

## A REVISION OF THE GENUS PHACELLARIA (SANTALACEAE)

by

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On several occasions the author received specimens for determination under the name of *Loranthaceae*, which in reality appeared to be *Phacellarias*, usually parasitic on *Loranthaceae*. When trying to name these *Phacellarias*, he perceived how difficult it was to survey the literature of the genus. Though only eight species have been described, and the authors usually have indicated the main differences between their new species and the most closely allied previous ones, the most essential characteristics of the species, viz., the structures of the inflorescences, were never indicated, and a critical review of all the species has never been given. Therefore it appeared an attractive task to undertake such a revision, if only it were possible to examine all the type specimens. Through the kindness of the Directors and Keepers of the Kew and Edinburgh Botanic Gardens (K, E) and of the Paris Natural History Museum (P), the author was actually allowed to do this. Moreover he had the opportunity to study specimens of the Herbarium of the British Museum of Natural History in London (BM) and the Buitenzorg Botanic Gardens (B), whereas he discovered one specimen in Mr. A. F. G. KERR's private herbarium. The author expresses his sincere thanks to all the gentlemen who made this revision possible.

### Phacellaria

BENTHAM, in BENTHAM & HOOKER FIL., Gen. pl., III, 1 (1880) 229; in HOOKER's Icones Plant., IV, 1 (1880) 17, t. 1324; HOOKER FIL., Fl. Br. Ind., V, 13 (1886) 235; HIERONYMUS, in ENGL. & Pr., Nat. Pflanzenfam., III, 1 (1889) 216; COLLETT & HEMSLEY, in Journ. Linn. Soc. London, 28, no. 189—191 (1890) 122, t. 17; HEMSLEY, in Journ. Linn. Soc., bot., 31, no. 215 (1896) 308; BOERLAGE, Handl. Fl. Ned. Ind., III, 1 (1900)

175, 179; BRANDIS, Indian trees (1906) 554; LECOMTE, in Bull. Mus. Hist. Nat., Paris, 20 (1914) 399; Fl. gén. Indo-Chine, V, 3 (1915) 211; W. W. SMITH, in Not. Bot. Gard. Edinburgh, X, 49—50 (1918) 188; RIDLEY, in Journ. As. Soc., Straits Br., 82 (1920) 193; Fl. Mal. Penins., 3 (1924) 170; PILGER, in ENGL., Nat. Pflanzenfam., ed. 2, 16b (1935) 71.

Herbs or undershrubs, parasitic on twigs of *Loranthoideae* and *Henslowia*, simple or branched, with scattered bract-like leaves. Flowers sessile in the axils of the bracts, either single with two lateral bracteoles (prophylls) bearing flowers in their axils or not, or with an involucre of many small bracteoles around their base and several flowers in the axils of these bracteoles, or moreover many adventitious flowers around the axillary ones, all the flowers with or without an involucre of small bracteoles; also often terminal flowers on the tips of the stems and the branches. Flowers hermaphrodite, monoecious, polygamie or dioecious. Male flower with a short perigone tube and 3—6 triangular valvate lobes; stamens equal in number to the lobes, inserted before the latter, inflexed in the bud upon a rather flat disc and somewhat impressed in its margin and upper surface, just reaching each other in the middle of the flower; filaments dorsiventrally flattened, short, attenuate from the base towards the tip; anthers cordate, with two thecae diverging towards the rounded base and converging towards the more acute tip, each of them bilocular and opening with a longitudinal slit. Female flower with an obovate to cylindrical inferior ovary, 4—8 triangular valvate perigone lobes, a flat or somewhat conical disc, and a short cylindrical style with a truncate or somewhat scutate or moreover lobed stigma. Hermaphrodite flowers like the female ones, but moreover with stamens, that are like those of the male flowers but somewhat smaller, just reaching the style with their tip when in bud, and often less in number than the perigone lobes. Ovary one-celled, but 4—6-, usually 5-celled in the apical (LECOMTE) and basal part (PIERRE), with a central columella almost reaching to the apex and bearing usually 3 (perhaps sometimes 4—5, according to PIERRE) pendulous ovules devoid of integuments. Fruit an oblong drupe, crowned by the perigone lobes and disc, with a fleshy outer layer, and a kernel that is 5-grooved, and 5-celled in the apical part, and contains a single seed, that is 5-grooved, 5-lobed at the apex, and composed of a large endosperm with a small embryo in the basal part.

The colour of the plants in the herbarium varies from light-ochraceous to ferrugineous or, in old specimens, to blackish. From the

fact that most of the collectors say nothing about the colour of the living plant, and that they often indicate it as a parasite, a *Loranthacea*, or a *Viscum*, one might conclude that, in the living state, it is green. I found the colour only in two instances indicated: on the label of EVRARD's no. 934 (*Ph. tonkinensis*) it is indicated as "vert clair", on that of FARGES's no. 1511 (*Ph. Fargesii*), as "jaune verdâtre". Moreover, the flowers of ROBERTSON's no. 2110 are indicated as "yellowish-green", those of SINGAPORE FIELD no. 23444 as "greenish white", the fruit of KLOSS's plant from Dran as "green".

The materials in the herbaria are, in the dry state, always unfit for examination or determination. If, however, one takes the trouble to soak a stem fragment with flowers in different stages of development in boiling water, he will perceive that all the essential parts regain their natural forms to such an extent that living plants, or materials preserved in alcohol, are not so indispensable as one might have at first expected.

The mode of development of inflorescences and flowers appeared to be of the utmost importance for the distinction of the species, but they were hardly ever described hitherto. Therefore I must treat them somewhat more in detail instead of only referring to the descriptions of the separate species.

In young stem tips, the bracts are very regularly arranged in a spiral (see plate VIII, 9; IX, 13, 18, 23; X, 26, 29). Later, when the stem stretches, the growth of its different parts is unequal: some bracts become far apart, others remain more or less crowded in whorls. When later the axillary flower groups become elongated by the development of more and more flowers, these whorls also may become stretched.

The most simple arrangement of the flowers in the axillary groups is found in *Ph. Fargesii* (plate VIII, 1 and 2). Here we usually find, in the axil of each bract, one single hermaphrodite flower, bearing two lateral bracteoles representing the prophylls. In some cases, we later find small flower buds in the axils of these bracteoles, but they always remain in an early stage of development. The stems, moreover, often bear one terminal, early developing flower.

Somewhat more complicated are the flower groups of *Ph. rigidula* (plate IX, 13—20). Here also we first find, in each axil, one flower with two bracteoles, but 1°, the flowers in the axils of the later reach full development, 2°, each flower bears, around its base, an involucre of a greater or smaller number of small bracteoles, and 3°, there may

develop, around the first three flowers, probably in the axils of some of the involueral bracteoles, perhaps outside of them, some more flowers. In this species the male and female flowers are, as far as known hitherto, found on different stems of the same plant, and consequently the flower groups are either entirely male or entirely female. In the male groups the number of flowers is greater than in the female ones; in the latter only few fruits reach full development.

Of *Ph. caulescens* (plate IX, 21 and 22) only one female stem is known, the flower groups of which probably show the same structure as the female ones of *Ph. rigidula* in the young state; no more than one flower seems to develop, but this may also be the case in female plants of *Ph. rigidula*.

In *Ph. malayana* (pl. VIII, 3—8) the bracts first bear a single flower in their axils, which is surrounded by an involuere of numerous small bracts. Later, flowers develop in the axils of these involueral bracts and finally a roundish group of flowers is formed, inserted on a semiglobose thickening of the stem. The first flower of each group appears to be female, the others either female or hermaphrodite or male, but I never found more than one fruit in each group.

In *Ph. tonkinensis* (pl. VIII, 9—12), *Ph. gracilis* (pl. IX, 23—25), and *Ph. compressa* (pl. X, 26—33), the inflorescences are still more complicated. The first axillary flower does not bear distinct lateral prophylls, but in *Ph. gracilis* and *Ph. compressa* it is surrounded by an involuere of small bracteoles, which is absent in *Ph. tonkinensis*. All subsequent flowers seem to develop somewhere in the vicinity of the first flower, but most of them very close to it and at the bracteal side. There seems to be an intercalary growth of the stem between the bract and the first flower, for the more flowers that develop between the bract and the first flower, the larger the space becomes for them. At length the group becomes elongated and consists of numerous flowers, one of the uppermost of which is the oldest one. In *Ph. compressa* and *Ph. gracilis* all the flowers have their own involuere of more or less numerous small bracts, whereas in *Ph. tonkinensis* such involueres are entirely absent. While the flowers develop the bract shrivels, and this has caused several authors to describe the flowers of certain species as entirely destitute of bracts.

In old stems of species with numerous flowers in each axillary group we find that many of the flowers have fallen off. The persistent involueres, which are hairy, and the separate bracteoles of

which are indistinct, then often make the impression of small hollows of the stem, in which the flowers have been inserted (see plate VIII, 11; X, 28).

In *Ph. compressa* we here and there find short branches covered with imbricate bracts and bearing only a terminal flower. There is, however, only a difference of degree between these short branches and the axillary flowers surrounded by an involucre of bracteoles.

About the distribution of the sexes in *Ph. tonkinensis*, *Ph. gracilis*, and *Ph. compressa*, see these species separately.

Though the characters of the inflorescences appear to be of more importance for the delimitation of species than all further ones, yet the differences between the species are so little definable that it seems rather arbitrary how many species must be distinguished. Therefore, I have done my best to accept all the species described formerly, and not to describe any new ones, but I could not maintain this standpoint. I felt obliged to unite *Ph. compressa*, *Ph. Wattii*, and *Ph. ferruginea* to one species and to distinguish one new species.

The following species of *Phacellaria* have been described hitherto.

*Ph. rigidula* BENTHAM, 1880.

*Ph. compressa* BENTHAM, 1880.

*Ph. Wattii* HOOKER FIL. 1886.

*Ph. caulescens* COLLETT & HEMSLEY, 1890.

*Ph. tonkinensis* LECOMTE, 1914.

*Ph. Fargesii* LECOMTE, 1914.

*Ph. ferruginea* W. W. SMITH, 1918.

*Ph. malayana* RIDLEY, 1920.

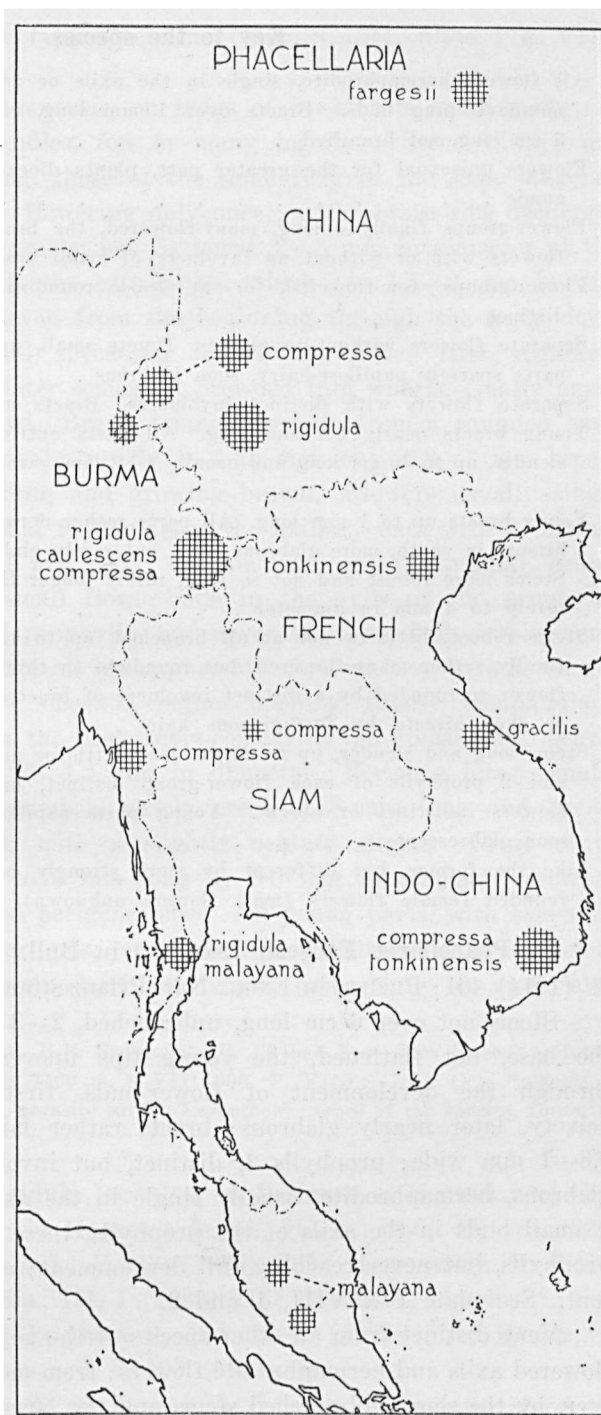
BENTHAM based the genus upon two species, *Ph. rigidula* and *Ph. compressa*. As, however, he described *Ph. rigidula* first, from well preserved materials, and published it once more in the same year in HOOKER's *Icones* with a plate, whereas *Ph. compressa* was based on inadequate materials, we can only choose *Ph. rigidula* as the type species of the genus. It is based on GRIFFITH no. 2745 (K).

