

A study of some Chinese *Plagiochila* species (Plagiochilaceae, Hepaticae)

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Descriptions, illustrations and distinctive characters based on type specimens are provided for eleven poorly known *Plagiochila* species from China: *Plagiochila biondiana* Steph., *P. debilis* Mitt., *P. delavayi* Steph., *P. deterrmii* Steph., *P. hamulispina* Herz., *P. hokinensis* Steph., *P. maireana* Steph., *P. perserrata* Herz., *P. sikutzuisana* Mass., *P. torquescens* Herz., and *P. wilsoniana* Steph. Their taxonomy and distribution are discussed.

Key words: China, descriptions, Hepaticae, Himalayas, illustrations, *Plagiochila*, taxonomy

INTRODUCTION

According to Piippo (1990), 76 species of *Plagiochila* are known from China. Most of the taxa and their distribution in China are poorly known, and no modern revision has been published. Only Taiwan is fairly well known and has been studied by Horikawa (1934), Hattori (1942, 1944, 1951), Herzog and Noguchi (1955), Shin (1968, 1970), and Yamada *et al.* (1981, 1986), and especially by Inoue (1958ab, 1959, 1961, 1962, 1965, 1968, 1971, 1982b, 1984). From mainland China and Hainan there are not many studies except Herzog (1930), Massalongo (1897), Stephani (1894, 1903, 1918, 1921, 1922), Levier (1906), Carl (1931), Inoue (1962, 1963, 1981, 1982a), and Chen and Wu (1979). Most taxa are only mentioned or given in lists and floras (Chen 1962, Chen & Wu 1965, Lin 1978, Gao & Zhang 1981, Hu & Wang 1981, Lin *et al.* 1982, 1990, Koponen *et al.* 1983, Wu *et al.* 1983, Aur & Zhang 1985, Li *et al.* 1985, 1986,

Li & Gao 1986, Luo 1986, Anonymous 1987, Guo *et al.* 1988, Xu 1989, So 1995, 1996, Piippo *et al.* 1997). The Himalayan area, Nepal, Sikkim, and Bhutan have been studied and some remarks from China have been presented in those works (Inoue 1960, 1965, 1987, Grolle 1964, 1966, Hattori 1971, 1975, Long 1979, Long & Grolle 1990).

In the present paper, 11 poorly known species of *Plagiochila* are described and illustrated. None of these species has been properly illustrated previously. Herzog (1930) provided descriptions for his own new taxa. Most of the species studied are known from Shaanxi, Yunnan, and Sichuan; some have wider ranges extending to Hubei, Taiwan, and Xizang. *Plagiochila biondiana* Mass., *P. hamulispina* Herz., *P. hokinensis* Steph., *P. maireana* Steph., *P. sikutzuisana* Mass., and *P. wilsoniana* Steph. are restricted to China, but *P. debilis* Mitt., *P. delavayi* Steph., *P. deterrmii* Steph. (also from Thailand), *P. perserrata* Herz., and *P. torquescens* Herz. are known also from the Himalayas outside China.

Plagiochila biondiana Mass. (Fig. 1a–d)

Mem. Accad. Agr. Art. Verona, Ser. 3, 73: 15. 1897. — Type: China. China interior, prov. Schen-si, sept. in cacumine Thae-pei-san, miserrime inter lichenes, 1894 *Giraldi*, det. Massalongo 34 (G!).

Plants fairly rigid, to 5 cm long and to 1.2 mm wide on main shoots, grayish olive brown when dry, erect or obliquely arising from substrate. Stem brownish. Branches very few, lateral-intercalary, often with reduced stolon-like leaves. Leaves on leading stem clasping, ventrally secund, imbricate, suborbicular, 1.0–1.1 mm long and 0.8–1.0 mm wide, obliquely spreading; branch leaves often smaller. Dorsal leaf margin somewhat arched, long decurrent, revolute; ventral margin somewhat arched, base dilated; apex rounded; teeth 6–12, or margins only crenulate or teeth absent, teeth 1–2 cells long and 1 cell wide at base, 8–13 μm long and wide. Apical cells 8–13 μm long and wide, cells of middle portion of leaves 8–18 μm long and 8–19 μm wide, at base 18–30 μm long and 11–15 μm wide, not differentiated as vitta; cells thin- to somewhat thick-walled, trigones absent, cuticle slightly verrucose. Underleaves absent. Asexual reproduction not present. Androecia and gynoecia not present.

Illustration: Massalongo 1897: Tav. I (fig. II).

Characteristic for *Plagiochila biondiana* are: 1) fairly long shoots, 2) branches often with reduced leaves, 3) leaves clasping and secund, 4) leaves suborbicular, 5) margins toothed with small teeth or only crenulate, 6) leaf cells small and trigones absent, and 7) basal cells not differentiated as vitta.

Plagiochila biondiana and *P. delavayi* are somewhat similar to each other (see the discussion under the latter species). Inoue (1965) placed *P. biondiana* together with *P. sikutzuisana*, *P. recurvata* (Nicholson) Grolle, *P. duthiana* Steph., and *P. poeltii* Inoue & Grolle in section *Poeltiae* Inoue. The section is characterized by usually a simple stem, reniform or suborbicular leaves with a long decurrent dorsal margin, absence of vitta at leaf base, cyathiform perianth, and branches intercalary and often stolon-like (Inoue 1965). For characters to distinguish the species from *P. wangii* Inoue, see Inoue (1962).

Total range: Shaanxi (China; Piippo 1990).

Plagiochila debilis Mitt. (Fig. 2a–d)

J. Proc. Linn. Soc. London 5: 97. 1861. — Type: India. Sikkim, Singalilah, 11 000 ft., *Hooker 1260* (NY, lectotype, not seen).

Plagiochila capillaris Schifffn. ex Steph., Spec. Hep. 6: 137. 1918. — Type: India. Sikkim-Himalaya, prope Kurseong, 5 500 p., 1899, *Decoly & Schaul* (G!). — Synonymized by Inoue (1965).

Plants filiform, to 4 cm long and to 2 mm wide on main shoots, yellowish brown or grayish olive brown when dry, erect or obliquely arising from substrate. Stem brown or yellowish brown at shoot apices. Branches fairly numerous, terminal and of *Frullania* type, sometimes lateral-intercalary. Leaves on leading stem distant, oblong-ovate, 0.7–0.9 mm long and 0.2–0.4 mm wide, not narrowing toward apex, obliquely spreading; branch leaves may be reduced. Dorsal leaf margin nearly straight, decurrent; ventral margin almost straight to arched, slightly decurrent, base not dilated; apex acute with teeth; teeth 5–8, 1–2 large apical teeth (= bilobed to 2/5 of leaf length), apical teeth to 12 cells long and to 7 cells wide at base, triangularly acute, other teeth 1–6 cells long and 1–4 cells wide at base, triangularly acuminate, tooth cells 15–35 μm long and 6–15 μm wide. Apical cells 15–25 μm long and 13–18 μm wide, cells of middle portion of leaves 15–33 μm long and 13–20 μm wide, at base 20–35 μm long and 15–20 μm wide, marginal cells lengthened at basal ventral margin in 1–2 rows, 23–35 μm long and 5–9 μm wide; cells thin- to somewhat thick-walled, trigones absent, cuticle smooth. Underleaves absent. Asexual reproduction not present. Androecia not seen. Gynoecia usually with one innovation. Perianth 1.2 mm long and 1.2 mm wide, obdeltoid, mouth and keels toothed, teeth 6–12 cells long and 2–6 cells wide at base, dorsal keel distinctly winged.

Illustrations: none.

Characteristic for *Plagiochila debilis* are: 1) filiform shoots, 2) leaves distant and oblong-ovate, 3) leaf apex with 1–2 large apical teeth, 4) trigones absent, and 5) perianth obdeltoid, dorsal keel distinctly winged, teeth well-developed. A description for the species was given by Inoue (1965).

