, glabrous. *Bracts* absent. *Calyx* cylindrical-campanulate, 6.5–8mm; tube 5–6mm, sparsely pilose on veins in basal half, upper half glabrous; lobes 5, posterior narrowly triangular with a lateral tooth, laterals broadly obovate from broad stipitate base, with 2 lateral teeth and broad, acute apex, anterior like laterals but smaller. *Corolla* pink, 25–28mm; tube 9–11 \times 1.3mm, c.1.3 \times calyx, sparsely long-pilose; erect part of galea c.4mm, anther-bearing part slightly inflated, c.5mm, horizontal, glabrous, rather abruptly tapered into a short conical beak c.3mm with obliquely truncate, bluntly crenulate apex; lower lip 8 \times 10mm, lateral lobes reniform, middle lobe small and indistinct, 2 \times 2.5mm, ovate-suborbicular, margins \pm entire, glabrous. *Stamens* inserted near top of corolla tube; 2 anterior filaments sparsely villous, 2 posterior glabrous; anthers 1.9 \times 1mm, thecae obtuse at base. *Capsule* unknown.

This new species is endemic to Bhutan and at present known only from the type gathering, which was originally determined in 1978 by Grierson & Long as 'sp. aff. *cooperi*'. It is obviously allied to *P. cooperi* P. C. Tsoong in its morphology but the very small middle lobe of the corolla lower lip is very distinctive. Other distinguishing features that separate it from *P. cooperi* are the villous anterior filaments, the smaller corolla and the calyx which, although similar in overall length to that of *P. cooperi*, has a noticeably longer tube and correspondingly shorter teeth. It is also similar to *P. longipedicellata* P. C. Tsoong but the latter has fusiform roots and much larger leaves. *Pedicularis*

sikkimensis Bonati is easily distinguished by its caulescent habit with stems up to 30cm tall (usually less) and consequent presence of 2 or 3 whorls of bracteate flowers (in *P. microloba* the pedicels arise directly from the crown and there are no bracts).

Prain's *P. ser. Asplenifoliae* as it appears to be presently delimited (as by Yang Han-bi *et al.*, 1998) has a very disjunct distribution. Of approximately 12 species, three including *P. asplenifolia* Flörke ex Willd. occur in the north-eastern Alps of Austria, Italy and Switzerland; eight occur from Bhutan and Sikkim (four) to Burma (one: *P. petrophila* H. L. Li) and China (three); and one (*P. ornithorhyncha* Benth.) is found in northern North America (Washington and Alaska to Sitka and Labrador). The limits of the series may require revision, or the distribution may represent real disjunctions, possibly as a result of extinction between the two western and eastern Eurasian concentrations. No lectotypification of the name *P. ser. Asplenifoliae* is known although because its name is derived from the epithet of one of its constituent species, *P. asplenifolia* Flörke ex Willd. from C Europe, Art. 22.6 requires that the series be typified by that species' name.

Pedicularis longipedicellata P. C. Tsoong var. ***lanocalyx*** R. R. Mill, var. nov. (sect. *Rhizophyllastrum* T. Yamaz. ex R. R. Mill ser. *Asplenifoliae* Prain).

A var. *longipedicellata* segmentis foliorum ad apices tenuiter canescenti-pilosis, calyce densiuscule lanato, dorso galeae glandulis stipitatis brevibus (haud papillis sessilibus) praedito, rostro galeae brevioris 1–1.5mm tantum longo differt.

Type: Bhutan. Bumthang District, Penge La, 14,400ft, 'dry hill top among dwarf rhodos, deep pink and pale pink flowers', 27 vi 1969, S. Bowers Lyon 15104 (holo. BM).

Originally named (on its label, wrongly) as *P. oederi* var. *heteroglossa* Prain, the holotype of this new variety was determined by Yamazaki (in sched., 1978) as *P. longipedicellata* but with a note, 'This specimen differs from the typical form by the calyx with lanate hairs'. Additional characters, such as the shorter beak of the galea (only 1–1.5mm, not 2.5–4mm), the galea glandular on its back, and the hairy calyx lobes, have been discovered and varietal rank seems appropriate. The variety is endemic to Bhutan.

Pedicularis yarilaica R. R. Mill, sp. nov. (sect. *Rhizophyllum* H. L. Li ser. *Merrilliana* P. C. Tsoong ex H. B. Yang). **Fig. 2B.**

A *P. merrilliana* H. L. Li caule minute pubescenti (pilis filis duobus solum), petiolis glabris, segmento terminali folii majore suborbiculari subintegro, pagina inferiore costa serpentino-cristata, calyx paulo minore (8–10.5mm) tubo glabrato vel sparsissime pubescenti (haud piloso nec dense hirsuto), corollae tubo vix vel haud calycem excedenti, corolla paulo majore (22–25mm non 18–23mm), eae galea parte antherifera rostro brevi sed distincto c.1mm longo et dentibus longioribus subulatis 0.5–0.6mm longis (non 0.3–0.5mm), lobo mediano labii inferioris corollae quam lateralibus distincte minore, filamentis anticis duobus in duobus partes superioribus pilis parcissimis tectis (haud omnino glaberrimis) differt.

Type: BHUTAN. Upper Mo Chu district: Yari La, between Chumiten and Tseya Gyethang, calyx pale green, corolla purplish pink, damp hill slopes, 14,000ft (4265m), 4 vi 1949, *F. Ludlow, G. Sherriff & J. H. Hicks* 16422 (holo. BM, iso. E).

Low, rather densely caespitose perennial with stout, fusiform, scarcely tapered fleshy roots. *Stems* several, 1–6cm, minutely pubescent with 2 rows of hairs c.0.1mm. *Leaves* mainly in a basal tuft, alternate; petioles 4–18mm, subglabrous; lamina ovate-oblong in outline, 6–13 × 2.5–6mm, ± runcinate-pinnatisect with 5–10 pairs of triangular-oblong, subentire lateral segments with broad, rounded, decurved tips and inrolled margins and a relatively large, suborbicular, ± entire terminal segment; upper surface glabrous, lower surface brownish-furfuraceous near the strongly serpentine-cristate midrib. *Inflorescence* of 2(–3) terminal flowers very close together. *Pedicels* c.4mm. *Bracts* c.10mm, with short broad petiole and deeply 3-fid lamina, each lobe petiolulate and pinnatifid. *Calyx* cylindrical-campanulate, 8–10.5mm, glabrate or very sparsely pubescent, split to c.1/4 on anterior side, with narrow, triangular-acute posterior tooth and obtuse, recurved lateral teeth, pilose especially in sinuses; tube 10-veined (the ribs appearing darker than the rest of the tube when dried). *Corolla* purplish pink, 22–25mm; *tube* 6–8mm, equalling calyx tube, glabrous; *galea* with its erect part c.6mm, anther-bearing part suberect and slightly inclined forwards, suddenly narrowed distally into a very short, slightly downwards-directed, truncate beak c.1mm which has 2 horizontally-projecting subulate teeth c.0.5–0.6mm on its anterior side; lower lip c.10 × 12.5mm, middle lobe oblong, c.3 × 2.5mm, smaller than laterals, laterals spreading at angle of c.45°, c.8 × 4.5mm, indistinctly undulate, ± glabrous on margins. *Stamens* inserted near base of corolla tube; 2 anterior *filaments* exceedingly sparsely short-pilose in upper 2/3, posterior glabrous; *anthers* c.2.5 × 1.2mm, thecae triangular-obtuse at base. *Style* finally exerted by 1.5–2.5mm. *Capsule* unknown. Damp hill slopes, 3960–4265m. *Flowering* June–July.

Other material examined. S TIBET (XIZANG): above Gautsa, 13,000ft, 17 vi 1939, *B. J. Gould* 2120 (K).

This new species is restricted to northernmost Bhutan and S Tibet; the epithet alludes to the type locality. It differs from *P. merrilliana* H. L. Li (as which the type was determined by Tsoong in 1950) in stem pubescence, and in having a serpentine-cristate midrib on the lower leaf surface, leaves with a larger, subentire terminal segment, longer teeth on galea, slightly shorter calyx with glabrous tube, slightly larger corolla (22–25mm, not 18–23mm), with the middle lobe of the lower lip noticeably smaller than laterals and the anther-bearing part of the galea with longer, subulate teeth, and by the 2 anterior filaments with a very few hairs in their upper 2/3 (not totally glabrous throughout). *Pedicularis merrilliana* is endemic to Sichuan and Gansu, China. It was originally classified in *P. ser. Rhynchodontae* Prain by Li (1949) but placed in its own series, *P. ser. Merrillianae*, by Yang Han-bi (1995). *Pedicularis yarilaica* has here been included in the same series on account of its similarity to *P. merrilliana*.