The distribution of the genus *Phacellaria* (see fig. 1) is restricted to a rather continuous area in the Southeastern part of the Asiatic Continent, extending over Southeastern China, French Indo-China, Eastern and Southern Burma, Siam, and the Malay Peninsula. It stretches away to the North as far as N.E. Sze-chuan in China (Lat.  $\pm 32^{\circ}$  N.), to the South as far as the State of Selangor in the Malay Peninsula (Lat.  $\pm 3^{\circ}$  N.). It appears to be restricted to

the mountainous regions, the altitudes indicated on the herbarium labels varying from 500 m to 7500 ft above sea level.

About the derivation of the name *Phacellaria*, PILGER, *l. c.*, says: "Name von  $\Phi\alpha\kappa\epsilon\lambda\omicron\varsigma$  ( $\Phi\alpha\kappa\epsilon\lambda\lambda\omicron\varsigma$ ), Bündel, Büschel; wegen der gebüschelten Blüten." BENTHAM, in his original diagnosis of the genus, does not mention fasciculate flowers, but he mentions fasciculate stems. If the derivation of *Phacellaria* from  $\Phi\alpha\kappa\epsilon\lambda\omicron\varsigma$  is right, it therefore probably refers to the stems, and not to the flowers. I have also considered a derivation from  $\Phi\alpha\kappa\omicron\varsigma$ , or  $\Phi\alpha\kappa\eta$ , as the stems originate from the lenticels of the host plant, *Phacellaria* than meaning *lenticellaria*, but this appears less probable.

Fig. 1. Distribution of the genus *Phacellaria*, indicated by means of the approximate localities of the species.



## Key to the species.

- 1 All flowers hermaphrodite, single in the axils or accompanied by two small, non-developing buds. Bracts over 1 mm long, recurved. Stems not over 6 cm long, not branched . . . . . 1. *Ph. Fargesii*
- Flowers unisexual for the greater part, plants dioecious, monoecious, or polygamic . . . . . 2
- 2 Flower-groups finally oblong, many-flowered, the bracts shrivelling, the single flowers with or without an involucre of small bracteoles . . . . . 3
- Flower-groups few-flowered, or at least roundish, bracts and bracteoles distinct . . . . . 5
- 3 Separate flowers without involucre. Bracts small, up to 0.5 mm long. Young parts sparsely papillose-hairy, soon glabrous . . . . . 5. *Ph. tonkinensis*
- Separate flowers with distinct involucre. Bracts usually larger . . . . . 2
- 4 Young bracts nearly 0.6 mm long. All parts entirely glabrous. Stems very slender, up to 30 cm long and usually 1—2 mm, rarely to 2.5 mm in diameter . . . . . 6. *Ph. gracilis*
- Young bracts up to 1 mm long. All parts rather densely velvety and somewhat hirsute in youth, more glabrous later, but rarely glabrous between the flowers. Stems more robust and not so long, rarely longer than 15 cm, usually 1—2.5, rarely to 4 mm in diameter . . . . . 7. *Ph. compressa*
- 5 Stems robust, little or not at all branched, up to 12 cm long. Flower-groups finally rather many-flowered, but roundish, on thickenings of the stem, each flower surrounded by a distinct involucre of bracteoles. Young parts velvety or even hirsute by ferruginous hairs . . . . . 4. *Ph. malayana*
- Stems long and slender, up to 25 cm long, little or not at all branched. Bracts and 2 prophylls of each flower-group distinct, but involucre of separate flowers indistinct or absent. Young parts papillose or somewhat velvety, soon glabrescent . . . . . 2. *Ph. rigidula*
- Like the former, but different by more strongly branched stems, and more rounded female flowers (male flowers unknown) . . . . . 3. *Ph. caulescens*

1. *Phacellaria Fargesii* Lecomte, in Bull. Mus. Hist. Nat. Paris, 20 (1914) 401; Pilger, in Engl., Nat. Pflanzenfam., ed. 2, 16b (1935) 71.

Stems not over 6 cm long, unbranched, 2—3 mm in diameter above the base, not flattened, the young tips uneven from the beginning through the development of flower-buds, first densely and shortly velvety, later nearly glabrous; bracts rather large, 1—1.25 mm long, 0.8—1 mm wide; prophylls 2, distinct, but involucre absent. Flowers glabrous, hermaphrodite, usually single in the axils, rarely moreover as 2 small buds in the axils of the prophylls, these buds again with small prophylls, but never reaching full development; adventitious flowers absent. See plate I & VIII, 1 and 2.

Very distinct from all other species of the genus by the usually one-flowered axils and hermaphrodite flowers; from most of the species, moreover, by the short unbranched stems and the large bracts and bracteoles.

Description of the type specimens (FARGES 1511, plate I & VIII, 1 and 2):

On *Taxillus sutchuenensis*, on twigs of 5—15 mm in diameter, in smaller and larger bundles, few or many together. Stems always unbranched, 3—6 cm long, those of the same twig in the same stage of development (probably flowering only once), with obtuse ribs decurrent from the bases of the bracts, not flattened, 2—3 mm in diameter at the base, attenuate towards the extremities, which are 1.5—2 mm in diameter. Young tips uneven from the beginning through the early developing flower-buds and spreading bracts, the latter first regularly arranged in a spiral, later somewhat crowded into whorls, finally again more regularly scattered. Bracts triangular-ovate from a rounded base, abruptly shortly acuminate, nearly 1—1.25 mm long, 0.8—1 mm broad, the tip at last shrivelling and growing brown. Flowers usually single in the axils and terminal to the stems, the axillary ones with 2 distinct lateral prophylls, which are nearly 0.5 mm long, ovate-triangular, acute; later sometimes also small flower-buds in the axils of the prophylls, again bearing 2 small prophylls, but never reaching full development. Flowers as far as known all hermaphrodite, first globose in bud (never depressed), later more obovate, before opening finally campanulate-cylindrical, rounded at the base, short-conical in the apical part, nearly 2.25—2.5 mm long, 1.25—1.5 mm in diameter. Perigone lobes usually 5, more rarely 4 in number, nearly erect, 0.75 mm long and broad. Style short-cylindrical, with a slightly scutate stigma. Fruit ovate, somewhat conical, up to 6 mm long by 3.5 mm in diameter, crowned by the erect or inflexed perigone lobes. All young parts, with exception of the glabrous flower-buds, very shortly and densely ferrugineous-velvety, growing glabrous later, at length hairy only on and below the bracts.

*Distribution:* China, N.E. Sze-chuan, "à Fâ hañ ky<sup>c</sup> dans la sous-préfecture de Teheñ keduc tin<sup>c</sup>", alt 1400 m, 8 VII 1900, P. FARGES 1511 (P), "plantes et fleurs d'un jaune verdâtre, parasite sur les Loranthus", types of the species, flowering and fruit-bearing.

2. *Phacellaria rigidula* BENTHAM, in BENTHAM & HOOKER FIL., Gen. pl., III, 1 (1880) 229; in HOOKER's Ic. pl., IV, 1 (1880) 17, tab. 1324; HOOKER FIL., Fl. Br. Ind., V, 13 (1886) 235; HIERONYMUS, in ENGL. & PR., Nat. Pflanzenfam., III, 1 (1889) 216; BOERLAGE, Handl. Fl. Ned. Ind., III, 1 (1900) 181; BRANDIS, Ind. trees (1906) 554; PILGER, in ENGL., Nat. Pflanzenfam., ed. 2, 16b (1935) 71.

Stems slender, 10—25 cm long, 0.75—1.5 mm in diameter above the

base, unbranched or with few branches, the tips nearly 1 mm in diameter, glabrous or somewhat papillose-hairy and then glabrescens except around the flowers; bracts rather large, ovate and acute, 0.6—1 mm long, imbricate in the beginning; prophylls distinct, involucre of 3—6 bracteoles, indistinct or later distinct. Flowers monoecious, as far as known the male and female flowers on different stems of the same plant, first in the axils of the bracts and the prophylls, later also crowded between these, forming together roundish or somewhat oblong groups on the scarcely thickened stem, the female groups with fewer flowers and finally with 1—3 fruits only. See plate II & IX, 13—20.

Nearly allied only to *Ph. caulescens*, but the latter is more strongly branched, with shorter bracts and the female flowers more roundish and single in the axils. Less closely allied to *Ph. tonkinensis*, which has smaller bracts, indistinct prophylls, no involucre, and flower-groups that finally are larger, more oblong, and with more numerous adventitious flowers. The differences with all other species are larger. *Ph. Fargesii* is a small plant with hermaphrodite flowers; *Ph. malayana* and *Ph. compressa* are more robust and more copiously hairy, and have distinct involucre around the flowers; *Ph. gracilis* has more numerous flowers in the groups and an involucre below each flower.

Description of the type specimens (GRIFFITH 2745, see plate II, 4 & 5 & IX, 13—15):

Stems on twigs of *Dendrophthoe*, probably *D. pentandra*, fascicled on the nodes of twigs of 4—8 mm diameter, and also from the lenticels of the internodes, spreading, slender and straight, up to 15 cm long, usually terete and 0.75—1.5 mm in diameter above the somewhat clavate base, gradually attenuate towards the extremities, finely grooved in the flowering portions, slightly dilated and angular below the flower groups, more strongly dilated at the insertions of the branches; branches none or few, rarely up to 5, from the lower portion of the stems divergent or incurvate, the tips terete, usually 0.5—0.75 mm in diameter. Bracts rather large, imbricate in young tips, ovate to elliptical, strongly acuminate, nearly 1 mm long including the acumen, 0.5—0.6 mm broad, convex; axillary flower and two lateral prophylls soon becoming distinct, the latter nearly half as long as the bracts and a quarter as broad, of the same shape for the rest; involucre of 3—5 bracteoles developing later, visible after the flower has fallen off, the separate bracteoles very small and roundish, acuminate or not so; first lateral flowers in the axils of the prophylls, each with an involucre of small bracteoles; further flowers developing between the axillary flower and the lateral ones,

apparently not at the adaxial side of the group, finally forming together a roundish group of nearly 6 flowers on a slight thickening (especially in the male stems). Male flowers nearly globose, first somewhat higher than broad, later somewhat depressed, 4—5-merous, nearly 1.5 mm in diameter. Female flower soon more high than broad, when flowering obovate, with the perigone depressed, nearly 1.5 mm in diameter, 4—5-merous; disc somewhat conical, its height about a quarter of the diameter. Fruit not known in the adult state, oblong-prismatical, up to 4 mm long, 1.5 mm in diameter, crowned by the persistent perigone, usually single in the axils, sometimes to 2 or 3. Arrangement of the male and female flowers uncertain: between the apparently female plants one detached male stem, therefore probably male and female flowers on different branches of the same plant (as in the specimen MACGREGOR 1125).

The type specimens described are well-developed and well-preserved. They are mounted on two sheets. The first sheet (plate II, 4) is the one from which plate 1324 of HOOKER's *Icones* seems to be rather freely drawn; it bears the original label and drawings of details, that have been copied on the plate. These specimens are not entirely glabrous, the very young parts and also the bracts and bracteoles are papillose-velvety, even in older flower-groups. The specimens on the second sheet (plate II, 5) are in a more advanced stage and entirely glabrous, but no differences of importance with those of the first sheet could be stated.