The leaf shape of the species is fairly similar to that of quite a few other species especially in Section *Firmae* Carl, but the absence of trigones

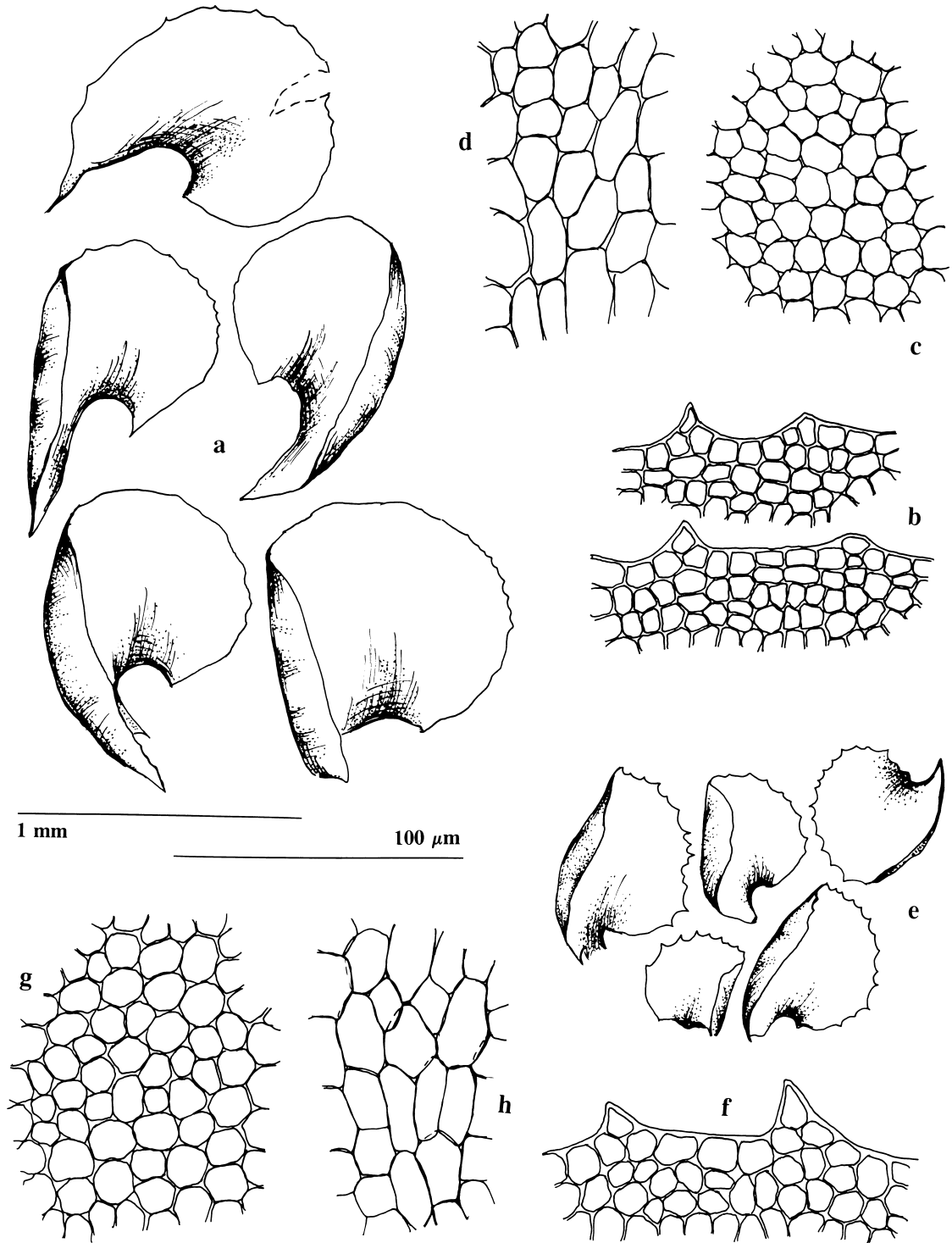


Fig. 1. — a–d: *Plagiochila biondiana* Mass., e–h: *P. delavayi* Steph. — a, e: Leaves. — b, f: Teeth and marginal cells. — c, g: Cells from middle portion of leaves. — d, h: Basal cells. — a and e according to 1 mm scale; b–d, f–h to 100 μm scale. — Drawn from the types (G).

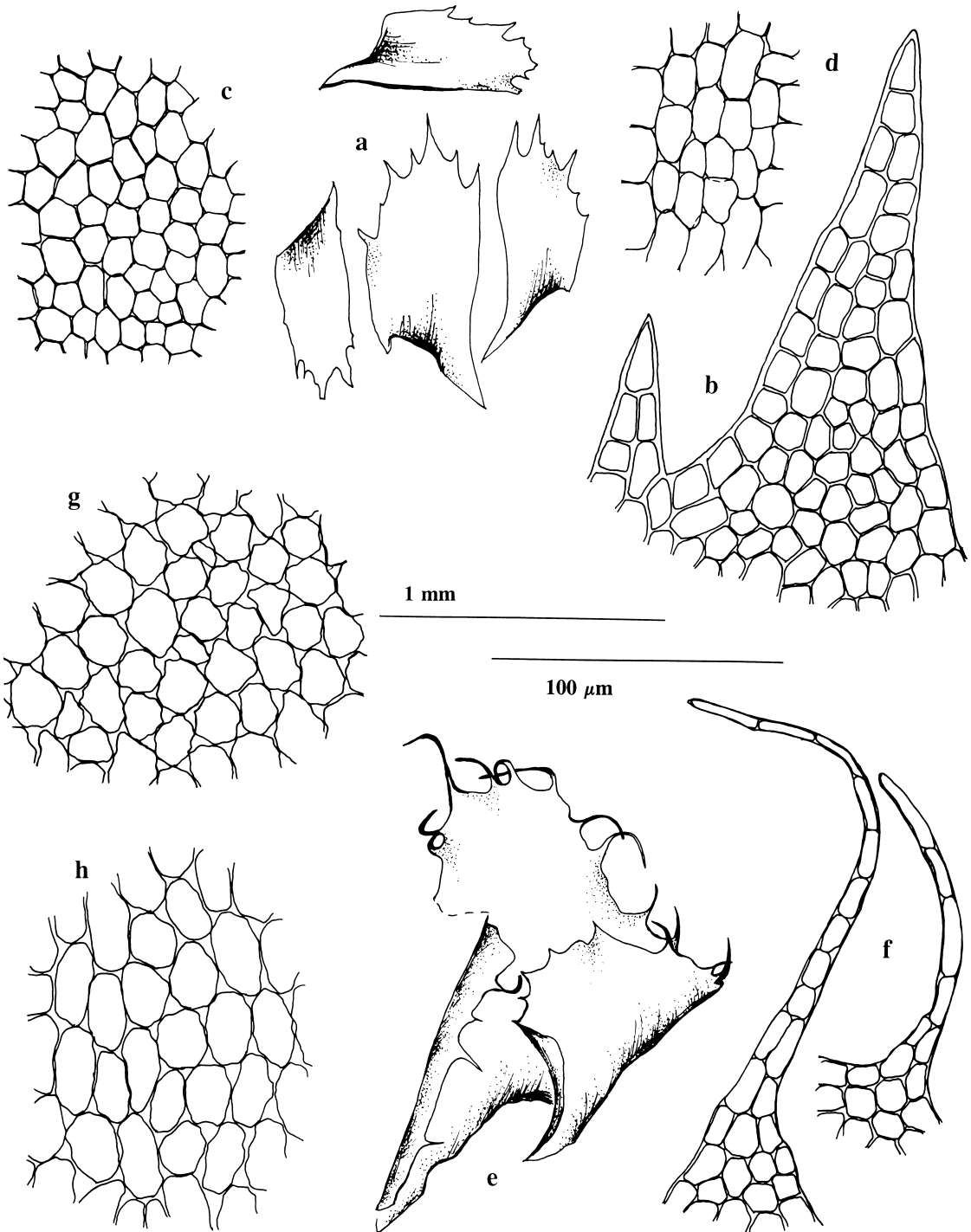


Fig. 2. — a–d: *Plagiochila debilis* Mitt., e–h: *P. deterrii* Steph. — a, e: Leaves. — b, f: Teeth and marginal cells. — c, g: Cells from middle portion of leaves. — d, h: Basal cells. — a and e according to 1 mm scale, and b–d, f–h to 100 μ m scale. — Drawn from the types (G), *P. debilis* from the type of *P. capillaris* Schiffn. ex Steph.

is a good distinguishing character. The species may be compared with *Plagiochila togashii* Inoue

from Japan, which also has no trigones (Inoue 1967, 1984).

