Botany. — „*The genus Coptosapelta* KORTH". (*Rubiaceae*). By Dr. TH. VALETON. (Communicated by Prof. J. W. MOLL).

(Communicated at the meeting of April 28, 1923).

§ 1 In my paper on *Lindeniopsis*, a new sub-genus of *Coptosapelta* KORTH. (Proceedings of the Academy of Sciences of May 30, 1908) I gave a synopsis of the few species of the genus, known at that time. At my further study of the Rubiaceae of the Malay Archipelago and of New-Guinea, I again found a number of species not described at all or not in the right genus, in consequence of which this number has increased to 11. Besides it appeared from the research, that the existing diagnosis, already revised by me, could no more be applied to all species. For this reason I want to subject the chief characteristics of the genus of systematical interest to an investigation and subsequently to summarize the species known at the present time.

§ 2. *Historical review.* The genus was constituted by KORTHALS (1851) on some fruiting branches of a liane, gathered by his colleague Dr. MÜLLER on the sandy plains near Karrau (Southern and Eastern division of Borneo). He found them to belong to a new genus in the group of the Cinchoneae DECANDOLLE, of which there are but a few genera known in the Dutch Indies.

As chief characteristics he considered the liane-like habit, the fruit splitting up in two cells, each of them splitting up again and the peltate seeds provided with a fringed wing, a combination of characteristics, not yet found in any genus. In naming the genus he apparently referred to the seeds. At least I think to recognise the words κοπτω, in the meaning of „Chopping" or „Hewing" (because of the notched wings) and πελτη shield. The significance of the connecting syllabe „sa" is not clear to me. Probably the name originally ran: *Coptospelta*, a bad word-formation. As a specific name he used „flavescens", alluding to the yellowish tint the leaves get on drying.

KORTHALS's specimen is lacking in the Dutch and Dutch-Indian Herbaria. It is not apparent either, that MIQUEL knew it (1856). It was however known to HOOKER, when describing in 1876 a second species of the same genus, *C. Griffithii* HOOK f. in Icones plantarum tab. 1089, in which he quoted KORTHALS's original and Borneo, Sumatra and Malacca as its native places. A short description of the species was afterwards given by HOOKER in HOOK. Flora indica III (1885) especially to distinguish this species from *C. Griffithii.* A little more detailed was KING in KING and GAMBLE, Flora of the Mal. Peninsula (1903).

The species however had not escaped the attention of either WALLICH or BLUME. The former published it in 1828 mistakenly as *Stylocoryne macrophylla* (= *Webera macrophylla* ROXB.), the latter took it for a new species of the same genus and gave a brief diagnosis of it in BLUME, Bijdragen (1826), as *Stylocoryne tomentosa,* while MIQUEL gave a somewhat fuller description of the same species, gathered by ZOLLINGER in Tjikoja in Java (number and date unknown), in 1856 in Fl. Ind. bat.. as *Stylocoryne ovata* MIQUEL. A third species of this genus, in order of time of discovery, is the *Coptosapelta Hammii* (subgenus Lindeniopsis) I previously discussed. It was gathered by HAM in Billiton in 1907. At about the same time a fourth species was collected in the Philippine Islands and, by E. D. MERRIL, described as *Randia olaciformis* and classed with the right genus by ELMER in 1912 (in Philippine Leaflets). A fifth species, already gathered by H. O. FORBES in British New-Guinea in 1885—86, was described by WERNHAM in 1917 (in Journ. of Botany). He classed it however with the genus *Tarenna* GAERTN. (= *Stylocoryne* WIGHT et ARNOTT). Besides I found two Borneo species undescribed in the Herbaria at Leyden and Berlin and three of New-Guinea, while finally an eleventh species was discovered, gathered bij the army surgeon JANOWSKY at the "Geelvinkbaai" in 1910.