Pedicularis dhurensis R. R. Mill, sp. nov. (sect. *Brachychila* H. L. Li ser. *Aloenses* H. L. Li). Fig. 3B.

Species affinis *P. aloensi* Hand.-Mazz. yunnanensi sed a qua corollis albis vel pallidissime lutescentibus (haud flavis), tubo corollae brevioris (2.5–3mm, non 3.5–6.5mm), galea majore (10–13mm, non 6–7.5mm) et in parte superiore sparsim tantum (haud dense) pubescenti, pilis caulium brevioribus (0.3mm, non 0.5mm) differt. A *P. kingii* Maxim. sikkimensi (quae flores albos etiam habet) calyce paullo brevioris (3–3.7mm longo, non 4–4.5mm) dentibus apicalibus subulatis, corollae tubo multo brevioris (2.5–3mm calyce aequanti, haud 6.5–8.5mm calyce subduplo longiore), filamentis omnibus (haud anticis tantum) versus apicem barbatis, caudis subulatis antherarum longioribus (0.7–1mm, non 0.5mm) recedit.

Type: BHUTAN. Dhur Valley, near Bumthang, 12,000ft (3658m), calyx pale green, streaked dark, corolla white, by the track in *Abies* forest, 22 vii 1949, F. Ludlow, G. Sherriff & J. H. Hicks 16933 (holo. E, iso. BM).

Perennial. Stems 14–30cm, numerous, branched from base, decumbent to suberect, shortly pilose in 2 rows, hairs c.0.3mm. Leaves opposite; petioles of lower ones 30–60mm, of upper ones 8–16mm, narrowly green-winged; lamina of lower leaves ovate-triangular, 35–50 × 20–25mm, pinnatisect with 5–6 pairs of opposite or slightly alternate segments, the lowest segments subequal to or not more than 1.5 × length of next highest pair; lower 2 or 3 pairs of segments shortly petiolulate and ± remote, others sessile, contiguous and decurrent, laminae elliptic or elliptic-ovate, deeply pinnatifid with 4–5 pairs of acute-dentate lobules and 3-dentate terminal lobule; upper surface subglabrous except for puberulent veins and midrib, lower surface glabrous, reticulate-veined. Inflorescence of pairs of flowers in axils of each leaf (even the lowest ones); pedicels 1.5–2mm in flower, c.2.5mm in fruit, suberect. Bracts all leaf-like but uppermost reduced to 3 lobes or to 1–2 pairs of leaflets. Calyx campanulate, 3.3–3.7mm, pale green with dark longitudinal streaks extending 1/2–3/4 way down tube; teeth narrowly subulate-triangular, glabrous, separated by broad, very shallow sinuses with ciliate margins; tube glabrous. Corolla white or very pale yellow, 14–17.5mm, erecto-patent with respect to axis (mostly 20–45°); tube 2.5–3mm, equaling calyx tube; galea 10–13mm, erect with shallowly incurved upper part which is sparsely short-pubescent; lower lip 8–10mm, lower 2/3 adnate to galea, free in upper 1/3 which is slightly out-curved and shallowly 3-lobed; middle lobe oblong-triangular and subacute, laterals broadly deltoid and acute, all sparsely hairy. Stamens inserted at base of tube; all filaments sparsely hairy especially near top; anthers c.2mm, thecae with long subulate tails 0.7–1mm. Capsule (immature) c.8 × 3.5mm, obliquely lanceolate, gradually narrowed to long acuminate tip. On wet banks and track-sides in *Abies* forest, 3660–3810m. Flowering July.

Other material examined. BHUTAN. Dhur Chu, Bumthang Chu, 3808m, Ludlow, Sherriff & Hicks 19493 (BM, E).

Endemic to the Dhur Chu Valley, Bumthang District, Bhutan, from whose name

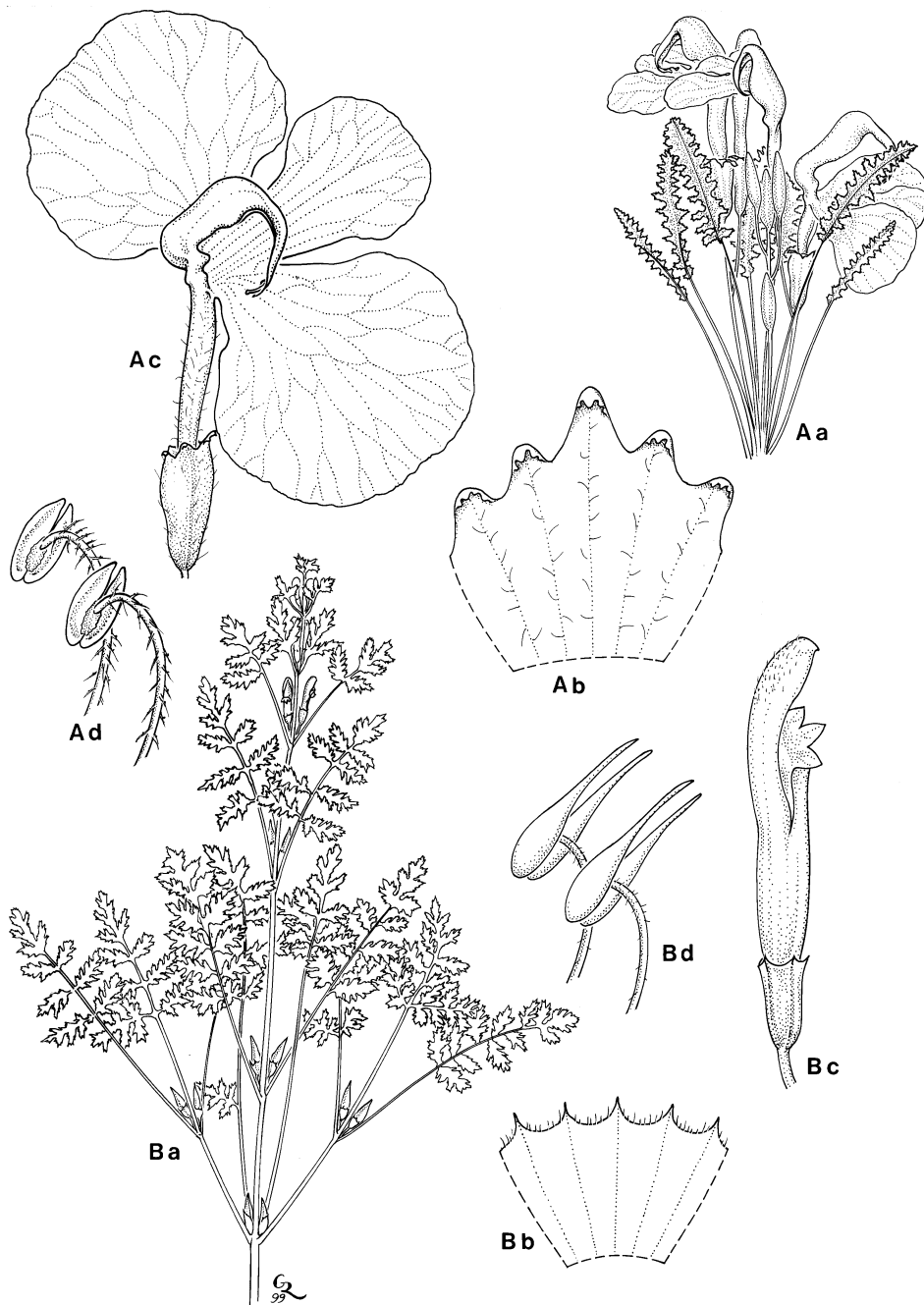


FIG. 3. A, *Pedicularis woodii* R. R. Mill: Aa, habit (showing three flowers and several capsules) $\times 3/4$; Ab, calyx opened out $\times 4.5$; Ac, undissected flower $\times 2.5$; Ad, anthers and filaments $\times 12$ (all from Wood 7316). B, *P. dhurensis* R. R. Mill: Ba, habit $\times 1$; Bb, calyx opened out $\times 7$; Bc, undissected flower $\times 5$; Bd, anthers and filaments $\times 15$ (all from Ludlow, Sherriff & Hicks 16933.) Drawn by Glenn Rodrigues.

the epithet is derived. The type was originally named by P. C. Tsoong in 1950 as '*P. cf. bambusetorum* Hand.-Mazz.' and re-determined by Grierson & Long in 1978 (E sheet) and 1980 (BM sheet) as *P. aurata* (Bonati) H. L. Li.