Range in China: Shaanxi, Yunnan, Sichuan (Piippo 1990, Piippo *et al.* 1997).

Total range: China, India (Sikkim, Darjeeling), Bhutan and Nepal (Inoue 1965, 1967, 1987, Hattori 1975, Long & Grolle 1990).

***Plagiochila delavayi* Steph. (Fig. 1e–h)**

Mém. Soc. Sci. Nat. Cherbourg 29: 224. 1894. — Type: China. Yunnan, Ma eul chan, *Delavay*, herb. Bescherelle (G-000549!).

Plants small, to 1 cm long and to 1 mm wide on main shoots, grayish olive green when dry, erect. Stem yellowish, brownish or blackish. Branches few, lateral-intercalary. Leaves on leading stem clearly clasping and ventrally secund, at shoot apex imbricate, at base distant, suborbicular, 0.3–0.8 mm long and 0.3–0.5 mm wide, not narrowing toward apex, subvertical; branch leaves similar but smaller. Dorsal margin arched, decurrent, revolute; ventral margin arched, base dilated; apex rounded; teeth 6–16, 1–3 cells long and 1–2 cells wide at base, margins often only crenulate, tooth cells 18–23 μm long and 5–15 μm wide. Apical cells 5–18 μm long and 13–23 μm wide, cells of middle portion of leaves 8–23 μm long and 10–18 μm wide, at base 25–40 μm long and 15–20 μm wide, basal cells somewhat differentiated and yellow; cells thick-walled but especially apical and marginal cells sometimes thin-walled, trigones small to moderate but may be inconspicuous at apex, cuticle verrucose. Underleaves absent. Asexual reproduction not seen. Androecia and gynoecia not seen.

Illustrations: none.

Characteristic for *Plagiochila delavayi* are: 1) plants small, 2) leaves clasping and secund, 3) leaves suborbicular, 4) marginal teeth small and leaves often only crenulate, 5) basal cells somewhat differentiated, 6) trigones variable but distinguishable, except sometimes at the apex, and 7) cuticle verrucose, and perianth cylindrical.

This species needs to be compared with many more or less similar species with suborbicular leaves and a basal vitta, e.g., *Plagiochila chinensis* Steph. (Inoue 1959), *P. orbicularis* (Hatt.) Hatt. (Inoue 1976), *P. microphylla* Steph. (= *P. wichurae* Steph., Inoue 1981), *P. zonata* Steph. (= *P. handelii* Herz., Inoue 1965), the variable *P. semidecurrans* (Lehm. & Lindenb.) Lindenb., and *P. satoi* Hatt. (Inoue 1974b, 1984).

Plagiochila chinensis differs from *P. delavayi* by its cell margins being visible inside trigones, the distinct vitta, the nearly straight dorsal margin of the leaves, and the leaf apex with two prominent teeth. These characters were studied also by Inoue (1959), and by the present author on the basis of the type (China, Yunnan, Tsang yang Tchang, 1889 *Delavay*, hb. Bescherelle 198, G!). Both species have a cylindrical perianth. *P. zonata*, as *P. biondiana* (see above), has an obdeltoid or cyathiform perianth (Herzog 1930: 16, Abb. 5: 1–9, 10–16).

Range in China: Shaanxi, Yunnan, Sichuan (Piippo 1990, Piippo *et al.* 1997).

Total range: China, Nepal (Grolle 1966).

***Plagiochila determii* Steph. (Fig. 2e–h)**

Bull. Herb. Boiss., Ser. 2, 3: 876. 1903; Spec. Hep. 2: 361. 1903. — Type: Himalaya Indian. *Determes 217* in herb. Renauld (G!).

P. determesii Steph. apud Carl, Ann. Bryol. Suppl. 2: 103. 1931.

Plants to 4.8 cm long and to 2.5 mm wide on main shoots, grayish olive green when dry, obliquely arising from substrate. Stem brown or blackish. Branches few, terminal and of *Frullania* type, sometimes lateral-intercalary. Leaves on leading stem contiguous or imbricate, triangularly oblong, 1.5 mm long and 1 mm wide, narrowing toward apex, subvertical; branch leaves similar. Dorsal leaf margin nearly straight, revolute, decurrent; ventral margin arched, basally revolute, base distinctly dilated; apex subtruncate; teeth 20–25, flaccid and curved, up to 11 cells long, basal tooth cells 25–35 μm long and 10–23 μm wide, apical tooth cells 30–62 μm long and 8–13 μm wide. Apical cells 15–30 μm long and wide, cells of middle portion of leaves 20–30 μm long and wide, at base 23–48 μm long and 20–28 μm wide; cells thick-walled, trigones large and nodulose, confluent, at apical portion thickenings confluent and walls seemingly thick-walled and trigones obscure, cuticle smooth. Underleaves vestigial. Asexual reproduction not verified, but fragile leaves perhaps serving as such. Androecia not seen. Gynoecia terminal on branches, bract margins with long hairs. Perianth not seen.

Illustrations: none.

Plagiochila deterrii belongs to Sect. *Yokogurenenses* Inoue, which currently is placed in Sect. *Subtropicae* Carl (Inoue 1965). Characteristic for the species are: 1) branches usually of *Frullania* type, 2) leaves triangularly oblong, 3) leaves apparently fragmenting, 4) teeth of leaf margins flaccid and curved, long with apical cells especially long, and 5) large trigones. The species was compared with *P. kitagawae* Inoue from Thailand by Inoue (1974a).

Range in China: Yunnan (Piippo 1990).

Total range: India (Sikkim), Nepal, Thailand, China (Inoue 1965, Grolle 1966, Hattori 1975, Mizutani 1979).

Plagiochila hamulispina Herz. (Fig. 3)

Symb. Sin. 5: 19. 1930. — Type: China. Yunnan bor.-occid.: prope fines Tibeto-Birmanicas inter fluvios Lu-djiang (Salween) et Dijou-djiang (Irrawadi or. sup.), in jugi Tschiangschel, 27°52', lateris occid. pluviisilva mixta temperata. Subst. truncis, alt. ca. 2 800–3 450 m, 1916 *Handel-Mazzetti* (Diar. Nr. 1769) 4326 (JE!, syntype).

Plants rigid, to 4 cm long and to 4 mm wide on main shoots, shoots characteristically curved at apices, olive green or brownish when dry, erect or obliquely arising from substrate. Stem brown. Branches irregular, numerous and making the plants fan-shaped, many branches very closely originating, lateral-intercalary, some branches different from those, yellowish, with smaller and distant caducous (?) leaves. Leaves on leading stem contiguous, sometimes imbricate, triangularly oblong, 1.2–2.0 mm long and 0.8–1.5 mm wide, narrowing toward apex, obliquely spreading; branch leaves often much smaller. Dorsal leaf margin nearly straight, revolute, long decurrent; ventral margin long-decurrent, base dilated; apex rounded; teeth 17–26, spinose, 2–11 cells long and 1–8 cells wide at base, the apical cell longest, 10–35 µm long and 5–20 µm wide, teeth both on dorsal and on ventral margins. Apical cells 15–20 µm long and 10–25 µm wide, cells of middle portion of leaves 18–25 µm long and 15–23 µm wide, at base 25–62 µm long and 18–25 µm wide, basal cells differentiated, vitta area small and not very conspicuous, yellow; cells with intermediate thickenings, fairly thin-walled but may be thick-walled, trigones large, nodulose, sometimes confluent, cuticle slightly verrucose. Underleaves ab-

sent. Asexual reproduction not seen. Androecia not seen. Gynoecia usually with one innovation. Perianth 4.5 cm long and 1.2 mm wide, long-cylindrical, mouth with long teeth (similar as on leaf margins), no keels or wings.