§ 3. *Habit.* Except the deviating species *C. Hammii,* above mentioned, a half-climbing shrub, all *Coptosapelta*-species hitherto known are lianes. To all of them the excellent description by ELMER of *C. olaciformis* (Phil. Leaflets V. p. 1856) is mainly applicable: "A looping treeclimber; stem two inches thick, very irregular, heavylooping, numerously branched toward the top and forming hanging masses; leaves coriaceous, descending, curved upon the upper deeper green surface, apex recurved; inflorescence from the longer samewhat drooping branches, *erect.*

Of the species, gathered in German New-Guinea by LEDERMANN, is twice given "Liane mit beindickem Stamm", once "Liane mit armdickem Stamm". For *C. Griffithii* from Malacca as well as for the oldest species *C. flavescens* is given "Liane", to which KING's native collector adds: "A handsome creeper, 30—50 ft. high". The two species from Borneo first described here, were probably of a similar habit. Of JANOWSKY's species is only said: "10 Meters high"; the piece of branch or stem, about as thick as a finger, gathered by him, shows a soft whitish strongly-lobed wood-cylinder with large vessels.

§ 4. *Stem* and *buds*. The rod-shaped twigs, as occurring in the herbaria, are nearly cylindrical (only in some species e.g. *C. montana* the utmost twigs are square), the nodes swollen and provided with an annular groove. As a rule only the flowering lateral and terminal branches are gathered, consequently but a few terminal buds, all of young specimens of *C. flavescens* and *C. montana* are present. These are wanting bud scales; they are formed by the two youngest leaflets, pressed together with the flat upper-surfaces, and are enclosed by the two rather small stipules only at the base. With the young growing twigs these very young leaflets are lanceolate and they consist more than half of a broad "*Vorläuferspitze*" rounded at the tip and certainly dark-green when alive (see RACIBORSKI in Flora 1900), reminding us of *Dioscorea*-species. Where there are axillary-buds, they are but a couple of mms. long, ovate, covered with long and dense hair.

§ 5. *Indument*. All species have a coat consisting of single short appressed hairs, and long hairs lying flat but free at the top; the latter are soft, straight, colourless or rarely (in sicco) yellowish, usually thinly spread; on the young twigs and leaves, the inflorescences and generally also the petioles, they are closer together, forming a soft, thin "tomentum".

On the full-grown leaves they are almost or totally absent in *C. olaciformis*, *fuscescens* and *maluensis*, where the twigs also grow bare in course of time. *C. Griffithii*, *C. Beccarii* and a hairy type of *C. flavescens* have a soft hairy covering, consisting of long curved hairs not close together.

§ 6. *Leaves*: 1. Shape: In most species hitherto known, the almost exact elliptical shape of the lamina is characteristic for the average-leaf; i. e. a symmetry of the two halves with respect to the transverse as well as the longitudinal diameter of the leaf, apart from the frequently lengthened tip and wedge-shaped base.

HOOKER (1882) and KING (1903) refer to it in their descriptions of *C. Griffithii* and *C. flavescens*, MERRILL of *C. olaciformis*, WERNHAM of *C. hameliaeblasta*.

Of course the elliptical shape is not constant with any individual, but often passes into the ovate form or becomes oblong (in this case the symmetry is preserved), the leaf-base varies between rounded and wedge-shaped. *Young plants* of *C. flavescens* have lanceolate leaves. The few known leaves of *C. Janowskii* (a mountain-species) are likewise lanceolate and provided with a long dropping-point. *C. montana* (a mountain-species from Borneo) has on several twigs elliptical and oval leaves with rounded base, and lanceolate, acuminate leaves. *C. Hammii* (the xerophilous species above-mentioned) has the tip ending in a very short hard mucro. For the rest the leaves of all species have a clearly marked acumen, sometimes very short.

2. The consistency of the leaf of old plants and twigs is thin-leathery, the colour of the upper-surface is glossy dark-green, of the lower surface lighter green with dark-green veins, in a dry condition hard and in herbaria as a rule brittle. Of young plants (see above) they are much thinner, in sicco almost membranous (in vivo herbaceous). *C. Janowskii* (see above) has likewise thin ones. When drying the leaves always change their colour to yellow or yellow-green, more or less mixed with sepia-brown, the upper-surface is as a rule dark-brown or olive-brown 153—155 (Code des couleurs de KLINCKSIEK et VALETTE). For *C. olaciformis* 183—188 or 193, or paler 217; for *C. Hammii* 202—217, for *C. flavescens* the colour of the upper-surface frequently 114, of the lower-surface 153.