The specimen from the Shan Hills (MACGREGOR 1125, plate II, 6 and IX, 2, 16—19) has the same indument as those from the first sheet of the types. It has several female stems and one male stem originating from the same stock. It is, moreover, remarkable for its rather high-conical discs, the height of the latter being nearly the half of the diameter, and the more numerous flowers in the male flower-groups, that also partly develop at the adaxial side of the group.

The specimens from Yunnan (HENRY 11085, plate IX, 20) are very young. They seem to be female and show only a beginning of flowering. The indument is ferrugineous and very sparse, and restricted to the inflorescences and their immediate proximity.

*Distribution:* China, Yunnan, "S. of Red River, from Manmei, 7000' forest", A. HENRY 11085 (K).

Burma, S. Shan States, without locality, altitude, nor date, R. W. MACGREGOR 1125 (E), on *Dendrophthoe pentandra*. — Mergui, GRIFFITH 2745 = Herb. WIGHT 44 (K), types of the species and the genus, on *Dendrophthoe* prob. *pentandra*.

### 3. *Phacellaria caulescens* COLLETT & HEMSLEY, in Journ. Linn.

Soc. London, 28 (1890) 122, t. 17; BRANDIS, Indian trees (1906) 554; PRAGER, in ENGL., Nat. Pflanzenfam., ed. 2, 16b (1935) 71.

Slender, to 30 cm long, twice branched, to 2.5 mm in diameter above the base, the tips shortly and densely papillose or somewhat velvety, glabrescent later; bracts rather large, roundish, short-acuminate, nearly 0.6 mm long by 0.5 mm broad, first imbricate; axillary flower soon with 2 or more indistinct bracteoles. Female flowers (male ones unknown) single in the axils, globose before opening, somewhat oblong later. See plate IX, 21 and 22.

Slightly different from *Ph. rigidula* by more strongly branched stems and roundish female flowers single in the axils; perhaps only a variety of this species.

Description of the type specimen (COLLETT 736):

Insertion of the plant unknown, parasitic on "*Loranthus*" according to the label. Only stem available broken off above the base, nearly 23 cm long, with several long branches that are again branched in their apical portions, together with the branches up to 30 cm long, terete and 2.5 mm in diameter in the lower portion, somewhat angular but not flattened, and gradually attenuate towards the extremities, the tips nearly 1 mm in diameter. Bracts first imbricate, roundish, short-acuminate, nearly 0.5 mm broad and a little longer, appressed. Flowers restricted to the nearly 5 cm long apical parts, terminal and single in the axils of the bracts, with 2 (perhaps more or less than 2) indistinct bracteoles, all of them female, globose before opening, nearly 1.25 mm in diameter, later slightly longer, with 3—6 conniving triangular perigone lobes; disk rather flat, style short. Fruits ovate-oblong, up to 5 mm long, 2 mm in diameter, somewhat contracted below the persistent inflexed perigone lobes. Indument on all young parts shortly and densely papillose or somewhat velvety, later disappearing.

The plate accompanying the original description is a good drawing of the greater part of the type specimen; also the drawings of the details are very exact. Further materials of the species are unknown.

*Distribution:* Burma, Shan Hills, Twangan, 4000 ft alt., V 1888, COLLETT 736 (K), "parasite on *Loranthus*", type specimen of the species.

4. *Phacellaria malayana* RIDLEY, in Journ. As. Soc., Straits Br., 82 (1920) 193; Fl. Mal. Pen., 3 (1924) 170.

Stems short and straight, up to 12 cm long, little or not at all branched, 1—2 mm in diameter above the base, the young tips terete, densely velvety, ferruginous; bracts first imbricate, 0.8—1 mm long, 0.6—0.8 mm broad, all flowers moreover with a distinct involucre of

small bracteoles at the base. Flowers monoecious, the first of each group female, the further ones probably male, rather many together forming roundish groups on semiglobose thickenings of the stem. See plate III & VIII, 3—8.

Approaches *Ph. compressa* by its coarse stems, velvety indument, and involucre of the flowers, but the flower groups of *Ph. malayana* are roundish, the first flower of each group is female, the subsequent flowers are usually male and originate from the axils of the involucre bracts of the first flower; moreover the stems are shorter and the male flowers are less depressed.

Description of the type specimens (ROBINSON s.n., plate III, 7 & VIII, 6—8):

Stems fascicled, on the thickened nodes of 3—4 mm thick twigs of a *Loranthoidea*, perhaps *Dendrophthoe*, up to 11 cm long, unbranched or with one or two branches, terete or somewhat angular and 1—1.5 mm in diameter above the base, flattened in the apical part (perhaps by pressure) and there up to 2 or 3 mm broad, the tips again 1—1.5 mm in diameter, rarely somewhat dilated. Bracts first imbricate, roundish and short-acuminate, 0.8—1 mm long, 0.6—0.75 mm broad; first axillary flower female without distinct lateral prophylls, but with a very distinct involucre of 6—10 bracteoles, that partly are nearly as large as the bracts, partly smaller than these, and from the axils of which later 5—10 flowers take their origin; these flowers probably all of them male, never fruiting. Female flowers obovate with usually 5 erect perigone lobes, and now and then a stamen, 1.5 mm long, 1 mm wide. Male flowers smaller, less than 1 mm in diameter, nearly 0.5 mm high, 3—5-merous. Indument on the young parts rather densely hirsute-velvety, on the stems and bracts soon diminishing, persistent on the involucre of the flowers, but the flowers themselves glabrous.

This species is well-distinct from all those previously described. The type materials are in an optimal stage of development, with young and old stems, flowering and fruiting. RIDLEY described the seeds as flat (as in *Viscum*), but this undoubtedly was caused by pressure during the drying of the specimens.

The specimens from Cameron's Highlands (plate III, 9 & VIII, 6—8) are in a more advanced stage; flowers are nearly absent and the fruits have for the greater part fallen off. For the rest no differences of any importance could be stated. The specimens from Lenya (plate III, 8) are much younger, with abundant flowers in bud and a few of them open, but they too show no important differences with the type specimens.

*Distribution:* Burma. Mergui, Lenya, 22 II 1927, R. N. PARKER 2670 (K) "parasitic on *Loranthus*" (the host plant indeterminable).

Malay Peninsula. Pahang, Cameron's Highlands, 4500 ft alt., 5 IV 1930, SINGAPORE FIELD No. 23444 coll. HENDERSON (B), "flowers greenish white", on *Loranthaceae*, probably *Macrosolen*. — Selangor, Gunong Mengkuang Lebar, 5000 ft alt., I 1913, H. C. ROBINSON s.n. (K), type of the species, on a *Loranthaceae*, probably *Dendrophthoe*.

5. *Phacellaria tonkinensis* LECOMTE, in Bull. Mus. Hist. Nat., Paris, 20 (1914) 399; Fl. Indo-Chine, V, 3 (1915) 213, ic. 22; PILGER, in ENGL., Nat. Pflanzenfam., ed. 2, 16b (1935) 71.

Stems long and slender, usually 15—45 cm long, 1—2.5 mm or rarely to 4 mm in diameter above the base, unbranched or with few branches, the tips rather fine, 1—1.5 mm in diameter, glabrous from the beginning; bracts small, semi-orbicular to roundish, sometimes short-acuminate, 0.3—0.5 mm long, soon remote; prophylls indistinct or none, involucre none. First flowers axillary, further flowers numerous on all sides of the first ones, at last forming oblong many-flowered flower-groups on little thickened cushions of the stems. See plate IV, 10 and 11 and VIII, 9—12.

Resembles *Ph. rigidula* and *Ph. caulescens* in general appearance, but differs from these species by the indistinct prophylls and the lack of involucre around the flowers, and the many-flowered oblong flower-groups. In the structure of the flower-groups it comes nearer to *Ph. compressa* and *Ph. gracilis*, but these have distinct involucre around the flowers.

Description of the types (BALANSA 4108, plate IV, 10 and VIII, 9—12):

On *Taxillus*, on twigs of 6—8 mm diameter; stems single or few together in fascicles, 10—20 cm long, unbranched or with a different number of irregularly arranged and long branches especially in the middle portion, that are not different from the main stem, sometimes again branched, the secondary branches very young; basal part of the stems terete, 1—2.5 mm in diameter, irregularly obtusely angular in the middle portion, often flattened to 3 mm broad, especially towards the extremities and at the insertions of the thickest branches; young tips terete or somewhat conical, obtuse, nearly 1 mm in diameter, soon becoming uneven by the development of flower-buds, with obtuse ribs below the axils. Bracts imbricate in the beginning, small, 0.3—0.4 mm long, roundish with broad base, short-acuminate, the acumen soon shrivelling, the whole bract almost disappearing at length. Flowers dioecious but not strictly so, some plants male, others male with few

female or hermaphrodite flowers, others perhaps entirely female; first flower of each group in the axil of the bract, with neither prophylls nor involucre of bracteoles, soon surrounded by adventitious small depressed flower-buds, that are more numerous at the adaxial than at the bracteal side, and that at length form oblong groups up to 7 mm long by 2 mm broad on slight thickenings of the stem; no terminal flowers seen. All flower-buds depressed in the beginning, up to 1 mm in diameter, the male ones remaining so, with usually 4, more rarely 5 triangular perigone lobes, the female and hermaphrodite flowers later roundish-ellipsoidal through the development of the ovary, with usually 5, more rarely 4, perigone lobes, 1.5—2 mm long, the style short-cylindrical, the stigma truncate or slightly scutate. Fruit up to 6 mm long, 2.5 mm in diameter, broadest near the base, gradually attenuate towards the persistent perigone. Very young parts papillose-hairy, glabrescent, or later with a remainder of the indument below the bracts only; flowers entirely glabrous.

The host of the types of *Ph. tonkinensis* in a *Taxillus* near *kwantungensis*, which I cannot determine with certainty (see Bull. Jard. Bot. Buitenzorg, sér. 3, XVI, 1, p. 44—45). The types themselves are in an optimal stage of development, but they are badly broken (see Plate IV, 10).

The specimens of EVRARD 934 (plate IV, 11) are parasitic on *Scurrula gracifolia*; nearly all the stems are broken off from the host plant. They are in an advanced stage of development, 20—45 cm long, one or twice branched, nearly glabrous, with one or few fruiting flowers in each flower-group and most of the further flowers fallen off.

*Distribution:* French Indo-China. Tonkin, forest of Mt. Bavi, towards 1000 m alt., 28 X 1887, BALANSA 4108 (P, L), "corolle d'un blanc sale", types of the species, parasitic on a *Taxillus* near *kwantungensis*. — Annam, Dalat, 23 VI 1924, EVRARD 934 (P, L), "vert clair, aphyllé", on *Scurrula gracilifolia*.

#### 6. *Phacellaria gracilis* DANSER, n. sp.

Caules longi, graciles, ad 30 cm longi, simplices vel ramis paucis, 1—2 mm diametro supra basin, parte media saepe paulo crassiores, apicibus plerumque 1 mm, raro ad 1.5 mm diametro, ab initio glabri; bractae ovatae, circiter 0.6 mm longae, paulum acuminatae, imbricatae, postea magis triangulares et distinctius acuminatae; flores omnes involucro distincto bracteolarum minutarum numerosarum circumdati. Flores primum singuli in axillis bractearum, postea cum multis floribus adventiciis greges oblongos planos formantes. Plate IV, 12 & IX, 23—25.

I did not see the possibility of including POILANE's no. 25403 in

any of the species already described. It resembles *Ph. rigidula* and *Ph. tonkinensis* in general appearance, but from the former it differs by the many flowered flower-groups and the more strongly developed involucre of the separate flowers, from the latter by the larger bracts and likewise by the involucre of the flowers. Through the latter feature it approaches *Ph. compressa*, but this species usually has shorter and more robust stems, a more copious indument, and larger bracts. The latter differences are rather vague, but the bracts are entirely like those of *Ph. rigidula*, and not like those of *Ph. compressa*. Therefore, I even consider the possibility, that the flower-groups of *Ph. rigidula* may occasionally develop more numerous flowers, in which case the limit between *Ph. rigidula* and *Ph. gracilis* would be effaced.