Pedicularis bambusetorum Hand.-Mazz. was described from Yunnan (type: *Handel-Mazzetti* 9034, holo. W–n.v., iso. E) and has generally been considered to be synonymous with *P. aurata* (Bonati) H. L. Li although the name *P. bambusetorum* was omitted from the synonymy of the latter in the *Flora of China* treatment. Examination of the isotype of *P. bambusetorum* at E reveals that it is in fact closer to the Sikkim endemic *P. kingii* Prain ex Maxim. than to *P. aurata* and may be conspecific with *P. kingii*; if so, *P. kingii* would be the correct name for the combined taxon.

Pedicularis sect. *Aloenses* H. L. Li, typified by *P. aloensis* Hand.-Mazz. (Art. 22.6), was established by Li (1949) for four Chinese species formerly grouped in *P. ser. Fragiles* Prain by Bonati (1911, 1921) or Limpricht (1924), namely *P. aloensis* Hand.-Mazz., *P. aurata* (Bonati) H. L. Li, *P. legendrei* Bonati and *P. wardii* Bonati, as well as the Sikkim species *P. kingii* Prain ex Maxim., which Prain (1890: 97) had regarded as one of the two original species of *P. ser. Fragiles*. Li also removed from *P. ser. Fragiles* another Chinese species, *P. corydaloides* Hand.-Mazz., that Handel-Mazzetti (1926) had included in it, and made that species a monospecific series of *P. sect. Dolichomischus* H. L. Li, *P. ser. Corydaloides* H. L. Li (Li, 1949: 159); that classification has been maintained (e.g. Yang Han-bi *et al.*, 1998). *Pedicularis bambusetorum* Hand.-Mazz., which had also been placed in *P. ser. Fragiles* (Handel-Mazzetti, 1923), was reduced by Li to a synonym of *P. aurata* (Bonati) H. L. Li. All these removals and transfers had the effect of restricting Prain's series *Fragiles* to the single species, *P. fragilis* Prain ex Maxim. from Arunachal Pradesh, which is fortunately also its type (by application of Art. 22.6). This species is distinguished from the members of *P. ser. Aloenses* by its ternate, sessile (not pinnatisect and long-petiolate) cauline leaves. *Pedicularis dhurensis* resembles the other members of *P. ser. Aloenses* in this combination of leaf characters and so is assigned to *P. ser. Aloenses*, not to *P. ser. Fragiles*.

The Dhur Chu plants here described as *P. dhurensis* R. R. Mill do not match either *P. kingii* (including *P. bambusetorum*) or *P. aurata*. They were originally tentatively re-determined by myself as *P. aloensis* Hand.-Mazz. but have been found to differ from that species also. Accordingly they are described here as a new species of *P. ser. Aloenses* H. L. Li. Both specimens were described as having 'white' or 'palest yellow' corollas. In contrast, *P. aloensis*, which is endemic to Yunnan (Yang Han-bi *et al.*, 1998), has golden-yellow corollas. The Sikkim endemic *P. kingii* has white flowers like *P. dhurensis* but it differs from *P. dhurensis* by its much longer corolla tube (6.5–8.5mm, twice as long as the calyx) and all the filaments (not just the anterior pair) barbate at their apex. There are other more minor differences in the lengths of the anther tails (those of *P. dhurensis* being longer than those of *P. kingii*), calyx length (*P. dhurensis* being shorter), etc. The two species are clearly more closely allied to each other than either is to *P. aloensis* of China. Both are known from very limited material and it may be that further collection in the intervening area may blur the distinction that appears to exist between *P. kingii* and *P. dhurensis*. However, both are accepted as full species in this paper and the *Flora of Bhutan*.

Pedicularis woodii R. R. Mill, **sp. nov.** (sect. *Saccochilus* T. Yamaz. ser. *Megalanthae* Prain). **Fig. 3A.**

A *P. megalantha* D. Don foliis minoribus multo angustioribus (lamina plerumque 25–40 × 3–7mm, non 40–120 × 10–40mm), segmentis laminae parvis solum dentatis (haud pinnatim divisus pinnulis crenato-serratis), corolla concolori (nec galea nec fauci albo) rosea, tubo brevior quam calyce subduplo (haud 2.5–4-plo) longiore, rostro galea brevior, marginibus loborum labii inferioris glaberrimis vel parcissime minutissime pilosulis differt. A *P. megalochila* H. L. Li f. *rhodantha* P. C. Tsoong foliis minoribus, calyce usque ad 1/3 sed numquam ultra medium fisso, lobis labio inferioris plusminusve glabris recedit. *P. pauciflorae* (Maxim.) Pennell maxime similis sed corolla minore tubo multo brevior 25–30mm calyce subduplo longiore (non 35–75mm calyce 4.5–6-plo longiore), corollae lobis labii inferioris marginibus glaberrimis vel parcissime pilosulis (non pilosis) differt.

Type: BHUTAN. Thimphu district, Dongshola, frequent in rock crevices in moist mountain cliff areas, 4400m, perennial herb from a tap root, corolla deep pink, 19 viii 1990, *J.R.I. Wood* 7316 (holo. E).

Perennial; *roots* slightly curved, simple or with few branches. *Stems* generally several, erect or ascending, 3–8cm, unbranched, shortly adpressed-pubescent all round. *Leaves* mainly radical with a few alternate cauline ones. *Radical leaves* numerous (12–25 per tuft); petioles 20–40mm, narrowly winged, shortly pubescent; lamina linear-oblong in outline, (15–)25–40 × 3–7mm, pinnatipartite with usually 7–15 pairs of segments; segments ovate-triangular, lowest pairs smaller and indistinct, more distant than those towards lamina apex, each segment crenate-serrate; segments with long creamy caducous hairs when young, finally glabrous, and also white-furfuraceous beneath when young; midrib with persistent dense short hairs on upper surface, glabrous and pale beneath. *Inflorescence* a few-flowered terminal raceme. *Bracts* leaf-like. *Pedicels* indistinct in flower, to c.10mm in fruit and then glabrous. *Calyx* narrowly urceolate-tubular, 15–17mm, split to c.1/3; tube membranous, 10-veined, sparsely spreading-villous on veins; mouth with 5 small oblong-ovate incised-dentate apical lobes c.1–1.5mm which tend to blacken and roll back when dry (especially 3 anterior ones). *Corolla* concolorous but galea slightly darker, pale or deep pink, 35–50mm; *tube* 25–30mm, slender (c.2mm diam. near middle, widening slightly upwards), straight, c. twice calyx, pilose; *galea* erect in centre of lower lip, strongly twisted and forming a wide arc but not an almost complete ring, c.14mm, anther-bearing part almost sessile on corolla tube, c.6mm, minutely glandular-punctate, gradually attenuate into coiled beak 6–7mm with obliquely acute, emarginate apex; *lower lip* 20–25 × 25–30mm, lateral lobes broadly orbicular-reniform, 8–10 × 14–18mm, middle lobe smaller, broadly obovate, 10–12 × 8–10mm, margins undulate and glabrous or with extremely sparse minute hairs. *Capsule* narrowly ovoid, c.20 × 5–6mm, shortly acuminate. *Seeds* not seen. Rock crevices, moist mountain cliffs, and open rocky moorland; 4400–4500m. *Flowering* August.

Other material examined. BHUTAN. summit of Lawgu (Daga-Thimphu), 4500m, on open rocky moorland, erect annual [sic], corolla pale pink, 8 viii 1989, *J. R. I. Wood* 7066 (E).

Endemic to C Bhutan (Thimphu District). This new species is clearly a member of *P.* sect. *Saccochilus* T. Yamaz. ser. *Megalanthae* Prain although its fruit capsules are very narrow compared with those of other members of this series. Within the series it is probably most closely allied to *P. pauciflora* (Maxim.) Pennell but also shares some characteristics with *P. megalantha* and *P. megalochila*, all of which also have corollas wholly or partly magenta like *P. woodii*. From all three it can be distinguished by the lobes of the lower lip of the corolla being completely glabrous or else exceedingly sparsely hairy (not more or less densely pilose). *Pedicularis megalantha* is readily separated by its white galea and corolla throat, and has a longer corolla tube. *Pedicularis megalochila* is polymorphic but only var. *megalochila* f. *rhodantha* P. C. Tsoong (the taxon occurring in Bhutan) has entirely pink corollas that would be confusable with the new species; var. *megalochila* f. *megalochila*, from Tibet and N Burma, has a yellow corolla with red beak, and var. *ligulata* P. C. Tsoong from SE Tibet has a yellow corolla with brownish-red beak. *Pedicularis megalochila* var. *megalochila* f. *rhodantha* has a shorter corolla tube than *P. woodii*. Two other members of *P.* sect. *Saccochilus* that occur in C and E Nepal, *P. hoffmeisteri* Klotzsch and *P. cornigera* T. Yamaz., are easily distinguished from *P. woodii* by their cream or lemon-yellow corollas. No species of *P.* sect. *Saccochilus* with cream or yellow flowers has so far been recorded from Bhutan or Sikkim.