3. With respect to the diagnosis of the genus as well as the species the nervature of the leaves, though showing common characteristics for all species, is of some importance. The nervature of the leaves is penniform, and the secondary or lateral veins never start from the median nerve opposite to each other at the same level, their number being as a rule rather small, 2 or 3 or 4 on each side. In many species the secondary veins next to the tip do not start above the middle of the median nerve, so that the upper half of the leaf is mainly supplied by tertiary veins. Besides they start at unequal distances from each other and are closest to each other at the leaf-base, the *lowest two* (or sometimes one) starting *close to or even from the leaf-base*; in consequence of this they resemble triplinerved and trinerved leaves (*Ficus, Cinnamonum, Viburnum*). There often starts from the leaf-base on one or both sides a secondary vein so thin, that it may be counted among the tertiary veins and may easily be overlooked; yet it follows in its course the stronger veins. After starting from the midrib these go upward in a wide curve till close to the edge, next about parallel with the edge towards the apex. The two foremost veins

end in the apex (acrodromous veins of ETTINGHAUSEN), the next run some way between the edge and the first pair and all or most of them end in the tertiary net without uniting.

The secondary veins thus run parallel to the margin for a great length and most of the basal veins partly embrace the higher ones. A definition answering exactly to this nervature, I do not find in ETTINGHAUSEN. It forms a mixture of the common *camptodromous*, (bogenläufige) with the *acrodromous* (= spitzenläufige) nervature; the term *amplexidromous* might be applied (see e. g. the figures of *Thibaudia* species (acrodromous) in v. E.'s work, besides *Nectandra* and other *Lauraceae*). The species with larger leaves *C. flavescens, olaciformis, Beccarii* have a somewhat greater number of veins (11—12), while the basal veins sometimes curve inward and unite with the preceding: schlingenläufige (brochidodromous) nervature.

The number of secondary veins of the deviating species *C. Hammii* amounts to 12; in the rather small leaves they are more crowded and fairly equally divided over the length of the leaf, joining with a curve. This is an instance of regular brochidodromous nervature, but the leaf-base is pointed and the veins are ascendent and embrace each other upward from the base, so that the character of the genus is not quite lost. The tertiary nervature is always clearly visible and equally spread over the whole leaf; the horizontal connecting veins are usually prominent and form a delicate lattice-like reticulation. Leaf-impressions made with carbon-paper usually show only this net-work.

4. Regarded biologically the leaves of *Coptosapelta flavescens* belong according to HANSGIRG (Phyllobiology, 1903, pag. 293) to the *Myrtus*- or *Lauraceae*-type with which he also classes the *Coffea*-species together with numerous other *Rubiaceae*, among which *Crossopteryx*, an african genus closely allied to *Coptosapelta*.

According to him these types are xerophilous. They belong to the periodically dry and moist regions along the Mediterranean from Spain to Palestine and also to tropical regions with similar climatological properties. As their characteristics he gives: "Strongly cutinized epidermis, rectilinear polygonal or sometimes undulated epidermis-cells, stomata sunk, very glossy lamina usually bare, sometimes grey- or white velvety, simple, narrow and entire or round, elliptical, oval and oblong, leathery and stiff", as protection against strong insolation, excessive evaporation, adhesion of water, winter-temperature, etc. Without doubt many of these properties belong to *C. flavescens*, occurring in the secondary woods of the first zone, a. o. in bamboo-woods between 200 and 500 meters, but only on adult old plants, the leaves of which are indeed rather like those of *Coffea arabica*. Also the tomentose leaves of *C. Beccarii* and *C. Griffithii* belong to this type. On the other hand *C. Janowskii* and *C. montana* are both mountain-plants with narrower leaves and a long dropping-point, instances of HANSGIRG's "*ficus-type of the rain-woods*". To this type the young plants of the above-mentioned species also approach, in which the xerophilous habit does not much come to the fore.