Illustration: Herzog 1930: 20 (Abb. 6: 15–18).

Characteristic for *Plagiochila hamulispina* are: 1) shoots characteristically curved at apices, 2) branches numerous, lateral-intercalary, making the plant fan-shaped, 3) some branches with small and perhaps caducous leaves, 4) leaves triangularly oblong, 5) teeth spinose, present throughout dorsal and ventral margins, 6) basal cells of leaves differentiated, 7) trigones large, and 8) perianth long-cylindrical.

Herzog (1930) compared this species with *Plagiochila vittata* Steph. and Carl (1931) placed it in Sect. *Hamulispinae* Carl with *Plagiochila perserrata* Herz. Both species have triangularly oblong leaves with revolute margins. Basal cells are differentiated as vitta. The trigones of leaf cells of *P. hamulispina* are larger than those of *P. perserrata*.

Total range: Yunnan (China; Piippo 1990).

Plagiochila hokinensis Steph. (Fig. 4a–d)

Bull. Herb. Boiss., Ser. 2, 3: 116. 1903; Spec. Hep. 2: 296. 1903. — Type: China. Yunnan. Hokin, *Delavay*, herb. Bescherelle (G!).

Plants fairly rigid, to 4 cm long and to 2 mm wide on main shoots, pale olive brown when dry, obliquely arising from substrate. Stem brown to brownish. Branches numerous, lateral-intercalary, shoot or branch apices may be tapering. Leaves on leading stem distant to contiguous, triangularly oblong, 1.0–1.1 mm long and 0.4 mm wide, narrowing toward apex, flaccid, obliquely spreading; branch leaves similar. Dorsal leaf margin nearly straight, revolute, very long decurrent; ventral margin slightly arched, revolute, base slightly dilated; apex subtruncate; teeth 2–12, short, apical cell sharp, 1–3 cells long and 1–2 cells wide at base, 15–30 µm long and 8–23 µm wide, smaller leaves with only 1–3 crenulate teeth. Apical cells 15–25 µm long and wide, cells of middle portion of leaves 15–28 µm long and wide, at base 28–40 µm long and 18–28 µm wide; cells thin-walled,

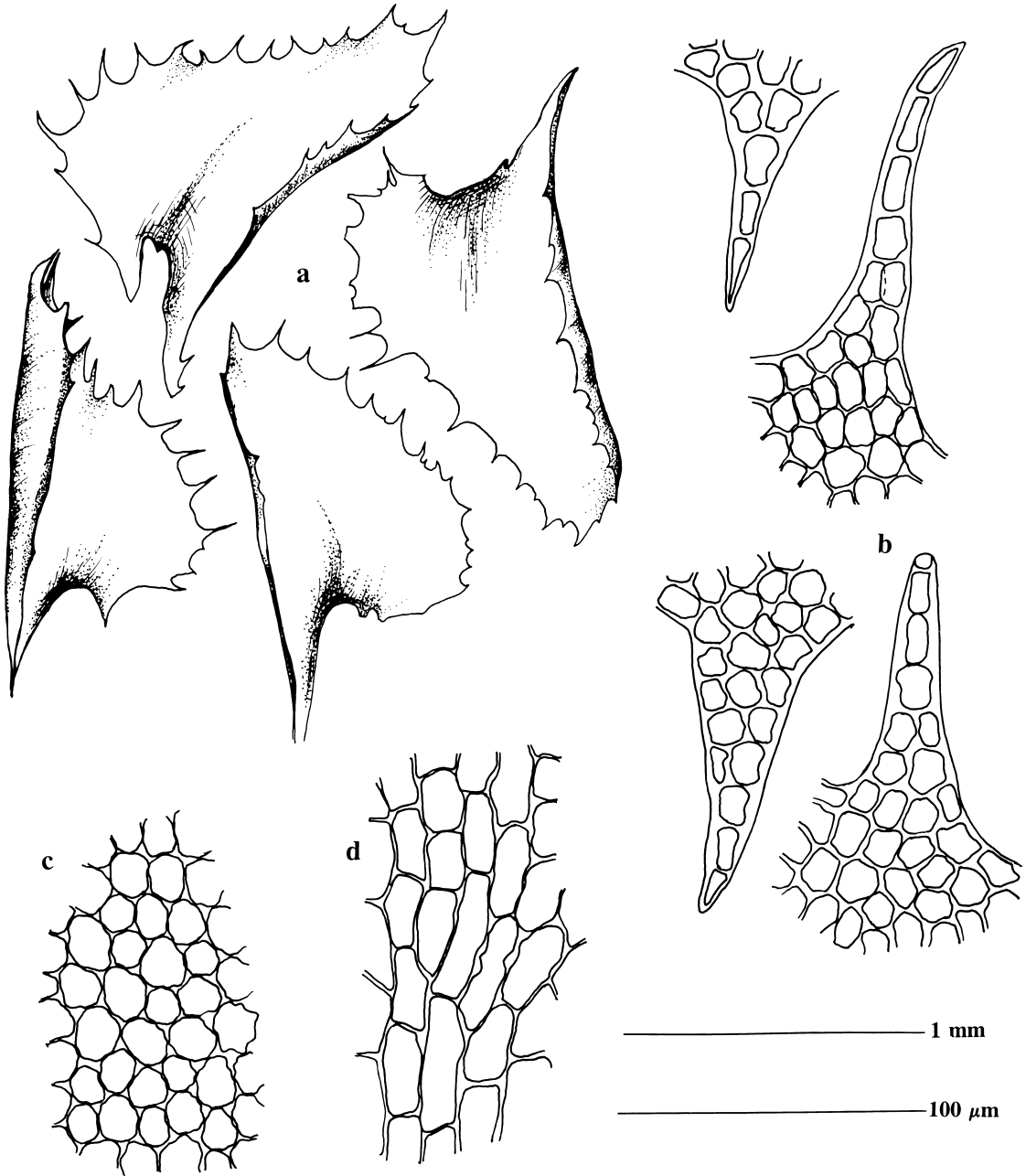


Fig. 3. *Plagiochila hamulispina* Herz. — a: Leaves. — b: Teeth and their cells. — c: Cells from middle portion of leaves. — d: Basal cells. — a according to 1 mm scale, and b–d to 100 μm scale. — Drawn from the syntype (JE).

trigones small at apex, otherwise large, nodulose, sometimes confluent, cuticle slightly verrucose. Underleaves absent. Asexual reproduction not present. Androecia terminal. Gynoecia not present.

Illustrations: none.