Description of the types (POILANE 25403, plate IV, 12 and IX, 23—25):

On *Scurrula parasitica*, the stems originating is large numbers from twigs of 10—20 mm in diameter, and here and there singly from thinner twigs, up to 30 cm long, unbranched or with few branches in the lower portion, or with numerous short branches below the young tips, terete and 1—2 mm in diameter above the base, often thicker (up to 2.5 mm) in the middle portion, somewhat irregularly angular, the young tips terete or somewhat conical, usually 1 mm, more rarely up to 1.5 mm in diameter. Bracts first ovate to elliptical and somewhat acuminate, nearly 0.6 mm long, regularly and rather densely imbricate, shrivelling later and then more triangular and more distinctly acuminate. Flowers nearly all of them male, here and there a female or hermaphrodite one in the middle of a group; prophylls absent, but each flower with an involucre of numerous small bracteoles; first one flower in each axil, later surrounded by rather numerous (nearly 6—12) adventitious flowers originating from the stem surface, especially at the bracteal and adaxial sides, all of them with an involucre; often instead of flowers roundish buds covered with small bracteoles; all flowers and buds together forming an oblong group not placed on any thickening of the stem. Flower-buds depressed in the beginning, soon becoming semi-globose, up to 0.75 mm in diameter, with 4—5 lobes, later opening into erect lobes and then up to 1 mm in diameter; the hermaphrodite and female flowers later obovate and 1.5—2 mm long through the development of the ovary, with 5 perigone lobes. Fruit unknown. All parts glabrous from the beginning.

*Distribution:* French Indo-China. Annam, Quang-tri prov., Col d'Ailao, alt. 500 m, 15 III 1936, POILANE 25403 (P, L), types, on *Scurrula parasitica*, this again parasitic on *Citrus nobilis*.

7. *Phacellaria compressa* BENTHAM, in BENTH. & HOOK. FIL., Gen. pl., II, 1 (1880) 229; HOOKER FIL., Fl. Br. Ind., V, 13 (1886) 235; COLLETT & HEMSLEY, in Journ. Linn. Soc. London, 28, no. 189—191 (1890) 122; HIERONYMUS, in ENGL. & PR., Nat. Pflanzenfam., III, 1 (1889) 216; BOERLAGE, Handl. Fl. Ned. Ind., III, 1 (1900) 181; BRANDIS, Ind. trees (1906) 554; PILGER, in ENGL., Nat. Pflanzenfam., ed. 2, 16b (1935) 71; *Phacellaria Wattii* HOOKER FIL., Fl. Br. Ind., V, 13 (1886) 236; BRANDIS, Ind. trees (1906) 555; PILGER, in ENGL., Nat. Pflanzenfam., ed. 2, 16b (1935) 71; *Phacellaria ferruginea* W. W. SMITH, in Not. Bot. Gard. Edinburgh, X, 49—50 (1918) 188; non HANDEL-MAZZETTI, Symbol. sin., VII, 1 (1929) 157.

Stems usually up to 20 cm long, but coarser than in all other species and more strongly flattened, 1.2—2.5 mm in diameter above the base, often up to 4 mm broad towards the extremities, the young tips terete, 1 mm or more in diameter; bracts usually imbricate on the young tips, more rarely remote from the beginning, nearly 1 mm long, up to 0.75 mm broad, acuminate; prophylls none or indistinct, but each flower with a distinct involucre of numerous small bracteoles, the first flower of each group axillary, the next few flowers perhaps in the axils of the bracteoles, most of the many flowers around the first one but outside its involucre and especially developing between the bract and the first flower, the latter moving upwards, the bract gradually shrivelling, the whole flower-group at length up to 7 mm long, 2 mm broad, inserted on a slight thickening of the stem. Plants usually dioecious, or on the male plants a few female or hermaphrodite flowers. Indument on all young parts densely velvety, or even hirsute, ochraceous or ferrugineous, less dense on the older parts of the stems, but persistent in the flower groups. Flowers either papillose or glabrous in the very young state, always glabrous later. See fig. 2, on page 228, and plate V—VII & X.

Closely allied to *Ph. gracilis*, but this is more slender and has the bract-shape of *Ph. rigidula*, and is, moreover, glabrous. Likewise to *Ph. tonkinensis*, but this is nearly glabrous and more slender, and has no involucre at the base of the flowers, and much smaller bracts. Also to *Ph. malayana* through the coarse stems, the involucre around the flowers, and the velvety or hirsute, ferrugineous indument, but *Ph. malayana* has all flowers in the axils of the bracteoles and, consequently, roundish flower-groups.

*Ph. compressa* was based on young, badly preserved plants (plate V, 13). Comparison, however, with the plants listed below, and among

which are the types of *Ph. Wattii* and *Ph. ferruginea*, showed that they all had to be included in one species. The types of *Ph. compressa* are female, or perhaps hermaphrodite, as appears from descriptions and drawings by L. PIERRE preserved in the Paris Herbarium (see fig. 2). As is evident from a letter by BAILLON, written to PIERRE October 17, 1888, and accompanying PIERRE's description, the latter was made from specimens which BAILLON received from Kew. Of these materials, however, nearly nothing is left on the sheet or in the cover in the Paris Herbarium. The description is as follows.

"*Phacellaria compressa* Benth. ex specim. a Baillon recepto."

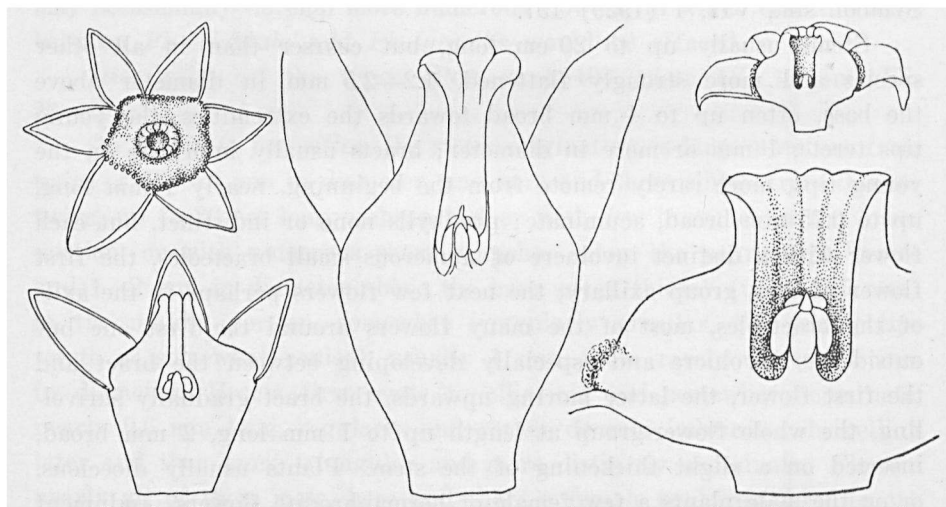


Fig. 2. Reproduction in ink of the most important leadpencil drawings by PIERRE to his notes on the type specimens of *Phacellaria compressa*, preserved in the Herbarium of the Paris Museum of Natural History.

"Flores ♀ secus ramos valde compressos urnigeros immersi. Bracteae bracteolaeque 0. Perianthii folia 6 margine disci inserta, oblonga, acuminata, fulvo-pilosa, valvata. Discus superus cum stylo confluentis, carnosus, ovarium vestiens vel basi ovarii et perianthii annularis. Ovarium fere superum vel basi leviter inferum 1-loculare vel ima basi incomplete 5-loculare. Stylus brevis crassus, usque placentam pervius, ore lobis 4—5 brevissimis. Columna axillaris leviter infera ad apicem libera supra ovula leviter producta, in cavitate erecta, ima basi inter ovula dissepimentis 5 divisa. Ovula 4—5, ab apice placentae descendunt."

"Fl. ♀ ? Stamina lobis perianthii alterna, filamentis complanatis brevibus, antherae apiculatae loculis valde divergentibus lateralibusque apertis."

"Nota. Je n'ai vu qu'une et deux étamines dans une fleur paraissant femelle. Ces étamines étaient alternes, non épipétales. De plus, l'ovaire n'est pas complètement infère. Il est même supère dans la fleur jeune et à peine semi-infère dans la fleur avancée. Le style est ouvert jusqu'au placenta qui se termine par une courte pointe, au dessus de laquelle pendent 5 ovules. Vers la base de ces ovules on distingue cinq rudiments de cloisons. Il n'est donc pas possible de placer cette plante parmi les *Osyridae*, où l'ovaire est complètement infère. Mais ce caractère de l'ovaire semble peu important. Cependant, s'il se vérifiait que les étamines fussent alternes, non épipétales, caractère dont je ne suis pas sûr, rejetterait cette plant hors des *Santalacées*. On peut considérer le disque comme confluent avec le style, comme dans le genre *Cathedra* etc. Le disque a certainement 5 angles ou davantage alternes avec les lobes du périanthe."

Though PIERRE examined too young flowers and consequently wrongly considered the ovary to be superior and (though not without doubt) the stamens to alternate with the perigone lobes, I take the liberty to publish his description, as it contains observations on the septa of the ovary and the number of ovules that have not yet been published elsewhere.

Of the types of *Ph. compressa* (PARISH s.n.) in the Kew Herbarium I give the following description (plate V, 13):

Parasitic on a twig fragment in a fascicle of more than 11 stems, these all unbranched, 7.5—13 cm long, 1.25—1.5 mm in diameter above the slightly swollen base, terete or slightly angular, flattened upwards, up to 2.5 mm and here and there up to 3 mm broad, less than 0.5 mm thick, the young tips rounded or obtuse, 1.25—2 mm broad. Bracts ovate, acuminate, up to 1 mm long and 0.3—0.4 mm broad, convex, imbricate in the beginning, soon remote, later less distinct, somewhat spreading. Flowers soon developing in the axils, first single, surrounded by 2 or more bracteoles or not so, later moving upwards and giving place to rather many young flower buds, the whole group becoming oblong; flower buds strongly depressed, 5—7-merous, the oldest one of each group at length developing, female, including the inferior ovary obovate, 1 mm long and wide, the perigone depressed, the lobes triangular, the disc flat or slightly conical, the style short-cylindrical, truncate. Further stages of development unknown. All parts densely velvety, almost tomentose, ferruginous, with exception of the flower-buds, that are papillose in the very young state, glabrous later.

When HOOKER described *Ph. Wattii* (see plate V, 14) as distinct

from *Ph. compressa*, he was right in so far as his specimens were entirely different from the types of *Ph. compressa* in appearance and in a much more advanced stage of development. This also caused him to describe the flowers of *Ph. Wattii* as much larger than those of *Ph. compressa*. He was, however, wrong in describing *Ph. Wattii* as hoary. The type specimens look somewhat hoary through mould, but for the rest are rather ferrugineous, like those of *Ph. compressa* and *Ph. ferruginea*.

Of the type specimens of *Ph. Wattii* (WATT 6154) I give the following description:

Parasitic on a twig of *Macrosolen* (prob. *parasiticus*) of nearly 10 mm diameter, many stems over a distance of nearly 6 cm from the thickenings of the nodes, but not really fasciated. Stems up to 18 cm long, with several (up to 10) divaricate or ascending branches especially in the middle portion, terete and 1.25—2 mm in diameter above the slightly swollen base, towards the extremities sometimes thicker, sometimes thinner, here and there somewhat flattened, especially at the insertions of the branches, but not towards the extremities; the latter with obtuse ribs, that are decurrent from the axils. Bracts not imbricate, soon remote and convex through the developing flower-buds, triangular, acute, 0.75—1 mm long, 0.75 mm broad at the base, the depressedly globose axillary flower with 2 small prophylls and probably some small involueral bracteoles, perhaps with small flower-buds in their axils, and later with more small buds between the bract and the axillary flower moving upwards, the flower-group at length oblong or roundish-oblong, or even a few groups confluent, together up to 6 mm long, 3 mm broad, on slight thickenings of the stem, up to 2 mm high, the fallen-off flowers leaving shallow hollows in the stem. All stems apparently male. Male flowers depressed, up to 1 mm high, up to 1.25 or even 1.5 mm in diameter, usually 4—5-merous, the perigone lobes erect or somewhat spreading, short-triangular, thickish, 1 mm long and broad, the stamens as usual. Indument ochraceous to ferrugineous, or blackish at length, but not hoary, on all young parts shortly but very densely velvety, less dense later, the stems glabrescent in the lower portion, the flower-groups with bearded, somewhat tomentose bracteoles, the young flower-buds velvety, later papillose, but the adult flowers nearly glabrous.