The plant is obviously a perennial despite the field note on *Wood* 7066, which has less complete roots than the type. The type sheet *Wood* 7316 comprises three plants, all in flower; one (upper left) also bears some capsules which appear to have shed their seeds and may well be persistent from the previous season. *Wood* 7066 comprises four plants collected the previous year but at about the same time (11 days earlier) and are all in flower with no seed capsules, which suggests that the actual fruiting period of the species is later than August. The lowest plant on this sheet, immediately left of the field label, is particularly small (only 6.5cm from base to top of uppermost flower) and has shorter leaves with the segments closer together; it appears to be at a relatively young stage of development even though it is in flower.

It gives me considerable pleasure to name this new species after its collector, John R. Ironside Wood, who has collected in Bhutan and elsewhere but who is perhaps best known for his fieldwork on the flora of Yemen, which culminated in the recent publication of his *A Handbook of Yemen Flora* in 1997. Many of his Bhutan collections have turned out to be new records and some, like the two specimens studied here, represent species new to science.

NOTES ON TYPIFICATION AND NOMENCLATURE

Pedicularis sect. **Hyporrhyncholophae** Hurus., J. Jap. Bot. 21: 165 (in clave; Dec. 1947) and J. Jap. Bot. 22: 75 (Jun. 1948, '*Hyporrhyncholophae*'); **P.** sect. **Brachyphyllum** H. L. Li, Proc. Acad. Nat. Sci. Philadelphia 100: 258 (Dec. 1948). *Pedicularis* sect. *Hyporrhyncholophae* Hurus. (type: *P. ikomai* Sasaki, of subsect.

Ikomanae Hurus.: designated by Hurusawa, 1947: 165), and *P. sect. Brachyphyllum* H. L. Li (not typified) both included *P. ser. Lyratae* Maxim. (the type of which is *P. lyrata* Prain: Art. 22.6) and so are at least partly synonymous. *Pedicularis sect. Hyporrhyncholophae* Hurus. was a new name for a group that had previously been designated *P. sect. Bidentatae verticillatae* by Bonati (1910) and Limpricht (1924). This designation, consisting of two words, does not comply with Art. 21.2, and no type for the section was indicated by Bonati. Hurusawa's name first appeared, in December 1947, spelled '*Hyporrhyncholophae*'; in that publication the name appeared in a Latin key to infrageneric taxa and was typified by *P. ikomai* Sasaki, so was validly published (the validating description being in couplet H. 1 of the key, which leads to the name). In 1948, Hurusawa published the name again, using the spelling *Hyporrhyncholophae* and provided a much fuller Latin description (Hurusawa, 1948a) but gave neither an indication of the type nor a reference to the 1947 part of his revision where the name had first appeared. The author's original spelling, *Hyporrhyncholophae*, is used here, both because it was the first used (Art. 60.1) and because it is the more grammatically correct (see Stearn, 1966: 269). Hurusawa's later change to '*Hyporrhyncholophae*' should be regarded as an orthographic or typographical error.

When first described, *P. sect. Brachyphyllum* H. L. Li embraced only two series: *P. ser. Lyratae* Maxim. and *P. ser. Debiles* Prain (to be typified by *P. debilis* Franch.: Art. 22.6). Hurusawa (1948b) had treated *P. ser. Lyratae* as one of six series (arranged in two subsections) of *P. sect. Hyporrhyncholophae* Hurus., namely *P. subsect. Lyratae* (Maxim.) Hurus. *ser. Lyratae* Maxim. *Subsect. Lyratae* comprises two series, *P. ser. Melampyriflorae* Prain and *P. ser. Lyratae* Maxim, neither of which contains the type of the section, *P. ikomai* Sasaki. The other subsection of *P. sect. Hyporrhyncholophae* Hurus., *P. subsect. Ikomanae* Hurus., comprises four series: *P. ser. Superbae* Maxim., *P. ser. Rigidae* Prain, *P. ser. Platyrrhynchae* Maxim. and *P. ser. Ikomanae* Hurus. (the last-named containing the type of the section, *P. ikomai* Sasaki).

Hurusawa (1949) grouped *P. ser. Debiles* (with several other series) in *P. sect. Orthorrhynchae* Prain *subsect. Orthorrhynchae* Prain (as *subsect. 'Euorthorrhynchae'*: incorrectly formed, Art. 21.3). He did not attempt to lectotypify *sect. Orthorrhynchae* Prain and no other lectotypification of that name has been traced. In order to establish the relative nomenclatural status of *P. sect. Brachyphyllum* H. L. Li and *P. sect. Hyporrhyncholophae* Hurus., it is first of all necessary to lectotypify *P. sect. Orthorrhynchae* Prain as it was published much earlier than either of the other names.

Prain (1890) used the name *P. sect. Orthorrhynchae* for a group of 28 species. He divided the section into three subgroups lettered A–C, which correspond to subsections as previously explained:

Pedicularis [*subsect.*] A. *Tenuirostres* Maxim. (to be typified by *P. tenuirostris* Benth. of *ser. Pectinatae*: Art. 22.6), comprising two series:

P. ser. *Pectinatae* Prain (type: *P. pectinata* Wall. [Art. 22.6]), and
P. ser. *Semitortae* Prain (type: *P. semitorta* Maxim. [Art. 22.6]).

Pedicularis [subsect.] B. *Euorthorrhynchae* Prain (no type designated: to be corrected under Art. 21.3 to *P.* subsect. *Orthorrhynchae* Prain), comprising (in order) the following three series:

P. ser. *Brevifoliae* Prain (type: *P. brevifolia* Don [Art. 22.6]),

P. ser. *Graciles* Maxim. with the single species *P. gracilis* Wall. ex Benth., which by applying Art. 22.6 is also to be taken as type of Maximowicz's original, broader, circumscription of ser. *Graciles*, and

P. ser. *Debiles* Prain (type: *P. debilis* Franch. [Art. 22.6]).

Pedicularis [subsect.] C. *Axillares* Maxim. (type: *P. axillaris* Franch. ex Maxim. of *P.* ser. *Longipedes* [Art. 22.6]), with three series:

P. ser. *Longipedes* Prain (type: *P. longipes* Maxim. [Art. 22.6], although its only other species, *P. axillaris*, is the type of subsect. *Axillares*),

P. ser. *Filicifolia* Prain [sic: the adjectival plural *Filicifoliae* is now used; to be typified by its only original species, *P. filicifolia* Hemsl.], and

P. ser. *Flexuosae* Prain (type: *P. flexuosa* Hook.f. [Art. 22.6]).

Hurusawa (1949) divided *P.* sect. *Orthorrhynchae* into two subsections: *P.* subsect. *Euorthorrhynchae* (to be corrected to *P.* subsect. *Orthorrhynchae*: Art. 21.3), with three series (*P.* ser. *Graciles*, *P.* ser. *Brevifoliae* and *P.* ser. *Debiles* – thus corresponding to Prain's 1890 circumscription), and *P.* subsect. *Tenuirostres* (Maxim.) Prain (two series: *P.* ser. *Semitortae* Prain, *P.* ser. *Pectinatae* Prain). Prain's third subsection, *Axillares*, which is ultimately based on *P.* ser. *Axillares* Maxim., was treated by Hurusawa (1949: 111) as *P.* sect. *Axillares* Hurus., with broader circumscription and for which no type was designated. *Pedicularis* ser. *Axillares* Maxim. (Maximowicz, 1888), and other names based on the same type (e.g. *P.* sect. *Axillares* Hurus., even though that was regarded by its author as a new name, not a new combination) are typified (Art. 22.6) by *P. axillaris* Franch. ex Maxim.

Yamazaki (1988: 114), apparently unaware that Prain's epithet *Orthorrhynchae* had already been published at sectional rank, recombined it as '*P.* sect. *Orthorrhynchus* (Prain) T. Yamaz., stat. nov., sensu emend.', changing the orthography by altering the ending to make it a substantive singular (*Orthorrhynchus*) instead of an adjectival plural (*Orthorrhynchae*), even though such a change is not mandatory (see Rec. 21B.1). Yamazaki did not typify sect. *Orthorrhynchus*; nor did either Prain (1890) or Limpricht (1924: 259), both of whose references Yamazaki cited under what he treated as the synonym *P.* §§ *Orthorrhynchae* B. *Euorthorrhynchae* Prain.