Characteristic for *Plagiochila hokinensis* are: 1) shoot and branch apices often tapering and have smaller leaves, 2) leaves distant to contiguous, 3) leaves triangularly oblong, dorsal margin very long decurrent, 4) leaf margins often conspicuously revolute, 5) leaves with up to 12 teeth, but

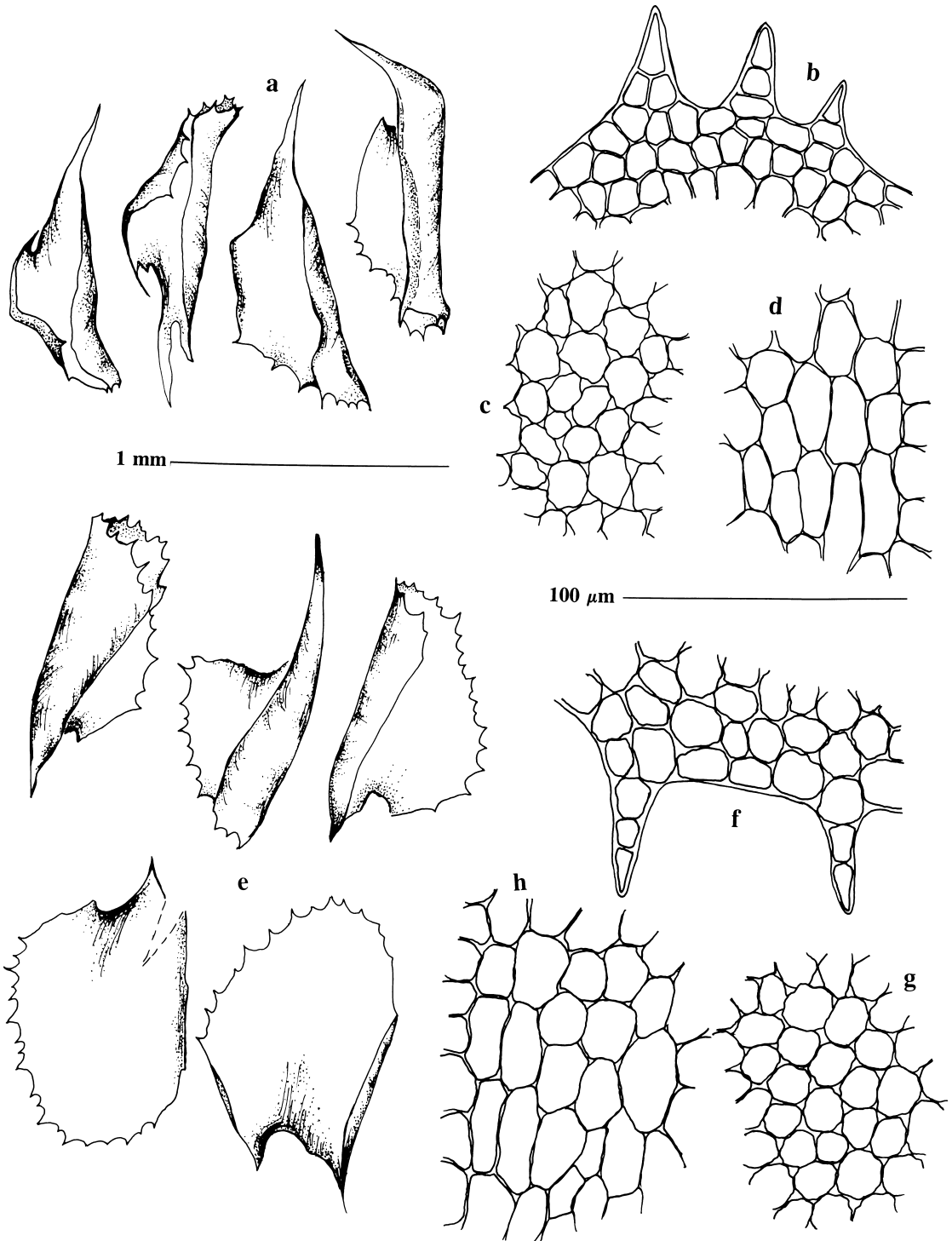


Fig. 4. a–d: *Plagiochila hokinensis* Steph., e–h: *P. maireana* Steph. — a, e: Leaves. — b, f: Teeth and marginal cells. — c, g: Cells from middle portion of leaves. — d, h: Basal cells. — a and e according to 1 mm scale, and b–d, f–h to 100 μm scale. — Drawn from the types (G).

smaller leaves with only 1–3 apical teeth, teeth small, and 6) trigones large except at leaf apex.

Plagiochila hokinensis was placed in Sect. *Renitentes* Carl (= Sect. *Zonatae* Carl) by Carl (1931) with *P. sikutzuisana* (but see under *P. biondiana* and Inoue 1965), *P. torquescens* and *P. wilsoniana*. Characters given by Inoue (1984) for the section do not, however, match these species.

Total range: Yunnan (China; Piippo 1990).

***Plagiochila maireana* Steph. (Fig. 4e–h)**

Spec. Hep. 6: 185. 1921. — Type: China. Yunnan, Tongtchouan, plaine, 1912 *Maire*, 334 in hb. Stephani (G-010737!).

Plants soft, small, to 2 cm long and to 1.5 mm wide on main shoots, yellowish brown when dry, erect or obliquely arising from substrate. Stem yellowish brown to brown. Branches fairly numerous, lateral-intercalary. Leaves on leading stem imbricate to distant especially when leaf margins very revolute, broadly ovate to triangularly ovate, 0.9–1 mm long and 0.6–0.7 mm wide, obliquely spreading; branch leaves similar. Dorsal leaf margin nearly straight, revolute, long decurrent; ventral margin arched, base dilated or not; apex rounded; teeth 15–23, spinose, on dorsal margin only on upper margin, 1–4 cells long and 1–3 cells wide at base, the apical cell narrowest, 18–25 μ m long and 4–20 μ m wide. Apical cells 15–28 μ m long and 10–23 μ m wide, cells of middle portion of leaves 18–28 μ m long and 13–25 μ m wide, at base 25–61 μ m long and 18–25 μ m wide; cells thin-walled, trigones large, nodulose throughout the leaves, cuticle faintly verrucose. Underleaves absent. Asexual reproduction not present. Androecia terminal or intercalary on branches. Gynoecia usually without or with one innovation. Perianth 2.2 mm long and 1.2 mm wide, long-cylindrical, keels without wing or teeth, mouth with short teeth.

Illustrations: none.

Plagiochila maireana is a poorly known species. Characteristic of it are: 1) small size, softness, yellowish brown color, 2) leaves imbricate to seemingly distant, 3) leaves broadly ovate to triangularly ovate, dorsal margin long decurrent, 4) teeth present only on upper part of dorsal mar-

gin, teeth fairly short, 5) trigones large, and 6) perianth long-cylindrical.

Total range: Yunnan (China; Piippo 1990).

***Plagiochila perserrata* Herz. (Fig. 5)**

Symb. Sin. 5: 19. 1930. — Type: China. Prov. Yunnan bor.-occid.: Prope fines Tibeto-Birmanicas in convalle fluvii Djiou-djiang (Irrawadi or. sup.), in pluviisilva mixta calide temperata supra vicum Schutsche, 27°55', ad arbores, alt. ca. 2 400–2 800 m, 1916 *Handel-Mazzetti* (Diar. Nr. 1776) 9477 (JE!, syntype).

Plants rigid, to 5 cm long and to 3.5 mm wide on main shoots, grayish olive brown or bluish green when dry, erect or obliquely arising from substrate. Stem brownish to brown. Branches fairly numerous, lateral-intercalary. Leaves on leading stem contiguous or imbricate, triangularly oblong, 1.0–1.8(–2.5) mm long and 0.8–1(–1.8) mm wide, narrowing toward apex, obliquely spreading; branch leaves similar. Dorsal leaf margin nearly straight, long decurrent, always long revolute; ventral margin arched, long decurrent, base dilated; apex rounded; teeth 10–28, rarely only 10, spinose, 2–8 cells long and 1–3 cells wide at base, narrowly triangular, teeth present on whole dorsal margin, even on the decurrent portion, 23–40 μ m long and 9–23 μ m wide. Apical cells 18–25 μ m cells long and 20–30 μ m wide, cells of middle portion of leaves 25–38 μ m long and wide, at base 33–85 μ m long and 13–23 μ m wide, basal cells differentiated, long and yellow; cells fairly thick-walled, trigones very small to small, intermediate thickenings sometimes above basal cells, cuticle verrucose. Underleaves absent. Asexual reproduction not present. Androecia not present. Perianth long-cylindrical, 4 mm long and 1.5–1.8 mm wide, no keels or wings, mouth toothless.

Illustration: Herzog 1930: 20 (Abb. 6: 11–14).