Here it is not only the danger of too strong evaporation, brought along by the succession of the monsoons, but no less the risk of the damage, caused by strong rainfall which prevails.

Among the remaining species, of which *C. maluensis* does not grow higher than 200 meters above the sea-level, while the others occur at different levels in the mountains, various transitions between HANSGIRG's *Myrtus-* and *Ficus*-type are found.

An instance of real xerophilous habit is only given bij *C. Hammii* (Lindeniopsis) which as I previously mentioned should be classed with SCHIMPER's "Hartlaub formation".

§ 7. *Stipules.* The usual shape of the stipules is that of a small triangular scale, which has often been lost with the full-grown twigs in the herbaria. At the back-side and along the edges it is covered with hairs, turned to the front, often longer than the stipule and sometimes covering it entirely. The variations in shape are usually due to differences in the ratio of width and length, which depends on the width of the node. Sometimes however they may be of use in the determination of the species. This is for instance the case with *C. flavescens* and *C. olaciformis*, which show a great resemblance on superficial contemplation of leaves and flowers and were considered identical by MERRILL.

Here, in numerous specimens examined by us, the stipules are quite sufficient to distinguish between the two species. *C. flavescens* has linear-lanceolate ones, rather abruptly passing into the broad base. They vary in length between 4 and 8 mms. and strike the eye in the herbaria because, at least in the dry specimens, the back-side is absolutely bare and the broad hairy edges show clearly. *C. olaciformis* has smaller stipules, usually only 2 mms., slightly longer than broad, in old condition hairless and swollen at the base. This description has been taken from a specimen, distributed by MERRIL himself from Luzon (Ph. pl. 396) and classified as *C. flavescens*. It is also applicable to ELMER's original specimen (see below § 11. Synonymy and relationships).

§ 8. *Inflorescence.* In all species the inflorescence consists of axillary compound cymes or corymbs, starting from the leaf-axils near the top of the twigs. At the top they are closer together and often (by the reduction of the floral leaves) are combined to large terminal decussated panicles or thyrsi. Such terminal panicles also occur in other genera of the group of Cinchoneae, viz. on *Cinchona* and *Ferdinandusa.*

In the descriptions of the genus (HOOKER—SCHUMANN—VALETON in Ic. bog.) there is wrongly spoken of "thyrsi penduli". Undoubtedly the panicles are erect in all cases (see ELMERS' description above, § 3), but the ends of the long branching twigs are drooping and proper flowering-branches start sideways from these. In good herbaria it may sometimes be observed how the flowering-branches form an almost right angle with the leaf-twigs.

The extension and relative length of the axis determine the character of the inflorescences with respect to the species. First of all two types may be distinguished.

The simplest case is *C. Janowskii*, a New-Guinea-Mountain-liane, where the axilary inflorescences have been reduced to single flowers and the terminal thyrsus to a simple closed raceme. The pedicels are rather long and about midway provided with two bracts. It is highly probable that on more luxuriant branches these bracts are fertile, forming forked cymes (dichasia). *C. montana* likewise has isolated flowers (uniflorous cymes) in the axils of poor flowering-branches and at the top a raceme of 5 flowers. A more luxuriant terminal twig, consisting of 6 internodia, has in the lower axils long-stalked closed racemes, bearing 5 flowers, in the following three-flowered cymes, while the top again forms a closed raceme with linear bracts. The twig of *C. Hammii* also ends in a raceme of 5—7 flowers, but with very short internodes and pedicels, so that the flowers, provided with long corollatubes, are close together and take the shape of an umbel.

In the second type both the axillary and the terminal inflorescences are compound, and the latter have the shape of corymbi or depressed (almost umbelliform) thyrsi in consequence of the decrease of length towards the apex of the internodes and peduncles; the axillary ones too are more or less corymbiform. Especially the relative length of the peduncles of the partial inflorescences, the number and density of the flowers, the number of internodes of the terminal panicles, determine the character of these species.

C. olaciformis deviates most of the rest on account of the slight extension of the corymbi and the small number of flowers. The axillary inflorescences are short-peduncled cymes with only 3—5 flowers, many times shorter than the leaves. The terminal thyrsi consist of but 2—3 internodes and cymes with few flowers and short peduncles, and are also shorter than the higher leaves.