Also W. W. SMITH was right in describing his *Ph. ferruginea* (see plate VI, 15) as a new species closely allied to *Ph. Wattii*, in so far as the type on which he based his species was rather different from the type of *Ph. Wattii* through the more robust stems, the larger bracts,

that are more strongly imbricate on the young tips, and the more dark-ferruginous indument; but among the materials listed below it seems impossible to distinguish more than one well-defined species. The types of *Ph. ferruginea* in the Edinburgh and Kew Herbaria are in a very advanced stage of development. The Edinburgh specimen is male, but in the accompanying cover there are detached fruits; the Kew specimen is female. Most of the flowers have fallen off the old stems, whereas the young stem tips do not yet bear flower-buds. The following description of the type specimens (FORREST 11585) must, therefore, remain incomplete.

Parasitic on twigs of 8—15 mm in diameter, probably of a *Loranthaceae*, fascicled and scattered, on the nodes and the internodes, many together, up to 18 cm long, terete and 1.25—2.5 mm in diameter above the base, unbranched or with a small number of branches at different heights, sometimes entirely terete, often flattened at the insertions of the branches and towards the extremities, or even fasciate, the flower-groups on thickenings of the stems. Bracts imbricate, ovate-acuminate, up to 1 mm long, later more apart, spreading, and more triangular. Axillary flower-groups gradually more-flowered, finally oblong, up to 6 mm long, each flower with an involucre of small bracteoles. Flowers dioecious. Male flowers strongly depressed in the very young state, later more globose, with 4—5 erect perigone lobes when open, 1—1.5 mm in diameter, the oldest flowers nearly 2 mm high, with perigone lobes broadly triangular, thickish, up to 1 mm long, 0.8 mm broad. Detached fruits ovate or ovate-oblong, up to 5 mm long, 3—4 mm in diameter, crowned by the persistent perigone, glabrous.

As the type specimens of *Ph. ferruginea* are too incomplete to base a full description on them, I will give this from specimens that undoubtedly are identical with them, viz., those collected by CHEVALIER, in Annam, under the numbers 30755 (♀, see plate VII, 17 and X, 26 and 27) and 30755-bis (♂, see plate X, 28).

Parasitic on *Loranthaceae*, female plants on *Taxillus chinensis*, male plants on *Macrosolen avenis*, fascicled and scattered on branches of 7—10 mm in diameter and single in the axils on twigs of 1—1.5 mm in diameter. Stems up to 15 cm long, irregularly branched especially in the lower and middle portion, the branches often branched again, the main stems 1.5—2.5 mm in diameter above the base, irregularly angular, here and there irregularly flattened, up to 3 or 4 mm broad or even fasciate, the young extremities terete. Bracts imbricate on the young tips, obovate from a broad base, short-acuminate, 0.75—1 mm long, 0.5—0.75 mm

broad, soon convex through axillary buds, remote, gradually shrivelling, finally almost disappearing. Flowers in axillary groups, but also single on short axillary branches. First flower-bud of each group axillary, depressed, with an involucre of nearly 5 very small bracteoles; next flower-buds very near the first bud, perhaps developing from the axils of the bracteoles, soon more numerous buds outside the involucres of the preceding buds, especially between the bract and the first flowers, less on the adaxial side, very few laterally, all of them slightly immersed in hollows of the stem, that probably are formed by the indistinct fringed involucres, the whole group finally oblong, up to nearly 6 mm long 2 mm broad, the female groups on distinct thickenings of the stem, the male ones hardly so. Female flower-buds strongly depressed and not to be distinguished from the male flower-buds in youth, the perigone developing long before the ovary, depressed-pyramidal, at length the ovary developing, the whole bud becoming obovate, 2 mm long, 1.5 mm in diameter, the perigone lobes usually 5, more rarely 6, very rarely 4 in number, triangular, nearly 0.5 mm long; disc nearly flat; style very short, cylindrical, nearly 0.2 mm both in length and in diameter, truncate. Male flowers first strongly depressed, finally ovate, 1.5—1.75 mm high, 1.5 mm in diameter, the solid basal part obconical, the perigone lobes together semiglobose, usually 4, rarely 5 in number, triangular, thickish, valvate. Fruits not known in the adult stage, those available up to 6 mm long, with a fleshy outer and a hard inner layer, containing a 3 mm long seed with 6 longitudinal grooves and 6 lobes at the apex. Indument dense and velvety on all young parts, ferruginous or more ochraceous, consisting of thickish papillose hairs, later gradually disappearing from the stems, persistent or partly persistent near the flower-groups and especially between the flowers and on the involucres. Flowers entirely glabrous from the beginning.

Of the further specimens listed below, HOWELL's from Yunnan (see plate VI, 16) are nearly identical with FORREST's, but they are female and abundantly fruit-bearing, with some of the fruits apparently ripe; they are parasitic on *Taxillus Delavayi*.

COLLETT's specimens from the Shan Hills Plateau are less robust than any of the further specimens and nearly all of the stems are simple, but for the rest they show no particularities. They are fascicled and scattered on twigs of a *Henslowia*, and all of them male. Also ROBERTSON's specimens (plate X, 29—33) from the Taunggyi Crags are parasitic on *Henslowia*, but they are as robust as CHEVALIER's plants described above. They are partly male, partly female. The indument is

rather more ochraceous than ferrugineous. One branch of the *Henslowia* shows many scars of stems already fallen off, whereas in the younger part new young stems are originating at several points. This suggests that *Phacellaria compressa* may creep under the bark of the host and may disappear at one point and reappear at another.

POILANE's no. 24714, from the Braïan, is female and parasitic on *Elytranthe albida*. The stems are abundantly flowering and already bear young fruits. They are very much like CHEVALIER's plants. POILANE's specimens from Blao, no. 22512 (see plate VII, 18), are parasitic on *Taxillus chinensis*, but for the rest cannot be distinguished from those of the former number. They are male, but one stem of the main bundle bears a few young fruits. POILANE's no. 22212 consists of broken young specimens on a fragment of a Loranthaceous branch; these specimens entirely agree in their characters with the other numbers of the same collector.

EVARD's no. 1878 consists of non-flowering fragments, which cannot belong to another species and show no differences from *Ph. compressa*.

KLOSS's specimens consist of detached stems, most of them male, one female and with a beginning of fruiting. They are little hairy and the indument is rather light-coloured, but as for the rest they agree with other Annamese specimens I have no doubts as to their specific identity.

HAYATA's specimens collected under no. 576 are old and coarse branched male detached stems, which have lost most of their flowers and nearly all of their ferrugineous indument. The specimen collected by HAYATA under no. 905 together with *Taxillus chinensis*, is one branched female stem with many unripe fruits and only few open flowers.

KERR's specimens from Siam are very much like those collected by CHEVALIER and POILANE in Annam. They are parasitic on *Elytranthe albida* and bear numerous male flowers, less numerous hermaphrodite ones, and perhaps few female ones.

*Distribution:* Burma. "Mao" (i. e. Muang Mao, or Muang Maw), on the eastern frontier of India (not in Manipur, as is usually cited from the label), alt. 7500 ft, 22 II 1882, GEORGE WATT 6154 (K), type of *Phacellaria Wattii* HOOKER FIL., on *Macrosolen* prob. *parasitica*. — Shan Hills Plateau, alt. 5000 ft, II 1888, H. COLLETT 331 (K), on *Henslowia* ("a *Viscum* on another *Viscum*"). — Southern Shan States, Taunggyi Crags, alt. 5700 ft, 3 IV 1926, W. A. ROBERTSON 2110 (K), "flowers yellowish green, parasitic on no. 2109", which is a *Henslowia*. — Moulmein, C. PARISI s.n. (K), type of *Phacellaria compressa* BENTHAM.

China. Yunnan, Tali Range, Lat. 25°40' N., 9—10,000 ft alt., IX 1913, GEORGE FORREST 11585 (E, K), "parasitic shrub of 6—12 inches, on f. in mixed

forests", types of *Phacellaria ferruginea* W. W. SMITH. — Yunnan, neighbourhood of Teng-yueh, 1911, E. B. HOWELL 325 (E), on *Taxillus Delavayi*.

French Indo-China. Annam, Lang Bian Mts., Dalat, 1400 m alt., 12—15 II 1914, CIEVALIER 30755 (P, L), female, on *Taxillus chinensis*, and 30755-bis (P), male, on *Macrosolen avenis*. — Upper Donnaï Prov., foot of the Braïan, near Djiring, 900 m alt., 4 III 1935, POILANE 24714 (P), female plants, on *Elytranthe albida*, this on *Quercus* no. 24711. — Dalat, 9 VI 1921, HAYATA 576 (P), male; Dalat, arboretum, 24 XI 1924, EVRARD 1878 (P), "Viscum, sur Loranthus 1877" = *Scurrula parasitica*. — Blao Agricultural Station, 800 m alt., 7 III 1933, POILANE 22212 (P), male. — *ibidem*, POILANE 22512 (P), on *Taxillus chinensis*, nearly male, but on one stem few female or hermaphrodite flowers. — Bellevue, HAYATA 905 (P), on *Taxillus chinensis*, female. — Langbian Prov., Dran, 3—4,000 ft alt., III—V 1918, C. BODEN KLOSS s.n. (BM), "mistletoe, fruit green", male and female stems.

Siam. Kao Keo Kang, S. of Dan Sai, alt. 1300 m, 10 IV 1922, KERR 5796 (Herb. KERR), on *Elytranthe albida*.

#### To be excluded from the genus.

"*Phacellaria ferruginea* W. W. SM.", HANDEL-MAZZETTI, Symbol. sin., VII, 1 (1929) 157 = *Viscum Loranthi* ELMER, Leaf. Philipp. Bot., 8, art. 121 (1919) 3089; DANSER, in Bull. Jard. Bot. Buitenzorg, sér. 3, XI, 3—4 (1931) 464, ic. 27, b, c; in Philipp. Journ. Sc., 58, 1 (1935) 142.

This record was based on the number HANDEL-MAZZETTI 4414 from China, Yunnan, in the Herbarium of the Vienna Natural History Museum, a fragment of which I could examine through the kind intermediary of Dr K. H. RECHINGER.

#### Index of collectors' numbers.

BALANSA 4108 = *Ph. tonkinensis*, type.  
 CIEVALIER 30755 & 30755-bis = *Ph. compressa*.  
 COLLETT 331 = *Ph. compressa*; 736 = *Ph. caulescens*, type.  
 EVRARD 934 = *Ph. tonkinensis*; 1878 = *Ph. compressa*.  
 FARGES 1511 = *Ph. Fargesii*, type.  
 FORREST 11585 = *Ph. compressa*, type of *Ph. ferruginea*.  
 GRIFFITH 2745 = *Ph. rigidula*, type.  
 HANDEL-MAZZETTI 4414 = *Viscum Loranthi*.  
 HAYATA 576 & 905 = *Ph. compressa*.  
 HENDERSON 23444 = *Ph. malayana*.  
 HENRY 11085 = *Ph. rigidula*.  
 HOWELL 325 = *Ph. compressa*.  
 KERR 5796 = *Ph. compressa*.  
 KLÖSS s.n. = *Ph. compressa*.