Characteristic for *Plagiochila perserrata* are: 1) plants rigid, 2) leaves triangularly oblong, 3) marginal teeth present on the whole dorsal margin, even on the decurrent part, teeth spinose, 4) basal cells differentiated, 5) cuticle verrucose, and 6) perianth long-cylindrical. See also under *P. hamulispina*.

Range in China: Yunnan (China), Taiwan (Piippo 1990).

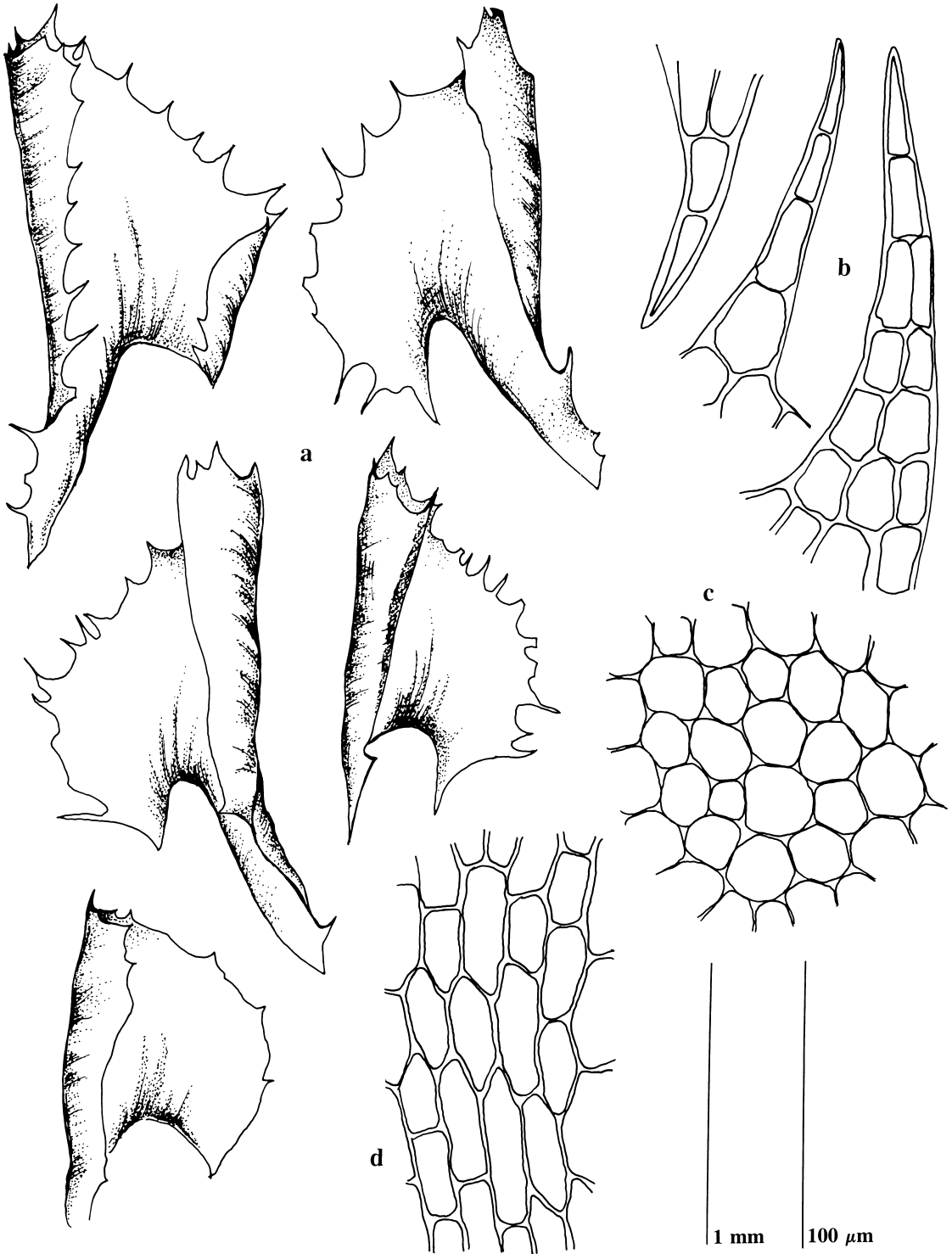


Fig. 5. *Plagiochila perserrata* Herz. — a: Leaves. — b: Teeth and their cells. — c: Cells from middle portion of leaves. — d: Basal cells. — a according to 1 mm scale, and b–d to 100 μm scale. — Drawn from the syntype (JE).

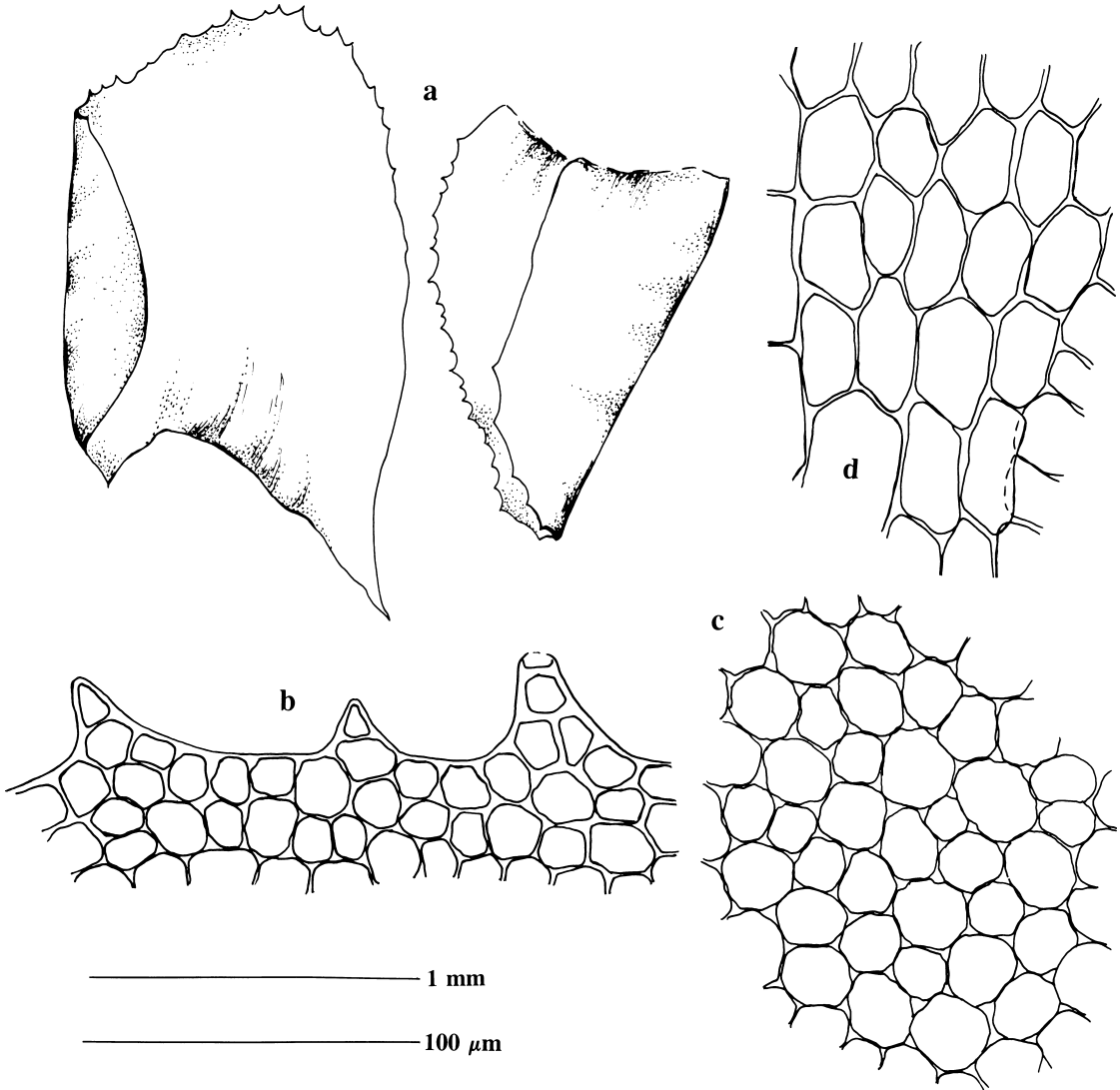


Fig. 6. *Plagiochila sikutzuisana* Mass. — a: Leaves. — b: Teeth and marginal cells. — c: Cells from middle portion of leaves. — d: Basal cells. — a according to 1 mm scale, and b–d to 100 μm scale. — Drawn from the type (G).