In the remaining species of this second type both the axillary and the terminal inflorescences are multiflorous much branched, corymbous, with moderately long or very long stalks, while the terminal panicles may consist of 5 internodes.

§ 9. *Flower and Seed.* The *calyx* is now cup-shaped, only superficially emarginate with 4—5 very short pointed teeth, now divided into nearly free sepals down to or almost down to the base, in which case the limb is not sharply separated from the ovary; in a third more frequent case cleft to the middle or a little farther. To characterise the genus it is therefore of no value, but of great value to determine the species. For all species mention should be made of the "intestinal gland papillae", (Darmdrüsen papillen: SOLEREDER), which are placed at the inside alternate with the lobes or teeth, and resemble those which the *Rubiaceae* always bear at the inside of the stipules and are sure to occur on their calyces more frequently than appears from literature.

The *corolla* which is contorted in aestivation, but without externally visible torsion, is trumpet-shaped and reminds us of species of *Randia* and *Tarenna*, having a quinquepartite limb and as in the case of *Randia* the relative lengths of tube and limb, though not always constant in the same individual, is when the average is considered, a means of distinguishing the species.

The following average rations were found: Tube many times as long as the lobes (*Lindenia*-type), 3—6 cms. long: *C. Hammii.* Tube twice as long as the lobes: *C. Janowskii.* Tube about the same length as the lobes or a little shorter: most of the species. Tube about half the length of the lobes: *C. Griffithii*, *C. fuscescens* and *C. lutescens.* A peculiarity is, that the tube which is usually cylindrical and equally wide along its whole length, shows a sudden inflation above the middle in two species, *C. Griffithii* and *C. Janowskii*, which for the rest are farthest apart on account of the length of the corolla tube.

The internal hairy covering of the corolla tube is also of some interest. Only in 3 species *C. Hammi*, *C. olaciformis*, *C. flavescens*, the interior of the corolla tube and the filaments are glabrous. In the other species, where the filaments are covered in front with long furry hairs directed downwards, this hairy covering continues as projecting ridges along the inside of the tube, down to the middle or till close to the base. Between these ridges the inside is covered with soft crisp hair; the descriptions of the genus however are wrong, where they say: "*Faux barbata*" for the hairy covering of the *faux* (regarded as orifice of the tube) is lacking everywhere.

When the limb is still closed, the corolla is externally entirely covered with thick-velvety or short silky hair.

The *stamina* have thin filiform filaments, which, as already observed, are congenitally attached to the corolla-tube, forming protuding ridges; the part projecting from the corolla is short and filiform, in some species hairless, in most of them covered with furry hair in front; the anthers are very narrow lanceolate and have a linear connective, coherent with the filament near the base at the backside; the long linear anthercells diverge more or less at the base, so that the base of the anther is retuse, or arrow-shaped as with *C. flavescens*, while the tip ends in a tapering point; the backside is covered with appressed hair, except in *C. Hammii*, where also the free filaments are almost lacking. The anthers hang more or less versatile from the corolla during the flowering and are curved up or contorted.

The *pistil* is highly characteristic for this genus. The stigma is wedge-shaped or cylindrical (in *Lindeniopsis* club-shaped) *not* divided into lobes, and proportionately long. The style is straight and smooth and compressed sideways, and about as long as the corolla-tube, so that the stigma overtops the corolla far. The papillary surface I generally found covered with pollen.

The *ovary*, covered with an annular disk, is regular, bilocular as in the whole group of Cinchoneae. Around a fleshy, cylindrical axis, nearly filling the two ovary-cells, are the numerous anatropous, flat, peltate, erect, imbricate ovules.

The *fruit* is globular or more or less oblong, compressed at right angles with the septum and has in a ripe condition a though, horny or thin parchment-like envelope, surrounded by a thin dry outer-integument. In very old fruits the outerlayer crumbles down and the horny valves come quite into view; in this respect there is some analogy with *Bikkia* (Condamineae). The splitting into valves is not perfectly regular. It begins with the separation of septum and axis, (loculicide dehiscence) at the top of the capsule, but next the septum itself splits, so that 4 cocci are formed open at the top and at the sides and connected at the base. This latter splitting however may fail to occur. During the splitting the fleshy placenta shrivels up, causing the numerous seeds to get gradually loose.