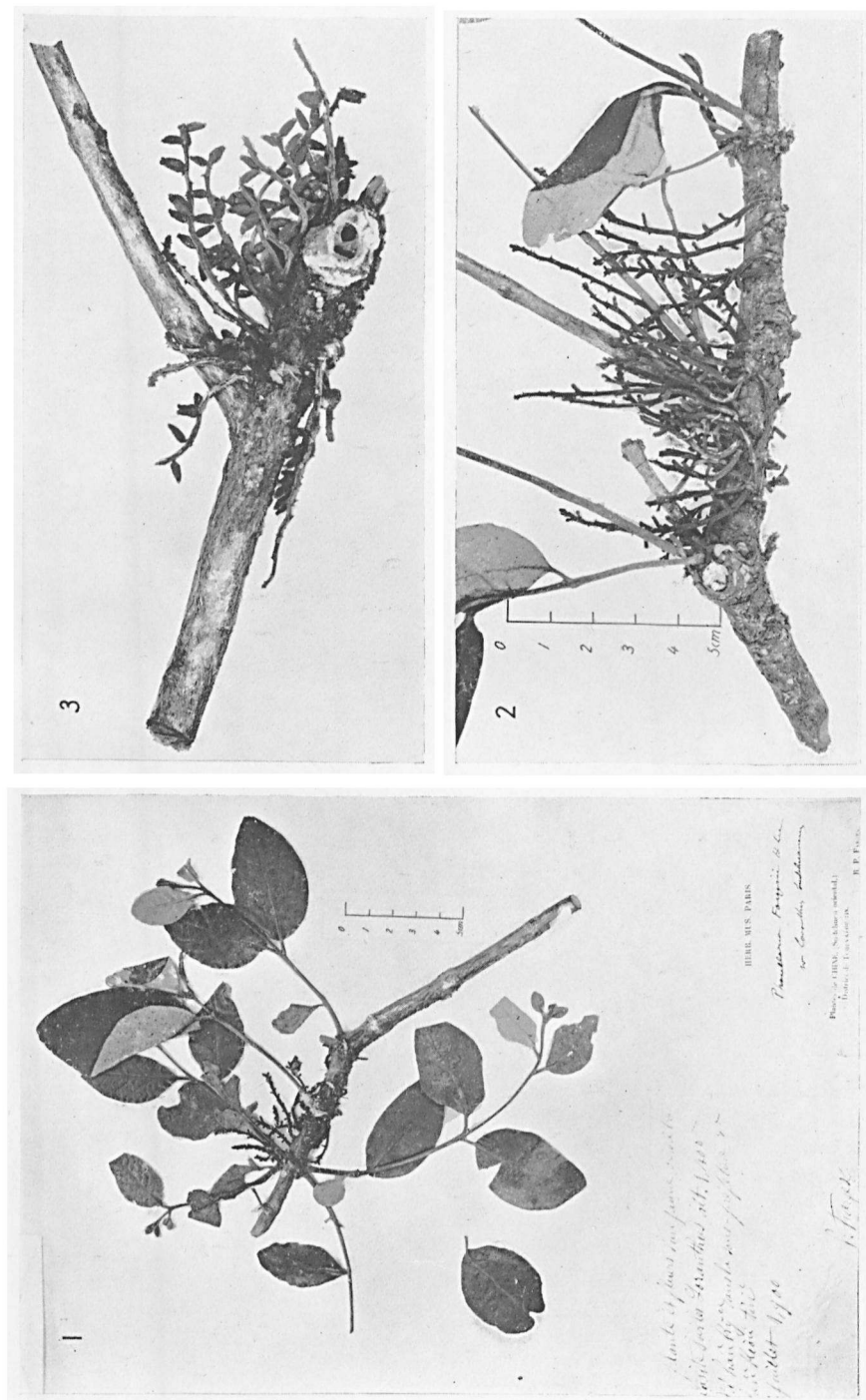


Plate I. *Phacellaria Fargesi*, some of the type specimens (FARGES 1511) on *Tarillus sutchuenensis*; 1: young and flowering stems; 2: older stems; 3: fruiting stems (same enlargement as 2). — Photo L. ALKEMA.

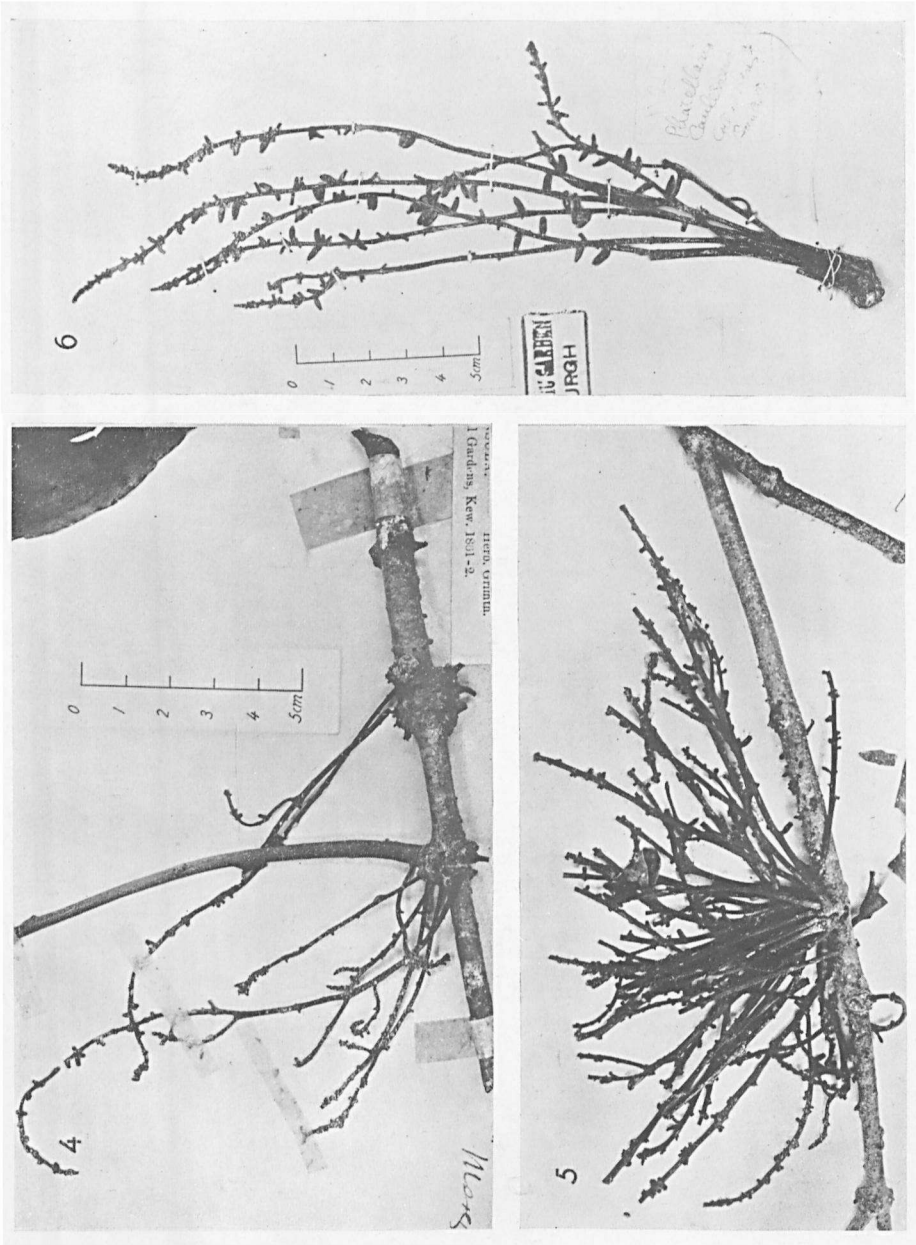


Plate II. *Phacellaria rigidula*; 4 and 5, type specimens (GRIFFITH 2745) on *Dendrophthora*; 6: other specimen (MACGREGOR 1125).  
Photo L. ALKEMA.

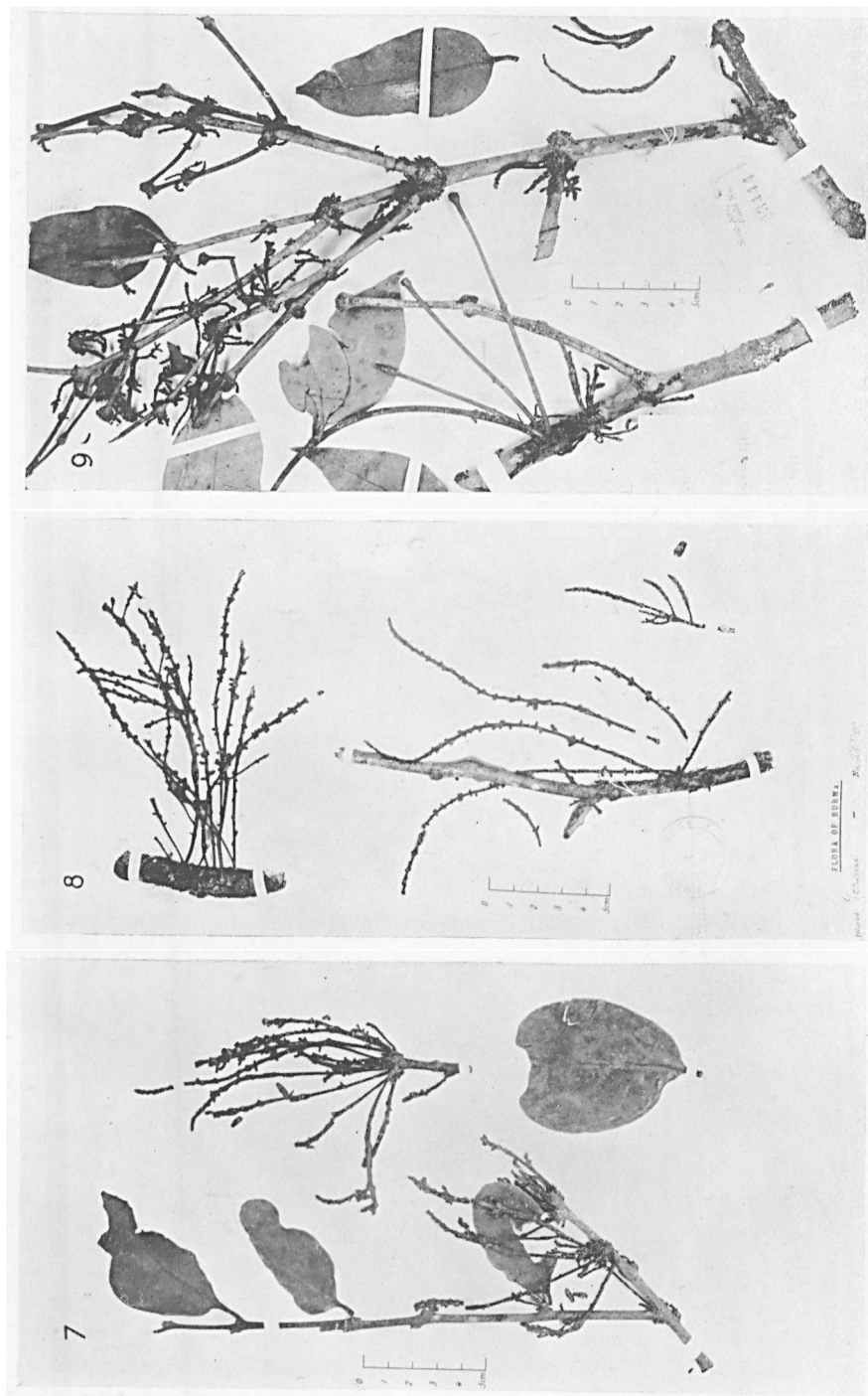


Plate III. *Phacellaria malayana*; 7: type specimens (H. C. ROBINSON s.n.) on *Dendrophthoe*; 8: young specimens (PARKER 2670) on unknown *Loranthaceae*; 9: old specimens (SINGAPORE FIELD No. 2344) on *Macrosolen*. — Photo L. ALKENA.