In his circumscription of *P.* sect. *Orthorrhynchus*, Yamazaki included three series: *P.* ser. *Pseudasplenifolia* Prain [sic: the adjectival plural form *Pseudasplenifoliae* is now used; Yamazaki (1988: 114) incorrectly altered this to *Pseudo-asplenifoliae*]; *P.* ser. *Remotilobae* P. C. Tsoong ex H. B. Yang (cited as 'Tsoong' as Yamazaki had wrongly assumed Tsoong's series to be validly published; see section headed

'Infrageneric Classification' above); and *P. ser. Debiles* Prain. Of these, the only one that was part of Prain's original concept of *P. sect. Orthorrhynchae* was *P. ser. Debiles*. *Pedicularis ser. Pseudasplenifoliae* was classed by Prain in *P. sect. Rhyncholophae* [subsect.] *D. Hyporthorrhynchae* Prain (Prain, 1890: 83–84), which was raised later to *P. sect. Hyporthorrhynchae* (Prain) Bonati (Bonati, 1910: 26), while *P. ser. Remotilobae* P. C. Tsoong has only recently been validated (Yang Han-bi, 1995).

So that Hurusawa's earlier treatment of *P. sect. Orthorrhynchae* is rendered consistent with Yamazaki's much later one, I here lectotypify *P. sect. Orthorrhynchae* Prain by *P. debilis* Franch. (type of *P. ser. Debiles* Prain). Because Hurusawa had placed *P. ser. Lyratae* in *P. sect. Hyporrhyncholophae* Hurus. and *P. ser. Debiles* in *P. sect. Orthorrhynchae*, *P. sect. Brachyphyllum* H. L. Li, which contained both those series and only those but was not typified, either becomes synonymous with *P. sect. Orthorrhynchae* if *P. ser. Debiles* and its type (*P. debilis* Franch.: Art. 22.6) be taken as its basis, or is liable to be supplanted by the earlier name *P. sect. Hyporrhyncholophae* Hurus. if *P. sect. Brachyphyllum* be both lectotypified by *P. lyrata* Prain, the type of *P. ser. Lyratae* Maxim., and considered a taxonomic synonym of *P. sect. Hyporrhyncholophae*. Taxonomically, *P. sect. Brachyphyllum* is now generally regarded as a separate section distinct from *P. sect. Orthorrhynchae*; thus, to preserve current taxonomy, it is more desirable to typify *P. sect. Brachyphyllum* by *P. lyrata* Maxim. and the name of that species is therefore here designated as its type.

The species of *P. sect. Hyporrhynchophae* Hurus. subsect. *Ikomanae* Hurus. differ from those of subsect. *Lyratae* (Maxim.) Hurus. in several corolla characters, elaborated by Hurusawa (1947) in his key and later in his descriptive account (Hurusawa, 1948b). Most later authorities, including Li (1948b) and Tsoong (1963), consider that these species do not belong to the same section as the species placed in *P. subsect. Lyratae*. Crucially, Tsoong (1963) regarded *P. ser. Ikomanae* Hurus. (the type of which is also the type of *P. sect. Hyporrhyncholophae* Hurus.) as belonging to 'grex *Sigmantha* subgrex *Rigiocaulus*' (in which Tsoong also grouped *P. ser. Rigidae*), while he placed both *P. ser. Lyratae* and *P. ser. Debiles* in 'grex *Brachyphyllum* subgrex *Brachyphyllum*'. Thus, although the infrageneric names were not valid, it demonstrates that *P. sect. Brachyphyllum* H. L. Li may be maintained as a section distinct from *P. sect. Hyporrhyncholophae* Hurus. because the types of the two names were by him considered to belong to different infrageneric groups.

Pedicularis aurata (Bonati) H. L. Li, Proc. Acad. Nat. Sci. Philad. 101: 152 (1949), emend. R. R. Mill (hoc loco).

Basionym: *Phtheirospermum auratum* Bonati, Notes Roy. Bot. Gard. Edinburgh 13: 105 (1921). Lectotype designated here: *G. Forrest* 12873 p.p. (E, sheet with red-printed label 'Type Specimen', left-hand plant). Isolectotype: 'duplicate' sheet of *Forrest* 12873, p.p. (E; the isolectotype is the large plant directly above the field label and numbered '1'). See notes below, followed by an emended description.

The type material of the name *Phtheirospermum auratum* (Forrest 12873 from the mountains of the Chungtien plateau, Yunnan, 12,000ft, vii 1914, E) has been re-examined. There are two sheets of this number. One, which is labelled 'Type Specimen', has fixed to the sheet a printed copy of the protologue, taken from Bonati's publication (cited above). This sheet also bears Li's *determinavit* slip dated January 1946, '*Pedicularis aurata* (Bonati) comb. nov.' and an annotation slip by P. C. Tsoong dated 1959. The other sheet of Forrest 12873 bears much less information on the label, which is not in Forrest's handwriting. This latter specimen bears no evidence of having been seen by Bonati; nor was it apparently seen by either H. L. Li or P. C. Tsoong, both of whose *determinavit* slips are on the original type specimen.

Unfortunately, examination of the sheet labelled 'Type Specimen' has revealed it to be a mixed gathering, of *P. aurata* and *P. aloensis* Hand.-Mazz. This was first noted by Tsoong (in sched.), whose annotation slip reads as follows: "The right-hand plant seems to differ from the left-hand one in dark-coloured calyx, much longer and narrower corolla. It may be a different species being mixed together". I have reached the same conclusion and have determined the right-hand plant as *P. aloensis* Hand.-Mazz.

Bonati's original description was based on both elements of the mixed gathering and hence is also confused. In such cases, Art. 9.12 dictates that the name remains attached to the element that corresponds most nearly with the original description or diagnosis. Comparison of both elements with the description reveals that, although some characters such as subsessile or sessile upper flowers, and cucullate middle lobe of the corolla, have obviously been derived from the right-hand plant, the majority (when not common to both species) apply to the left-hand plant and not to the other. Moreover, only the left-hand plant is in fruit, so it must have been used to describe the capsules and seeds. Accordingly, the *left-hand plant* of the type sheet of Forrest 12873 (E) is here designated *lectotype* of the name *Phtheirospermum auratum* Bonati and consequently also of the combination *Pedicularis aurata* (Bonati) H. L. Li.

The second sheet is also a mixed gathering. There are four separate plants mounted on the sheet, which I have numbered 1–4. Only one of these can be definitely assigned to *P. aurata*, namely the largest plant mounted directly above the label and by me given the number '1'. This plant has the light-coloured calyces typical of the species, and is here designated *isolectotype*. The other three plants are similar to the *right-hand* plant on the sheet bearing the lectotype (i.e. the left-hand plant thereof, as designated above), and so are likewise referable to *P. aloensis*. The following emended description of *P. aurata* is provided here, based on the lectotype and *isolectotype* only.

Perennial. *Stems* 32–39cm, 2mm thick below and c.1mm thick above, subglabrous below (very sparsely patent-pilose), sparsely patent-villous in middle part with hairs mainly in channels between glabrous ribs, patent-pilose in inflorescence with long

gland-tipped hairs 0.5–0.7mm. *Leaves* opposite; petioles of lower ones 30–40mm, of upper 10–20mm; lamina of lower leaves ovate in outline with the lowest pair of segments $1.5 \times$ as long as the next highest pair, segments of lower leaves c.7 pairs, markedly decreasing in size upwards, all sessile or lowest pair scarcely petiolulate, contiguous with narrowly green-winged rachis which is not dilated below lobe-pairs, elliptic to oblong, lowest c.20 \times 6mm, all pinnatisect or deeply pinnatifid with 6–7 pairs of doubly acute-serrate segments, very sparsely pubescent above, sparsely pilose beneath mainly on midrib. *Inflorescence* a well-differentiated terminal raceme of 6–10 distant, opposite pairs of flowers. *Pedicels* c.2mm in flower, 3–4mm in fruit, erect and closely parallel to axis, shortly pilose in a line on adaxial side otherwise glabrous. *Petioles of lower bracts* c.5mm, of upper 3–5mm, all c.1.5–3 times longer than pedicels; *lamina of lower bracts* ovate-oblong, c.8 \times 4mm, pinnatifid with 3–4 pairs of segments; *lamina of upper bracts* suborbicular, 3-lobed with incised-dentate margins (sometimes thus appearing 5-lobed). *Calyx* rather broadly infundibular, 3.0–3.2mm long, c.2.5mm across at top, pale green or straw-coloured and shining even in flower, 2 teeth with dark reddish-purple streak extending to near middle of tube; split on anterior side, teeth 5, deltoid-lanceolate, acute but tips not recurved, c.0.7mm, ciliate (cilia numerous), tube subglabrous. *Corolla* yellowish-white (when dry), 10–12mm, erecto-patent with respect to axis (c 45°); *tube* c.2mm and thus subequalling or slightly shorter than calyx; *galea* 8–10mm, erect with dorsal side gently but distinctly curved, shortly pubescent dorsally; *lower lip* 4.5–5.5mm, suberect with short, decurved 3-lobed tip, lobes sparsely ciliate, middle one suborbicular and with 3 minute teeth at tip, laterals oblong, slightly narrower, with a single tooth. *Stamens* inserted near base of corolla; *anterior filaments* sparsely short-pilose, *posterior filaments* glabrous; *anthers* c.2 \times 1.3mm, thecae short-subulate at base (tails c.0.2mm). *Capsule* 10 \times 3.5mm, erecto-patent, obliquely lanceolate-ellipsoid, with a shoulder on adaxial side, attenuate into a subulate tip, glabrous and shining. *Seeds* 2mm, ovate with truncate base, testa yellowish, striate and obscurely reticulate.