The *seeds* are flat, round or oblong with the hilum about in the middle (peltate) and surrounded by a membranous fringe-like notched wing, about as broad as the seed. For the distinction of species only differences in size are to be considered (except in *Lindeniopsis* where the edge of the wing is not fringed); *C. olaciformis* and *C. maluensis* have the smallest seeds; *C. Griffithii* the largest, as far as we know.

As to the process of pollination it may only be surmised. The contorted movable projecting anthers and the long protruding stigma point at the probability of wind-pollination, but the prominent flowers scenting of elder and orange-blossom may point at a connection with insects. The possibility of self- and inter-pollination is corroborated by the great mass of flowers and by the fact that (at least in the herbarium) the anthers are already open in the buds.

§ 10. The *station*: About the character of the locality in which the various species are found we only know as follows:

C. flavescens was gathered by KORTHALS on the barren sands along the river Karrau in Borneo; by KING's collector in bamboo-woods in Malacca 100—200 metres above the sea-level, by various collectors in Western Java at the foot of the mountains, on various spots in light secondary wood.

C. maluensis at 40—100 meters above the sea-level in passable primeval forest, about 20—25 meters, high; the ground covered with foliage („Galerie wald" SCHIMPER), with occasional low wood, mostly consisting of Pandanus and low feather-leaved palms (Camp Malu); idem with many tree-ferns and bamboo and Selaginella a metre high, as undergrowth (April-flusz): LEDERMANN.

C. fuscescens in "Buschwald" changing into mountain-wood up to 1500 metres above the sea-level, few large trees, many epiphytes and moss, many glades, ground often overgrown. On steep rocky slopes (Felsspitze): LEDERMANN.

C. lutescens in dense wood on hills, about 25 metres high, rather mossy; in the underwood many dwarf-fan-palms and lianes, *Freycinetia, Araceae, Agathis, Pandanus*: LEDERMANN.

§ 11. *Relationships and synonymy.* On account of the structure of ovary and fruit *Coptasapelta* belongs to the very natural tribe of *Cinchoneae* HOOKER (Genera plant. II p. 11) among which 44 genera are reckoned. This tribe is divided into two subtribes:

I. *Eucinchoneae* with a valvate aestivation.

II. *Hillieae* with an imbricate or twisted aestivation.

To the latter tribe *Coptasapelta* belongs, which genus in Genera plant. was placed among the former, a mistake already corrected by KING and by SCHUMANN.

The latter places (Pflanzenfam. IV, 4 p. 42 and 48) *Coptasapelta* immediately beside *Crossopteryx*, an African genus, I could not examine, to which only one species or group of species belongs, living on the barren Campos of Abyssinia — till lower Guinea. On comparing the detailed description OLIVER gives of this genus, I found, that nearly all more or less important characteristics given by O. are also applicable to *Coptosapelta*; only two are lacking, viz. Stigma clavatum bilobum and tubuscorollae gracilis, limbus parvus. The important characteristic of the length of the stigma however is present. *Lindeniopsis* however has a stigma clavatum and a tubuscorollae gracilis, so that only the bilobular stigma forms an important difference. This points to a close relation between these two genera, especially between *Crossopteryx* and *Lindeniopsis*, on account of the shrubby, xerophilous habit.

The leaf-nervature of *Crossopteryx* is not fully described, but the leaves have the same shape; they are larger than with most *Coptosapelta*-species, but equal to those of *C. flavescens*. The close relationship of the two genera cannot be doubted. I could not find any striking points of similarity with other genera of the tribe of *Cinchoneae*, of which but a small number of species occur in the old world. The most characteristic peculiarity, the structure of the stigma does not occur in any other genus of this tribe.