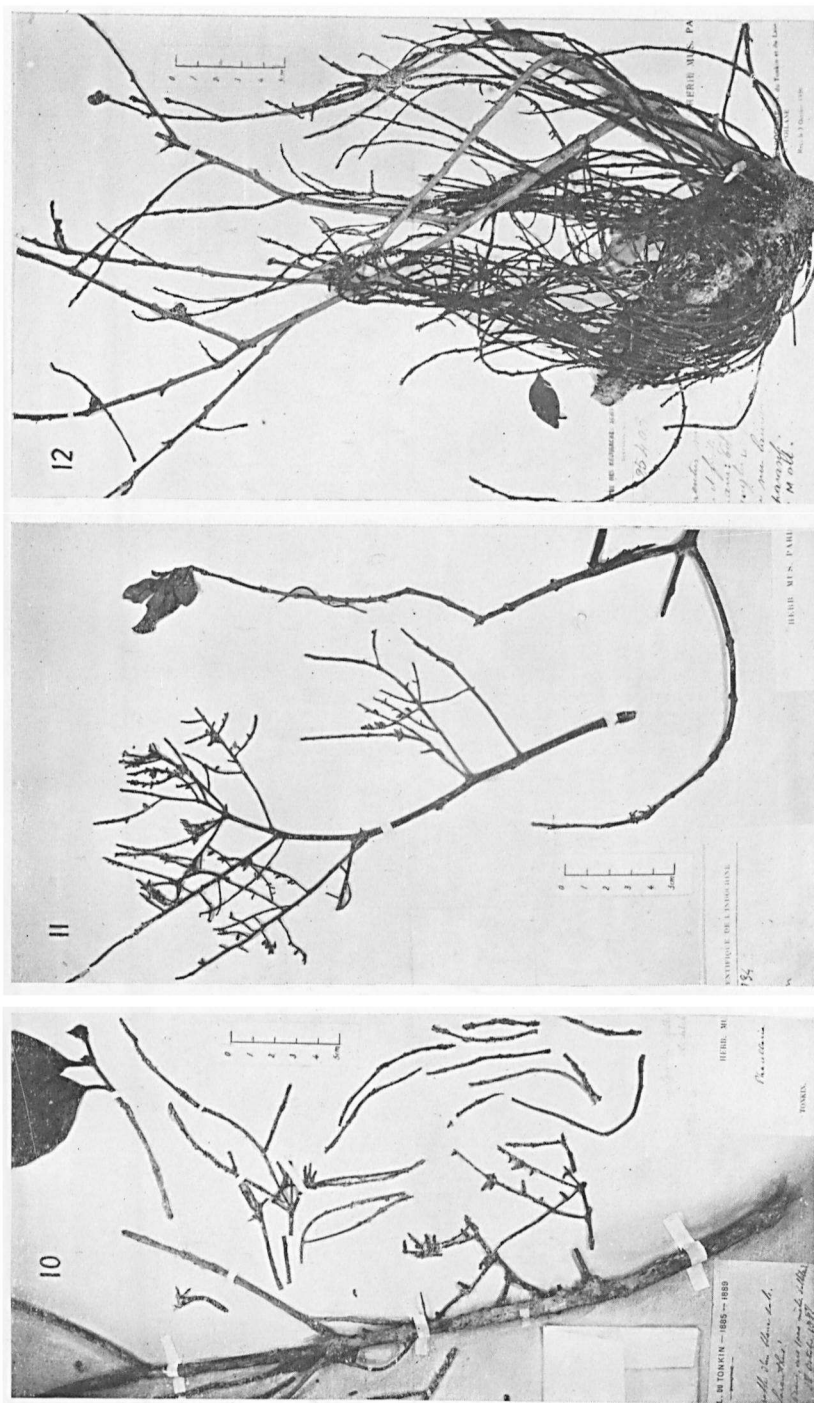


Plate IV. 10 and 11: *Phacellaria tonkinensis*; 10: part of the type specimens (BALANSA 4108) on *Taxillus*; 11: other specimen (EVRARD 934) on *Scurrula gracilifolia*; 12: *Ph. gracilis*, type specimen (POLANKE 25403) on *Scurrula parasitica*. — Photo L. ALKENA.



Plate V. *Phacellaria compressa*; 13: type specimens the species (PARISH s.n., same enlargement as the following; 14: type specimens of *Ph. Wattii* (WATT 6154) on *Elytranthe*. — Photo L. ALKEMA.

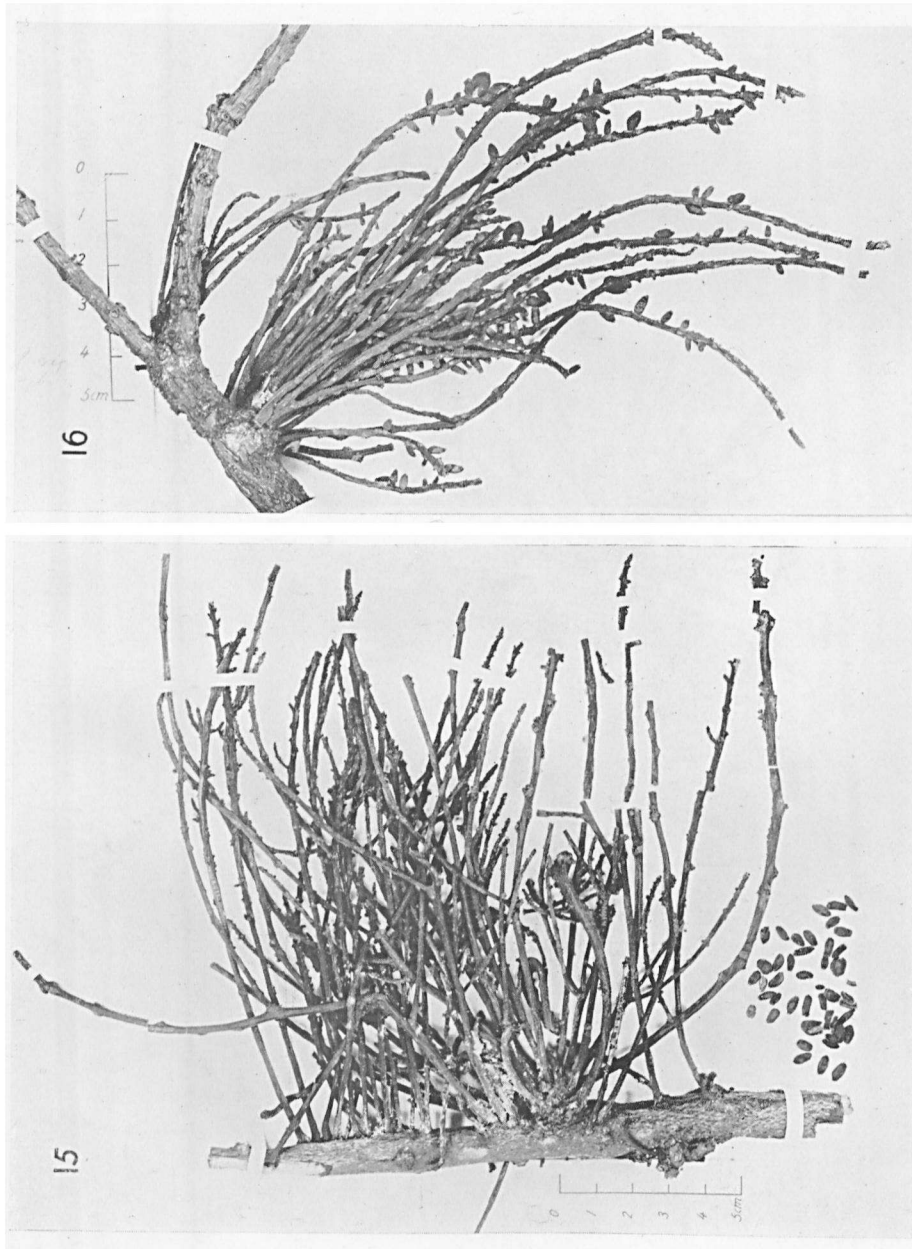


Plate VI. *Phacellaria compressa*; 15: type specimen of *Ph. ferruginea*, male plant and detached fruits (FORREST 11385) on unknown *Loranthaceae*; 16: female plant (HOWELL 325) on *Taxillus Delavayi*. — Photo L. ALKEMA.

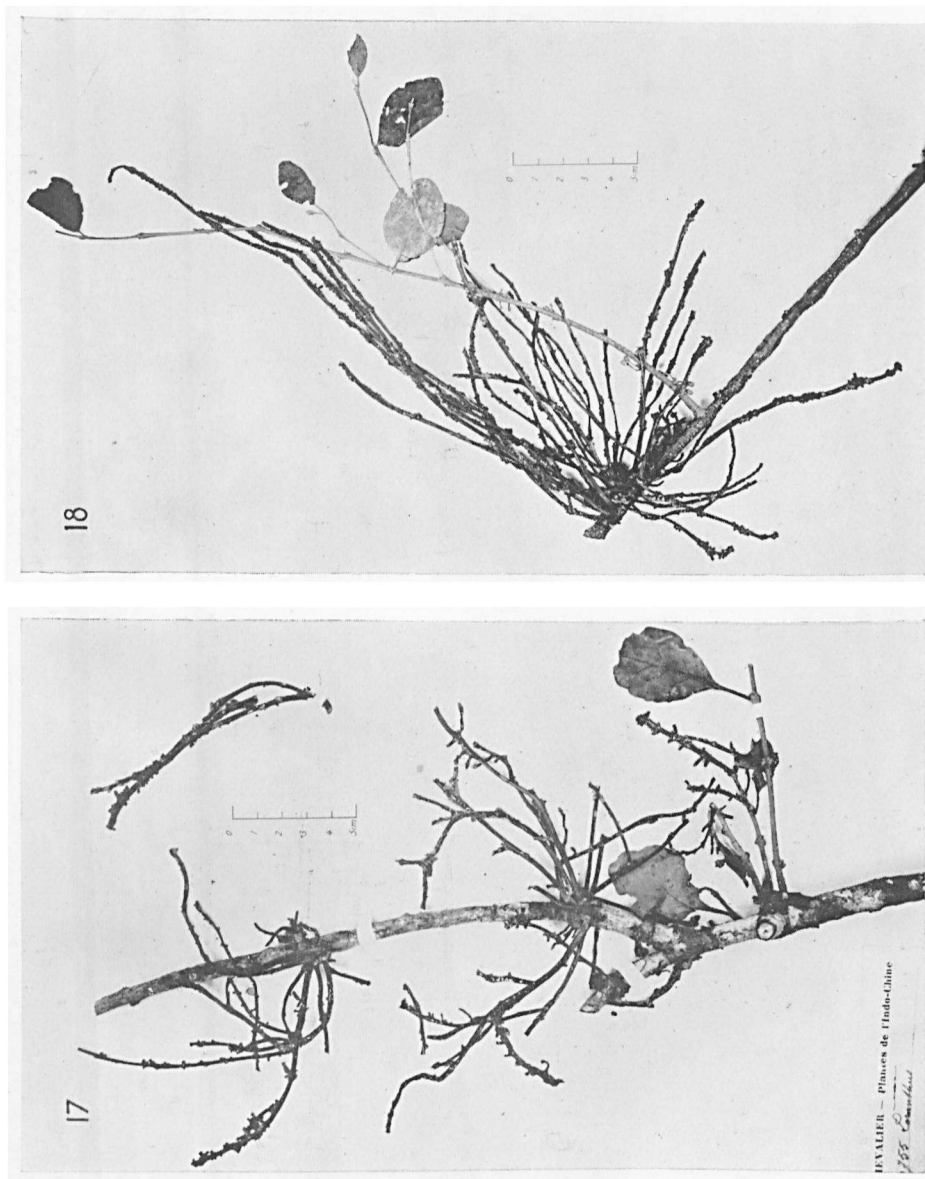


Plate VII. *Phacellaria compressa*; 17: female plants (CHEVALIER 30755) on *Tarillus chinensis*; 18: almost male plant (POLANE 22512) on *Tarillus chinensis*. — Photo L. ALKEMA.