Pedicularis bella Hook.f., Fl. Brit. India 4: 313 (1884).

Type: SIKKIM. Kongra Lama, 16,000ft, 24 ix[?] 1849, *J. D. Hooker* s.n. (Herb. Ind. Or. Hook. fil. & Thomson, *Pedicularis* no. 22) (holo. K).

Only this specimen was cited in Hooker's protologue and therefore it must be regarded as holotype. The month of collection is not clearly legible. The number *Pedicularis* 22 (which should not be regarded as a collector's number) was also used for a specimen from Sikkim, Samdong, 16,000ft, 11 ix 1849, *Hooker* (K). Both collections are referable to *P. bella*; each consists of several flowering plants and one fruiting plant.

Pedicularis clarkei Hook.f., Fl. Brit. India 4: 310 (1884).

Lectotype designated here: SIKKIM. Jongri, 12,000ft, 15 x 1875, *C. B. Clarke* 25935 (lecto. K).

The name is based on four elements conserved at K: Clarke's specimen cited above, and three others all collected previously by J. D. Hooker and collectively given the number 'Herb. Ind. Or. Hook.f. & Thoms. *Pedicularis* no. 28'. Two of these latter were collected from Yeumtang (2 and 6 ix 1849) and the third from Jongri (23 vii 1849); all were cited in synonymy by Hooker (loc. cit.). Clarke 25935 is already regarded as the *de facto* type by the Kew Herbarium by virtue of it being conserved in a type cover (whereas the Hooker specimens are not), but no formal lectotypification has apparently been made previously.

Pedicularis confertiflora Prain, J. Asiat. Soc. Bengal 58 (2): 258 (1889) & Ann. Roy. Bot. Gard. (Calcutta) 3: 142, t. 27 A-D (1890).

Syn.: *P. brevifolia* sensu Hook.f., Fl. Brit. Ind. 4: 307 (1884) p.p. quoad pl. sikkim., non D. Don (1825).

Pedicularis brevifolia D. Don is confined to the West Himalaya; J. D. Hooker misapplied the name to plants from Sikkim. His collections (Lachen, 13,000ft, 'fl. blood red', 14(?) vii 1849, K; Lachen, 13,000ft, 15 vii 1849, K; Yeumtong, 14,000ft, 6 ix 1849, K; Kangar Lama, 14,000ft, 14 vii 1849, K) are a mixture of no less than six different taxa, as noted by Tsoong on determinavit slips dated 1949: *P. confertiflora* Prain, *P. flexuosa* Prain, *P. heydei* Prain, *P. instar* Prain var. *paradoxa* Prain, *P. schizorrhyncha* Prain and *P. roylei* Maxim. The specimens of *P. confertiflora*, lettered A by Tsoong on one of the sheets and D on the other, constitute part of the type material of *P. confertiflora* Prain. (The other element of *P. confertiflora* was collected in Chumbi and Phari by King's collector; it does not seem to be represented at K and is presumably at CAL, where Prain was based before he began work at Kew). Unfortunately it is impossible, as is often the case with Hooker's mixed gatherings, to associate particular plants with particular field labels and so it is impossible to deduce where exactly in Sikkim this syntype of *P. confertiflora* was collected. However, *P. confertiflora* 'A' and 'D' are homogeneous. Tsoong unfortunately did not use the same letters to denote the same species on each sheet: 'A' on the sheet where 'D' is *P. confertiflora* refers to *P. roylei* while 'D' on the sheet on which 'A' refers to *P. confertiflora* is *P. instar* var. *paradoxa*.

Pedicularis elwesii Hook.f., Fl. Brit. Ind. 4: 312 (1884).

Lectotype designated here: SIKKIM. Lachen, 12,000–14,000ft, 15 vii 1849, J. D. Hooker s.n. (K; isolecto. BM).

Hooker (*Fl. Brit. Ind.* 4: 312, 1884) based his name *P. elwesii* upon material from the Lachen Valley in Sikkim collected by himself (cited first) and Elwes. It was also equated with 'Pedicularis no. 24' of the *Herb. Ind. Or. Hooker fil. & Thomson* collection.

There are two sheets in the type cover at K: the *Hooker* specimen (with field ticket in his handwriting giving locality and date) cited above, consisting of two plants and three other stems, all in flower, and a second sheet on which are mounted two

different specimens. One of the latter is Mr Elwes' specimen which inspired Hooker's choice of epithet; it was collected in 'Alpine Sikkim' and communicated to Hooker in March 1877. The other specimen mounted with the Elwes collection was collected in fruit by Gammie in 1892, several years after the name had been published; thus it is not type material. As Elwes' specimen is incomplete (comprising only part of one flowering stem and a separate basal leaf) and it does not seem to be duplicated elsewhere (whereas Hooker's '*Pedicularis* no. 24' is also duplicated at BM), I designate the more complete and better annotated collection of Hooker as lectotype. Another unlocalized Hooker collection at K, which also bears the number '*Pedicularis* no. 24', cannot be regarded as part of the lectotype (Art. 9.2).

Pedicularis excelsa Hook.f., Fl. Brit. Ind. 4: 311 (1884).

Type: SIKKIM. Yeumtong, 12,000ft, ix 1849, *J. D. Hooker & Thomson, Pedicularis* no. 27 (K, specimen with handwritten Hooker label giving locality, altitude and date as indicated).

Hooker gave a precise type locality in *Flora of British India*: 'Yeumtong, in the Lachen Valley, 12000ft', and the number '*Pedicularis* no. 27'. The specimen bearing Hooker's handwritten label corresponding to the locality and altitude must therefore be regarded as the holotype. Two other sheets, one of them a truly magnificent specimen, are also numbered *Pedicularis* no. 27 but are unlocalized; because the numbered, unnamed collections in the Hooker & Thomson *Herb. Ind. Or.* collection are sometimes from more than one locality, there is no definite proof that they also represent type material.

Pedicularis gammieana Prain, J. Asiat. Soc. Bengal 68 (2, no. 3): 260 (1889).

Type: INDIA (SIKKIM). 'Eastern Himalaya: Lang-mang-nang-zo, 10,000 feet, *Pantling*' (iso. K).

This species was described by Prain (1889) on the basis of a single *Pantling* collection from Sikkim, cited above. A fuller description and illustration of the species were given in his monograph (Prain, 1890: 162, pl. 22C f. 16–20). Later, Prain (1903: 22) synonymized the name with *P. flagellaris* Benth., which was based on a specimen from 'Assam' (*Griffith* 3940, K; more likely to have been collected in Arunachal Pradesh than modern Assam). In his 1890 monograph, Prain had treated *P. flagellaris* as a member of ser. *Microphyllae*, whereas *P. gammieana* was placed in ser. *Pseudocaespitosae* Prain; these two series were far removed from each other in Prain's sequence (the latter is now considered synonymous with *P. ser. Pseudasplenifoliae* Prain: Yang Han-bi *et al.*, 1998). Prain's later decision to synonymize the two species does not seem justified. The types of both names have been examined. *Pedicularis gammieana* differs by its corolla with long beak and longer, lanate stem indumentum, and other characters. The two species are here maintained as distinct, one (*P. gammieana*) being a Sikkim endemic. *Pedicularis flagellaris* might possibly be expected to occur in extreme SE Bhutan where it borders on Arunachal Pradesh; both regions are poorly botanized.

Pedicularis lachnoglossa Hook.f., Fl. Brit. India 4: 311 (1884).

Lectotype designated here: SIKKIM. Lachen Valley, alt. 14,000ft, [15 vii 1849], *J. D. Hooker* numbered '*Pedicularis* no. 32' (lecto. K, specimen with handwritten ticket; isolecto. BM).