Total range: Nepal, Bhutan, China, Taiwan (Hattori 1971, 1975, Mizutani 1979, Inoue 1987, Long & Grolle 1990).

***Plagiochila sikutzuisana* Mass. (Fig. 6)**

Mem. Accad. Agr. Art Verona, Ser. 3, 73: 13. 1897. — Type: China. China interior, provincia Schen-si sept. inter muscos in monti Si-ku-tzui-san, 1894 *Giraldi*, det. Massalongo 18 in hb. Levier (G!).

Plants fairly soft, to 4.5 cm long and to 3 mm wide on main shoots, olive green when dry, erect

or obliquely arising from substrate. Stem brown or olive green. Branches rare, usually only flagelliform lateral-intercalary branches, more rarely regularly developed lateral-intercalary branches. Leaves on leading stem \pm or distinctly ventrally second, contiguous to distant, broadly ovate, 1.1–1.6 mm long and 1.2 mm wide, narrowing toward apex, obliquely spreading; branch leaves similar if branches well-developed. Dorsal leaf margin slightly arched, exceedingly revolute, long decurrent; ventral margin arched, base dilated; apex obtuse; teeth 20–30, on dorsal margin only on up-

per part, 1–4 cells long and 1–2 cells wide at base, their cells 15–25 μm long and 8–20 μm wide. Apical cells 15–25 μm long and 13–30 μm wide, cells of middle portion of leaves 18–35 μm long and 18–38 μm wide, at base 18–38 μm long and wide, slightly differentiated; cells fairly thin-walled, trigones middle-sized to fairly large, not clearly nodulose, cuticle slightly verrucose. Underleaves absent. Asexual reproduction not present. Androecia and gynoecia not present.

Illustration: Massalongo 1897: Tav. I (fig. 1).

Characteristic for *Plagiochila sikutzuisana* are: 1) fairly large but soft plants, 2) usually only flagelliform branches present, 3) leaves broadly ovate, 4) dorsal leaf margin exceedingly revolute, 5) teeth on dorsal margin present only on upper part, teeth fairly small, and 6) trigones middle-sized to fairly large. Massalongo (1897) compared the species with *P. semidecurrans*.

Total range: Shaanxi, Taiwan (Piippo 1990).

Plagiochila torquescens Herz. (Fig. 7)

Symb. Sin. 5: 21. 1930. — Type: China. Prov. Yunnan bor.-occid.: Prope fines Tibeto-Birmanicas inter fluvios Ludjiang (Salween) et Djiou-djiang (Irrawadi orient. super.), in pluviisilvis mixtis temperatis vallis Tjionton-lumba infra Tschamutong. Substr. ligno putrido Piceae et Tsugae, alt. 2 950 m, 1916 *Handel-Mazzetti* (Diar. Nr. 1759) 9179 (JE!, syntype).

Plants to 4 cm long and to 3 mm wide on main shoots when dry, olive brown when dry, erect or obliquely arising from substrate. Stem brownish. Branches fairly numerous, lateral-intercalary. Leaves on leading stem contiguous to imbricate, ventrally secund, often both margins conspicuously revolute so the leaves seem very narrow and distant, triangularly oblong, 1.5–1.8 mm long and 0.8–1.2 mm wide, narrowing toward apex, obliquely spreading or often squarrose; branch leaves similar. Dorsal leaf margin nearly straight, narrowly revolute, long decurrent; ventral margin decurrent, above base dilated but again narrowing at base; apex obtuse or somewhat truncate; teeth 15–23, 1–3 teeth at upper portion of dorsal margin, ciliate-spinose, 3–10 cells long and 3–8 cells wide at base, uppermost cell longest, 18–30 μm long and 3–20 μm wide. Apical cells 13–25 μm

long and wide, cells of middle portion of leaves 25–30 μm long and 20–30 μm wide, at base 38–80 μm long and 10–23 μm wide, vitta area differentiated, small, yellow; cells thin-walled, trigones large, intermediate thickenings present, cuticle smooth. Underleaves absent. Asexual reproduction not seen. Androecia terminal or intercalary on branches. Perianth long-cylindrical, to 4.5 mm long and 1 mm wide, mouth crenulate or toothed, keels very narrow.

Illustration: Herzog 1930: 20 (Abb. 6: 19–23).

Characteristic for *Plagiochila torquescens* are: 1) branches fairly numerous, 2) leaves often squarrose, 3) leaves triangularly oblong, 4) often both leaf margins conspicuously revolute, 5) marginal teeth present on dorsal margin only on upper part, teeth spinose, 6) basal leaf cells differentiated, 7) trigones large, and 8) perianth long-cylindrical. According to Inoue (1965), who studied the type in W, the perianth has distinct dorsal and ventral wings, and the keels are bilobed up to 1/4 of their length. These characters are used also in his key. Apparently his observations are based on specimens other than the actual type. Inoue (1967) gives differences of this species with *P. harae* Inoue and *P. alata* Inoue (see also Inoue 1969).

Range in China: Xizang, Yunnan (Piippo 1990).

Total range: India (Darjeeling), Bhutan, Nepal, China (Inoue 1965, 1987, Hattori 1971, 1975, Mizutani 1979, Long & Grolle 1990).

Plagiochila wilsoniana Steph. (Fig. 8)

Spec. Hep. 6: 242. 1922. — Type: China. China interior, prov. Hapei, abique loco spec., *Wilson 5967* (G-010736!).

Plants fairly rigid, to 3 cm long and to 3.1 mm wide on main shoots, olive green when dry, erect or obliquely arising from substrate. Stem brown. Branches few, lateral-intercalary. Leaves on leading stem distant, ovate, 1.0–1.1 mm long and 0.7–0.8 mm wide, quite widely spreading; branch leaves similar. Dorsal leaf margin nearly straight up to half its length, may be revolute, decurrent; ventral margin arched, base usually not dilated; apex almost as wide as base, obtuse; teeth 18–22, spinose, teeth present usually only on upper half of dorsal margin, 1–6 cells long and 1–3 cells wide at base, uppermost cell sharp, narrow and the longest, often very narrow, 15–28 μm long and 10–