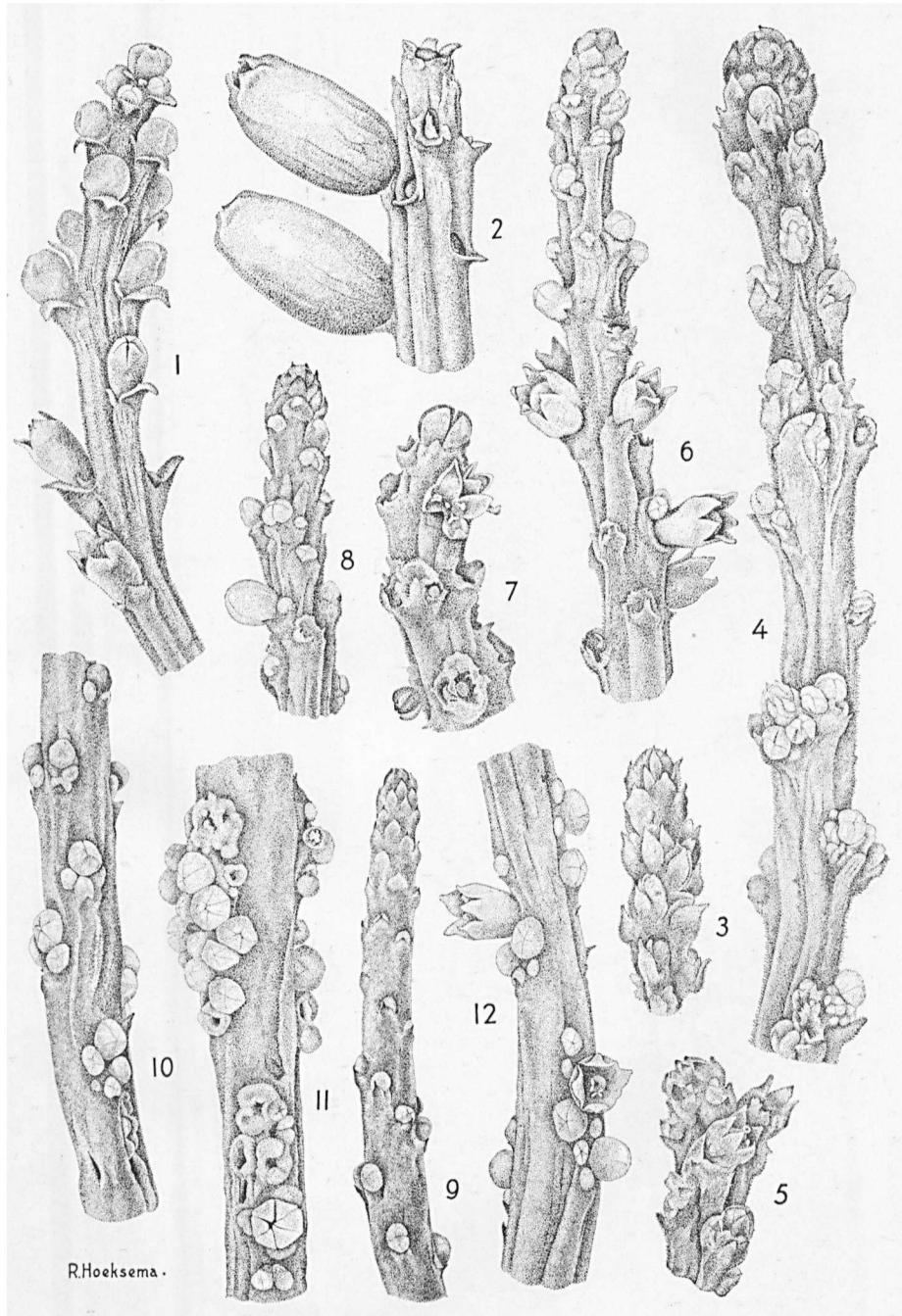


Plate VIII. 1 and 2: *Phacellaria Fargesii* (FARGES 1511); 1: flowering stem tip, 2: fruiting stem tip; 3-8: *Phacellaria malayana*; 3-4: stem tips in bud (ROBINSON s.n.), 5: stem tip with female flowers (*idem*); 6: stem tip with female flowers (SING. FIELD No. 23444); 7: stem tip with male flowers (*idem*), 8: stem tip with buds (*idem*); 9-12: *Phacellaria tonkinensis* (BALANSA 4108), 9: young stem tip with flower buds; 10 and 11: stem fragments with male flowers in bud (11 upside down); 12: stem fragment with male flowers in bud and hermaphrodite flowers opened. All figures 5 × enlarged.

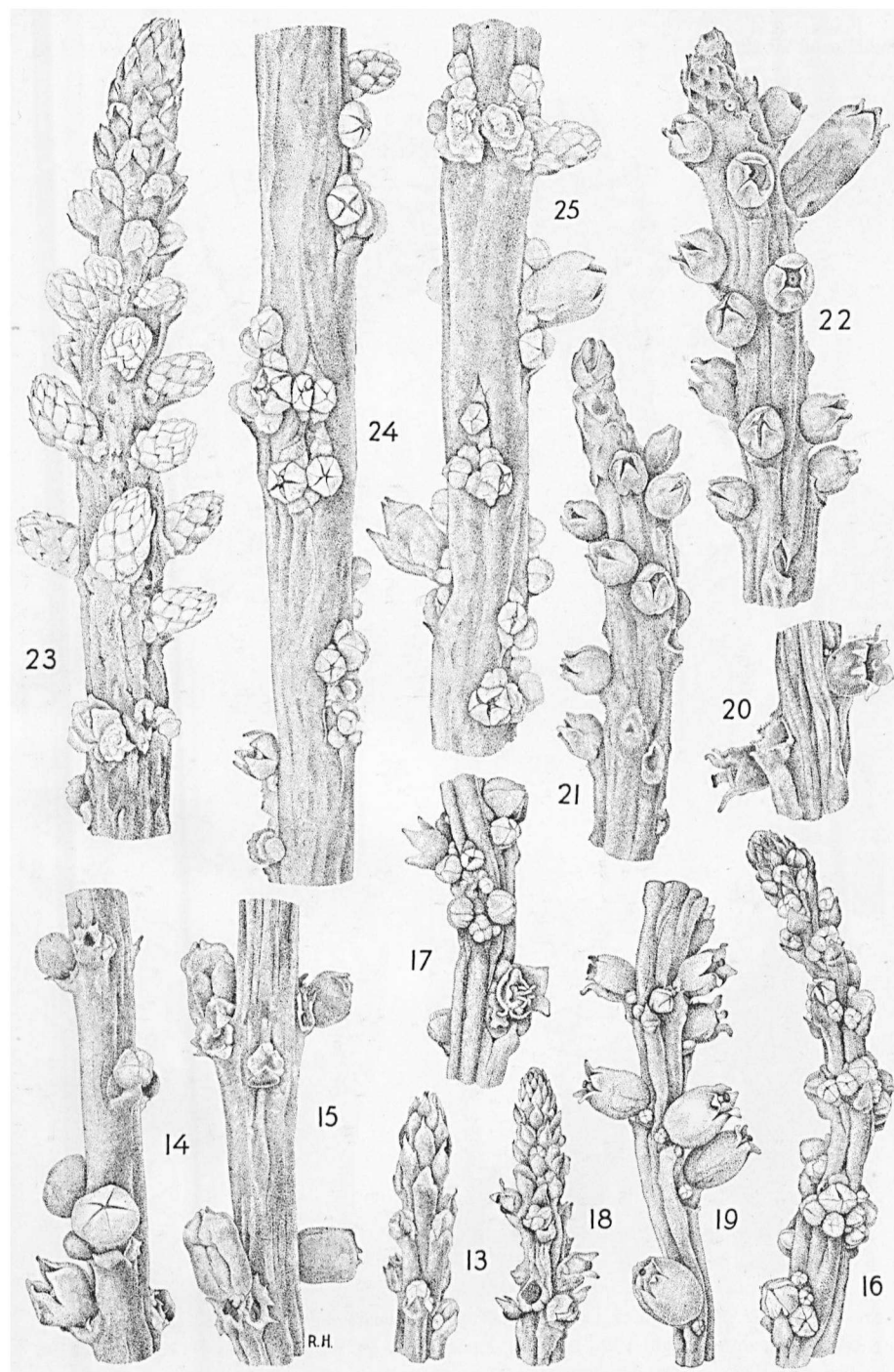


Plate IX. 13—20: *Phacellaria rigidula*; 13: young stem tip (GRIFFITH 2745); 14: stem fragment with male flowers (*idem*), 15: stem fragment with female flowers (*idem*), 16 and 17: stem fragments with male flowers (MACGREGOR 1125), 18 and 19: stem fragments with female flowers (*idem*), 20: stem fragment with female flowers (HENRY 11085); 21 and 22: *Phacellaria caulescens* (COLLETT 736), stem tips with female flowers; 23—25: *Phacellaria gracilis* (POILANE 25403), 23: stem tip with young branches and a few male flowers, 24: stem fragment with male flowers,

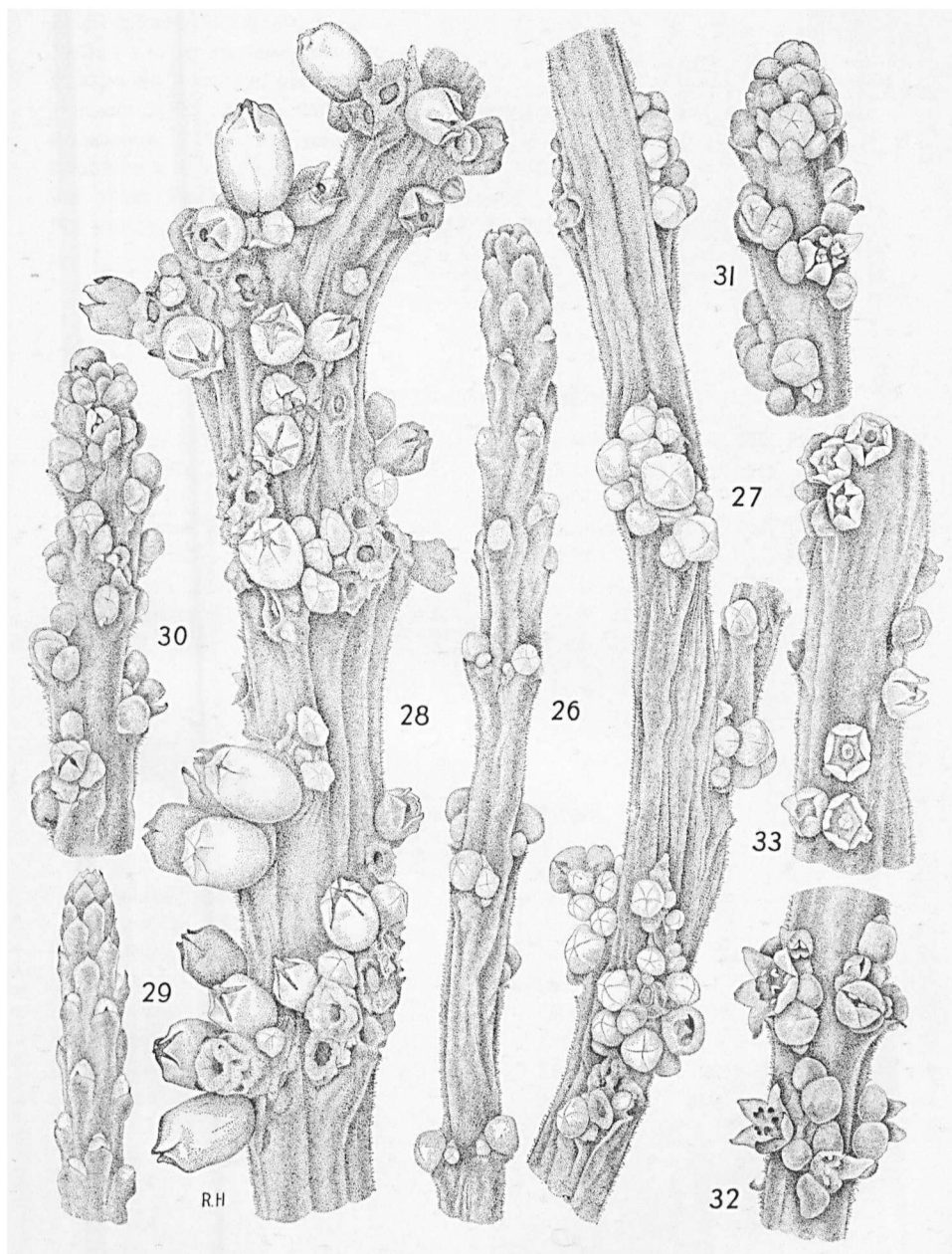


Plate X. 26—33: *Phacellaria compressa*; 26: young stem tip (CHEVALIER 30755-bis), 27: stem fragment of male plant (*idem*); 28: stem fragment of female plant (CHEVALIER 30755), 29: young stem tip (ROBERTSON 2110), 30 and 31: stem tips of male plant (*idem*), 32: stem fragment of male plant (*idem*), 33: stem fragment of female plant (*idem*). All figures 5 × enlarged.

- MACGREGOR 1125 = *Ph. rigidula*.  
 PARISH s.n. = *Ph. compressa*, type.  
 PARKER 2670 = *Ph. malayana*.  
 POILANE 22212, 22512, 24714 = *Ph. compressa*; 25403 = *Ph. gracilis*, type.  
 ROBERTSON 2110 = *Ph. compressa*.  
 ROBINSON s.n. = *Ph. malayana*, type.  
 SINGAPORE FIELD No. 23444 = *Ph. malayana*.  
 WATT 6154 = *Ph. compressa*, type of *Ph. Wattii*.

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