Hooker (1884, 4: 311) based *P. lachnoglossa* on *Pedicularis* no. 32 of the Hooker & Thomson collection and cited one gathering only, collected by Hooker from 'Sikkim Himalaya: Lachen Valley, alt. 14,000ft'. There are two sheets at K that are labelled '*Pedicularis* no. 32'. Of these, the one bearing Hooker's handwritten ticket giving locality and date is here selected as the lectotype. An identically labelled sheet at BM is designated isolectotype. Li (1949: 77) stated that he did not examine this material for his revision and there is no evidence on the sheets that he saw either of them subsequently.

Pedicularis megalantha D. Don, Prodr. Fl. Nepal 94 (1825).

Lectotype designated here: Hab. in Gosaingthan Nepaliae, *Wallich* 411/1 (lecto. K).

There are two distinct collections numbered *Wallich* 411, here referred to as 411/1 and 411/2. Don (loc. cit.) only cited the Nepal collection (411/1) and thus it must be regarded as the type. The whereabouts of the material Don actually examined are not known with certainty. *Wallich* 411/2 is from Kumaon, NW India and is excluded. Pennell (1943) also seemed to exclude this element but did not explicitly designate *Wallich* 411/1 as lectotype, as is done here. Yamasaki (1982) also indicated that the type was from C Nepal but their text is insufficiently precise to constitute a lectotypification.

Clarke's manuscript 'name', '*P. fenestrata*', appears on the label of a specimen from Darjeeling (Singalelah, 11,000ft, 7 x 1870, *Clarke* 12571, K) but it does not seem ever to have been validly published. However, the specimen to which it refers is mentioned implicitly in a comment by Hooker in *Fl. Brit. India* 4: 306 (1884), under *P. robusta*: "Clarke collected on Singalelah, in Sikkim, alt. 11,000ft, a plant with the habit of this, but in fruit only, with straight oblong-lanceolate acuminate capsules 1in. long, and seeds nearly 1/6in. long, striate and punctulate". This note is linked to an annotation on the specimen: "See at end of *P. robusta*, Fl. Ind." in what looks like Prain's writing. Hooker was clearly aware that the capsules and seeds of Clarke's plant differed from those of *P. robusta* (for which he described them as "2/3in. long, broadly oblong, tip rounded with a lateral point; seeds 1/10in. long, subellipsoid, subacute, finely striate, not punctulate, pale"). However, he did not consider that the plant could belong to another species. Comparison of '*P. fenestrata*' with fruiting material of *P. megalantha* shows that they are a perfect match and Clarke's manuscript name should therefore be considered as referring to *P. megalantha*. From a second annotation on the sheet it is clear that Prain came to the same conclusion.

Pedicularis megalochila H. L. Li, *Taiwania* 1: 91, t. 1 f. 7 (1948) forma ***rhodantha*** P. C. Tsoong, *Acta Phytotax. Sin.* 18: 279 & 320 (Jan. 1955) & *Bull. Brit. Mus. (Nat. Hist.)*, Bot. 2: 8 (Nov. 1955).

Lectotype designated here: BHUTAN. Me La, 14,000ft, 6 viii 1933, *Ludlow & Sherriff* 425 (BM).

The original material (all BM) of Tsoong's forma *rhodantha* comprised numerous syntypes from Bhutan and six syntypes from SE Tibet. Of these, all the Bhutan syntypes except *Ludlow & Sherriff* 425 were determined by Tsoong in 1950 while the Tibetan ones and *Ludlow & Sherriff* 425 (Bhutan) were determined by him in 1949. The Bhutanese sheet of the earlier batch of determinations has here been chosen as the lectotype.

Pedicularis microcalyx Hook.f., *Fl. Brit. India* 4: 315 (1884).

Lectotype designated here: SIKKIM. Lachen, 12,000ft, 20 vi 1849, *J. D. Hooker* (lecto. K, being part of *Herb. Ind. Or. Hook. fil. & Thomson 'Pedicularis no. 25'*).

The K representation of '*Pedicularis no. 25*' of the Hooker & Thomson collection comprises four specimens: the lectotype here designated; two other specimens from Lachen (14,000ft, 15 vii 1849, one with note, 'corolla dirty pink') and one from Samdong (16,000ft, 11 ix 1849). Hooker's protologue reads: 'Alpine Sikkim Himalaya: Lachen and Samdong, alt. 12–15,000ft, J. D. H.'. The Samdong specimen was actually said to have been collected at 16,000ft, outside the range given by Hooker (probably an error in the *Flora*, or else the value in the *Flora* is the result of subsequent re-calibration of Hooker's field altitude reading: Springate, personal communication, 2000), and is in fruit. There is little to choose between the three Lachen specimens but the one selected as lectotype was the first to be discovered and also best shows the characteristic very small calyx which gives the species its epithet.

Pedicularis pantlingii Prain, *J. Asiat. Soc. Bengal* 58 (2): 273 (1889) & *Ann. Roy. Bot. Gard. (Calcutta)* 3: 148, t. 16B (1890).

Lectotype designated here: SIKKIM. Lachen, 13 vi 1849, corolla red purple, *Hooker* (K, *Herb. Ind. Or. Hook. fil. & Thomson 'Pedicularis no. 30'*), also lectotype (chosen here) of *P. furfuracea* Wall. ex Benth. var. *integrifolia* Hook.f., *Fl. Brit. India* 4: 316 (1884) (non *P. integrifolia* Hook.f., op. cit. 4: 308, 1884).

The name *P. pantlingii* Prain is ultimately based on *P. furfuracea* var. *integrifolia* Hook.f., *Fl. Brit. India* 4: 316 (1884) which was cited as the only synonym by Prain (1889). There being already *P. integrifolia* Hook.f., Prain's name represents a *nomen novum* for *P. furfuracea* var. *integrifolia*. The latter name was based on *Pedicularis no. 30* from 'Sikkim, 9–10,000ft' in the Hooker & Thomson series. Two specimens labelled *Pedicularis no. 30* are present at K; one is otherwise unlabelled, while the other bears Hooker's field label 'Lachen, 11,000ft, June 13 1849, corolla fl. red purple' and it is accordingly here chosen as lectotype of the variety.

Pedicularis scullyana Prain ex Maxim., Bull. Acad. Imp. Sci. Saint-Petersbourg sér. 3, 32: 529 (1888); cf. also Prain, J. Asiat. Soc. Bengal 58: 269 (1889); Prain, J. Linn. Soc. 26: 268 (1890) & Ann. Roy. Bot. Gard. (Calcutta) 3: 127 (1894).

Type: SIKKIM. Jongri, Pey-kiang-la, *King's collectors* (holo. CAL–n.v.).

There is at K a specimen of *P. scullyana*, long thought to be the type, which is labelled 'Central Nipal. Comm. J. Scully, Esq., Sept. 1880'. It bears a note in Clarke's writing dated September 1893: 'Pedicularis Scullyana Prain *vide* Prain'. Unfortunately, by a quirk of fate, this specimen is *not* type material even though Prain named the species after Scully and probably intended it to be the type of the name, and although it was one of three specimens cited by him (Prain, 1889: 269; see above), namely 'Nepal (Wallich! Scully!; Jongri, (Dr. King's collectors!)'. However, Prain's name first appeared in an earlier publication by Maximowicz (1888: 529; see above) and there only the Jongri specimen was cited. Thus that specimen, cited by Maximowicz as 'Tongri ad Pey-kiang-là (herb. Calcutt.!)', 'Tongri' being a misreading of (or misprint for) Jongri, must be regarded as the holotype. Hence, neither Scully's specimen nor the Wallich gathering also cited by Prain have any nomenclatural or type standing whatever.

Pedicularis pennelliana P. C. Tsoong, Acta Phytotax. Sin. 3: 307 (Jan. 1955).