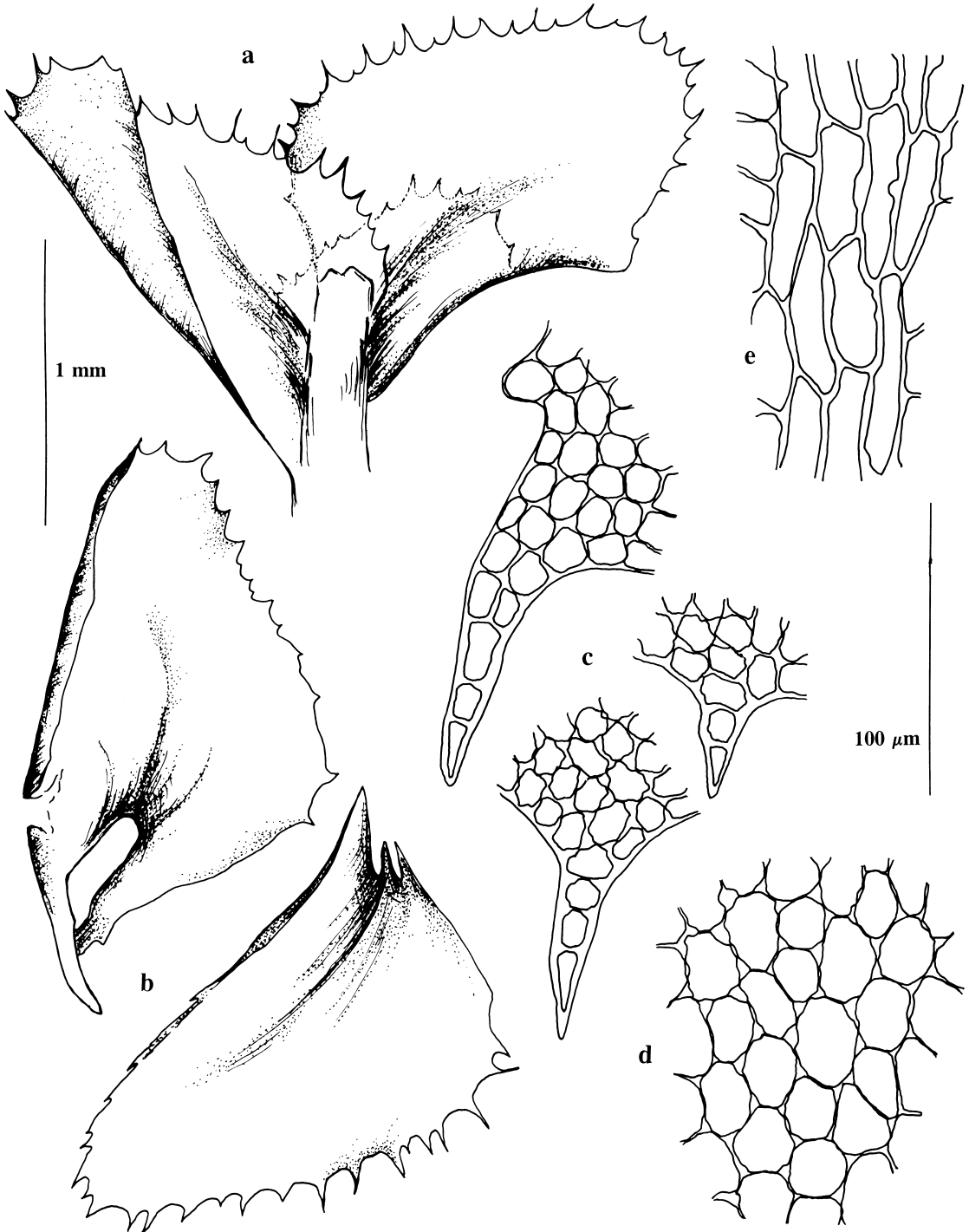


Fig. 7. *Plagiochila torquescens* Herz. — a: Habitus. — b: Leaves. — c: Teeth and marginal cells. — d: Cells from middle portion of leaves. — e: Basal cells. — a according to 1 mm scale, and b–d to 100 µm scale. — Drawn from the syntype (JE).

23 µm wide, the apical one 18–30 µm long and 3–18 µm wide. Apical cells 15–25 µm long and

15–28 µm wide, cells of middle portion of leaves 18–30 µm long and 18–25 µm wide, at base 18–

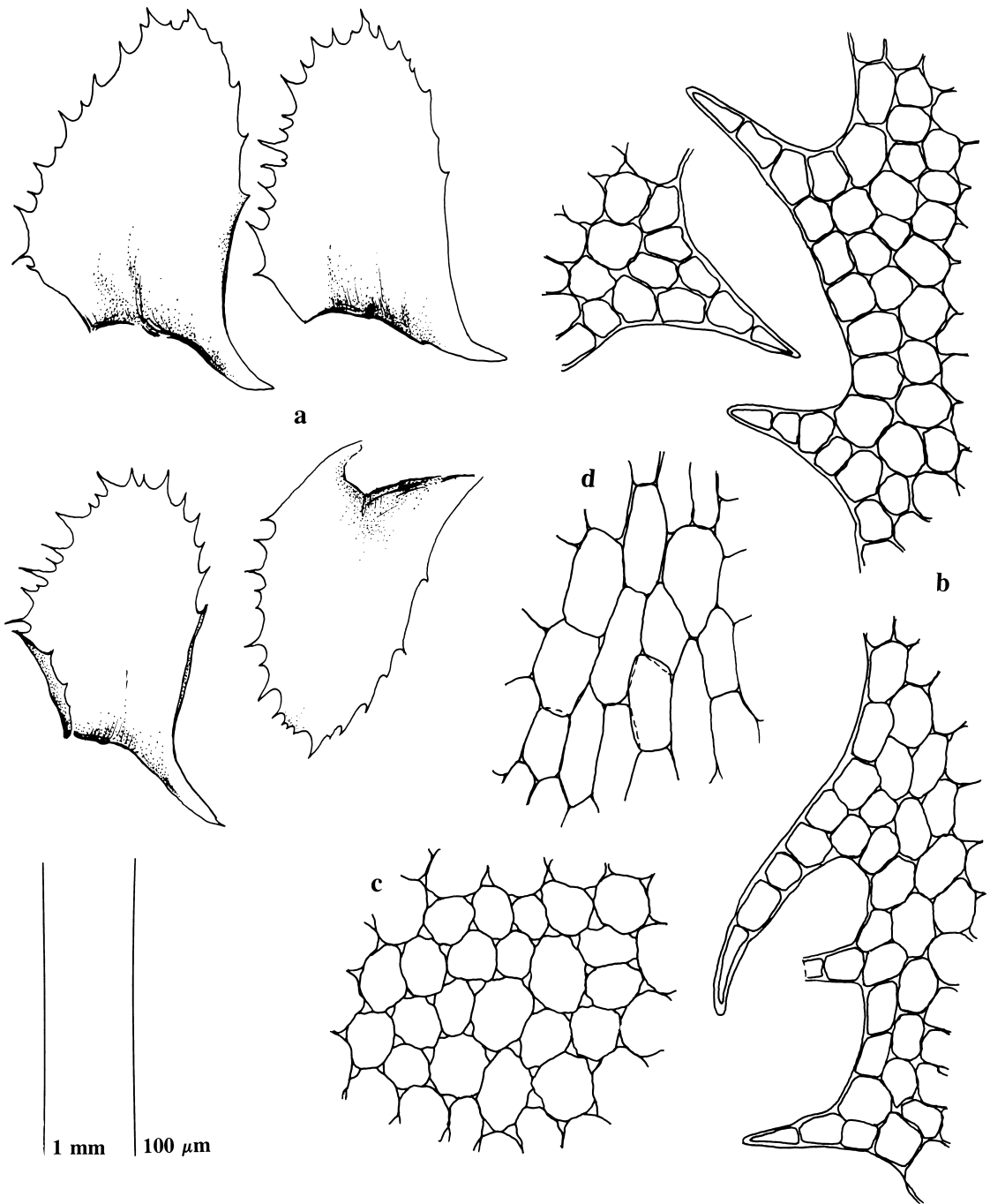


Fig. 8. *Plagiochila wilsoniana* Steph. — a: Leaves. — b: Teeth and marginal cells. — c: Cells from middle portion of leaves. — d: Basal cells. — a according to 1 mm scale, and b–d to 100 µm scale. — Drawn from the type (G).

35 µm long and 18–28 µm wide; cells thin-walled, trigones large and nodulose, cuticle smooth. Underleaves absent. Asexual reproduction not present. Androecia and gynoecia not present.

Illustrations: none.

Characteristic for *Plagiochila wilsoniana* are: 1) leaves distant and widely spreading, 2) leaves ovate, 3) uppermost tooth cell sharp and narrow,

4) trigones large, and 5) cuticle smooth. Inoue (1967) discussed differences between *P. wilsoniana* and *P. grollei* Inoue.

Total range: Hubei, Yunnan, Sichuan (China; Piippo 1990, Piippo *et al.* 1997).

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