The nomenclature of the taxon known as *P. brunoniana* Wall. ex Pennell or *P. pennelliana* P. C. Tsoong at species rank, and *P. gracilis* subsp. *stricta* (Prain) P. C. Tsoong at infraspecific rank, has become very tangled. Briefly the sequence of events and their consequences are as follows:

1. Wallich (1829) recognized three taxa at species rank within *P. gracilis* sensu lato: *P. gracilis* sensu stricto, for *Wallich* Numer. List. 413; *P. stricta* Wall., for *Wallich* Numer. List. 414; *P. brunoniana* Wall., for *Wallich* Numer. List. 422. All these were at that time nomina nuda.
2. Bentham (1835) validly published *P. gracilis* Wall. ex Benth. based on several syntypes, including *Wallich* 413.
3. Prain (1890: 137–140) monographed *P. gracilis* recognizing three varieties: var. *typica*, var. *macrocarpa* Prain and var. *khasiana* Prain. (The last-named is not relevant to this discussion.) Var. *typica* included *Wallich* 413 and is correctly called, at that rank, var. *gracilis*. Within it, Prain reduced *P. stricta* Wall. (no. 414) and *P. brunoniana* Wall. (no. 422) to synonymy. However, within it he treated three forms, called by him forma "vera", forma "stricta" and forma "prostrata" (the quotation marks being part of his typography). Two of these forms (f. *vera* and f. *stricta* Prain) were provided with validating descriptions (p. 140) but f. "prostrata" was not formally described. Forma *vera* included *Wallich* 413 and is correctly f. *gracilis* (Arts. 24.3, 26.2); it was regarded as being fairly local and NW Himalayan. Forma *stricta* was based on *Wallich* 414 and its

name is therefore *P. gracilis* var. *gracilis* f. *stricta* [Wall. ex] Prain. Forma *prostrata* Prain (nom. inval.: Art. 37) was used for *Wallich* 422 which was also the original specimen of Wallich's nomen nudum, *P. brunoniana*. Var. *macrocarpa* Prain was based on six syntypes from the eastern Himalayas. Pennell (1943: 129) selected *Clarke* 12732 as lectotype. The nomenclature of this variety is relatively uncontroversial; it was raised to subspecific rank as *P. gracilis* subsp. *macrocarpa* (Prain) P. C. Tsoong, which name is used in *Flora of Bhutan*. The nomenclatural problems surround the taxon called *P. brunoniana* or *P. gracilis* subsp. *stricta*.

4. Pennell (1943: 128) validly published the name *P. brunoniana* Wall. ex Pennell. Within it he recognized two subspecies: *P. brunoniana* subsp. *ctenodonta* Pennell based on a single specimen (*Koelz* 10180: holo. US, iso. hb. Gordon College, now RAW) from the Kukti Pass; and *P. brunoniana* subsp. *typica* (correctly subsp. *brunoniana*: Arts. 24.3 and 26.2). This had three synonyms: *P. brunoniana* Wall., nom. nud. based on *Wallich* 422; *P. gracilis typica* f. *prostrata* Prain (inval.); and *P. gracilis* [subsp.] *macrocarpa* (Prain) Pennell (which Pennell referred to as '*P. gracilis macrocarpa* Prain'). Pennell lectotypified *P. brunoniana* by *Wallich* 422 (CAL).
5. Tsoong (1955a: 307–308) revised *P. gracilis* s.l. recognizing two species and three subspecies:
 - i. *P. gracilis* subsp. *genuina* P. C. Tsoong (i.e. subsp. *gracilis*: Arts. 24.3 and 26.2).
 - ii. *P. gracilis* subsp. *stricta* (Prain) P. C. Tsoong which included *P. stricta* Wall. (no. 414; nom. inval.), *P. gracilis* var. *typica* f. *stricta* Prain as well as f. *prostrata* Prain and f. *vera* Prain p.p. excluding *Wallich* 413, and *P. brunoniana* Wall. (no. 422). Tsoong provided no description; however, *P. gracilis* f. *stricta* Prain was validly described (Prain, op. cit. 140) and thus Tsoong's subspecific name is also valid. Within it, however, Tsoong also included the lectotype of *P. brunoniana* Wall. ex Pennell, yet he explicitly considered Pennell's concept of *P. brunoniana* to be different from that of Wallich (see below, under *P. pennelliana*).
 - iii. *P. gracilis* subsp. *macrocarpa* (Prain) P. C. Tsoong.
 - iv. *P. pennelliana* P. C. Tsoong, for *P. brunoniana* Pennell (1943) non Wall. and excluding the synonyms listed by Pennell (all of which Tsoong included under his subsp. *stricta*). *Pedicularis pennelliana* P. C. Tsoong had two subspecies: subsp. *genuina* P. C. Tsoong (correctly, subsp. *pennelliana*: Arts. 24.3 and 26.2) with the synonym *P. brunoniana* subsp. *typica* Pennell (i.e. subsp. *brunoniana*), and *P. pennelliana* subsp. *ctenodonta* P. C. Tsoong. The latter subspecies was also stated by Tsoong to be based on *P. brunoniana* subsp. *typica* Pennell, rather than, as one would have imagined, *P. brunoniana* subsp. *ctenodonta* Pennell. (A misprint is suspected here but, as it stands, the citation of subsp. *typica* invalidates Tsoong's combination subsp. *ctenodonta* (Pennell) P. C. Tsoong, which becomes a superfluous synonym of subsp. *pennelliana*, although that was presumably not Tsoong's intention.)

Tsoong considered that *Wallich* 422, the lectotype selected by Pennell for *P. brunoniana* Pennell, represented *P. gracilis* subsp. *stricta*, whereas Pennell had equated it with what Tsoong called subsp. *macrocarpa*. Tsoong's exclusion of *Wallich* 422 from *P. brunoniana* leaves *P. pennelliana* (Tsoong's nomen novum for *P. brunoniana* [sensu] Pennell) without a type and hence, if it is to be regarded as a distinct species, it needs to be typified, presumably by one of the other specimens that Pennell cited under *P. brunoniana*. Until the *P. gracilis* complex is thoroughly revised over its whole range, however, it seems best to regard *P. pennelliana* as a superfluous, invalid name for *P. brunoniana* Pennell, or for *P. gracilis* subsp. *macrocarpa* (Prain) P. C. Tsoong if that species is treated as a subspecies of *P. gracilis*.

Pedicularis sikkimensis Bonati ex W. W. Sm., Rec. Bot. Surv. India 4: 401 (1913) and ***P. ser. Sikkimenses*** P. C. Tsoong ex H. B. Yang, Acta Phytotax. Sin. 33: 248 (1995).

Pedicularis sikkimensis Bonati ex W. W. Sm. is validly published, although it is predated by a homonymous manuscript name of C.B. Clarke ('*P. sikkimensis*' Clarke in sched.: Clarke 25850B, a sheet of *P. flexuosa* Hook.f.).

Tsoong (1956a, 1963) proposed, but did not validly publish, '*P. ser. Sikkimenses* P. C. Tsoong'. As originally conceived by him (Tsoong, 1956a: 47, invalidly published as a *nomen nudum*) this series included three species: *P. sikkimensis* Bonati ex W. W. Sm. and two Chinese endemics, *P. atuntsiensis* Bonati (NW Yunnan) and *P. elliotii* P. C. Tsoong (SE Xizang). Had Tsoong validly published this series name, application of what is now Art. 22.6 would have typified it by *P. sikkimensis* even if no type had been designated at the time. However, *P. ser. Sikkimenses* was only validated, by Yang Han-bi, as recently as 1995 (Yang Han-bi, 1995: 248). In her publication, she explicitly designated *P. elliotii* as type of the series and therefore Art. 22.6 cannot be applied to typify the series by *P. sikkimensis* which in any case she did not include in it. The most recent classification to have treated *P. sikkimensis* is that of Yamazaki (1988), who placed it in *P. ser. Asplenifoliae* Prain although, to key it out as a member of that series, he had to add a note in the couplet to the effect that the very long corolla tube of *P. sikkimensis* was an exception to the characters given. The leaf arrangement of *P. sikkimensis* is rather difficult to determine and it seems that Yamazaki misinterpreted it as primarily alternate but 'frequently subopposite', and thus included it in group *Allophyllum*. Bonati's protologue, however, described it as principally opposite with some leaves alternate, with the flowers also oppositely arranged (not alternate), which would place it in group *Cyclophyllum*. Bonati did not assign *P. sikkimensis* to a series, but noted that it was very close to *P. flexuosa* in having 2 villous filaments, a glabrous [lower] lip and toothed calyx lobes but was easily distinguished from that species by its rhizome; he also noted similarities in leaf form to *P. albiflora* and *P. gammieana*. These latter two species belong respectively to *P. ser. Asplenifoliae* (an alternate-leaved group) and *P. ser. Pseudasplenifoliae* Prain (an opposite-leaved one). Opposite or whorled

versus alternate leaves and flowers have been used by most workers including Yamazaki as the first dichotomy to separate major groups within *Pedicularis*. Therefore, Yamazaki's interpretation led to *P. sikkimensis* being grouped in *P. ser. Asplenifoliae* in his Nepal revision. The species was not treated in *Flora of China* (Yang Han-bi *et al.*, 1998). However, using the key to series in that Flora, and treating the leaf and flower arrangement as opposite, *P. sikkimensis* keys out easily to *P. ser. Sikkimenses*. Therefore, I uphold Tsoong's original intention of removing *P. sikkimensis* from *P. ser. Asplenifoliae* (in which it is anomalous, as Yamazaki noted, in its very long corolla tube) to *P. ser. Sikkimenses* P. C. Tsoong ex H. B. Yang along with the two Chinese species included in the series by Yang Han-bi (1995).

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