Remarkable however is the resemblance of pistil and corolla in species of two genera, belonging to the *bacciferous Rubiaceae* with many ovules, viz. *Tarenna* GAERTN. (syn. *Stylocoryne*, syn. *Webera*), which has given rise to a peculiar synonymy.

The name *Stylocoryna*, given in 1797 by CAVANILLES to a species from the Liu-tchiu-Archipelago, is formed from the words στυλος: pillar and κορυνη: club, briefly denoting the structure of the pistil of *Coptosapelta*, as described above. HOOKER referred this species to the genus *Randia* LINN., so that the characteristic generic name was lost. In 1834 WIGHT brought it up again in the form of *Stylocoryne* (independent of *Cavanilles*?) for a plant from Ceylon new to him, viz. *St. corymbosa* WIGHT, which again showed this peculiar shape of pistil. Neither could this name be kept, as the same species had previously been diagnosed by GAERTNER (in 1788) as *Tarenna zeylanica*, wich latter name of course enjoys the preference. The first generic name however had been accepted by various authors (ROXBURGH, BLUME, a.o.) and BLUME was the first to apply it to *Coptosapelta flavescens* KORTH, discovered by v. HASSELT and himself in Java. He called it *Stylocoryna tomentosa*, while likewise WALLICH, MIQUEL and later MERRILL and WERNHAM classed species of *Coptosapelta* either with *Stylocoryne* or with *Randia* (see above p. 2).

Whether the great similarity in floral structure between two genera, belonging to different principal divisions of the family, also points to a natural relation, is still an *open* question.

§ 12. *New description of the genus.* *Calyx* cup-shaped, quinquepartite, quinquelobate or quinquedentate, perennial, with axillar glands.

Corolla, contorted in the bud, trumpet-shaped, tube varying in length, outside velvety or covered with sulky hair, inside bare or provided with furry ridges descending from the filaments, between those thinvelvety, straight or inflated above the middle, throat not bearded, lobes linear-oblong, obtuse.

Stamina 5, inserted on the throat, filaments filiform, short, the front furry or bare, anthers thin, linear-lanceolate, tapering at the top, at the base twice-pointed, obtuse or arrow-shaped, near the base dorsifix, on the backside provided with two rows of hairs directed upwards (in Lindeniopsis bare).

Disc small, annular.

Ovary bilocular, style anceps, hairless, stigma entire, cylindrical or club-shaped, long, far overtopping the corolla (in one species square with hairy angles); placentas coherent to the septum, ovules numerous, ascendent, imbricate.

Capsule more or less globular or oblong, bilocular, at the top loculicide bivalvular, later on quadripartite.

Seeds small, peltate, imbricate; membranous, winged all round with fringy notched (in Lindeniopsis undulate) wing; endosperm fleshy, germ straight, root straight, directed downwards.

Lianes or *Shrubs* (*Lindeniopsis*). Twigs velvety or bare, round or more or less square. Leaves opposite, thin-leathery, elliptical, lanceolate or oval, usually tapering with a rather abrupt acumen; usually hairy on the underside. Leaf-nervature more or less acrodromous. Stipules small, interpetiolar, triangular.

Flowers small or middle-sized, white or light yellow, in axillary closed racemes or trichotomous, branched cymes, united at the twig tops to many-flowered panicles.

§ 13. *Conspectus of the Species.*

I. Subgenus *Lindeniopsis*. Shrub. Seeds with a slightly crenate and undulated wing. Calyx-lobes longer than the ovary. Corolla tube long. Anthers hairless.

1. *C. Hammii*, VAL. 1909.

Leaves elliptical with short, acute, hard point; secondary veins 5—7 on each side, arcuately anastomosing (brochidodromous). *Corolla* hairless inside. Twigs sharply squared. *Stipulae* very small. Plant grey velvety all over, later on bare. *Fruit* oblong, length up to 30 mms.

Distribution. Hitherto endemic in Billiton on sandy barren soil.

II. Subgenus *Eu-Coptosapelta*. Lianes Seeds with fringed wing. Calyx-lobes not longer than the ovary. Corolla tube not more than twice as long as the lobes. Backs of the anthers covered with long hair.

2. *C. olaciformis* (MERRILL), ELMER 1913. *Randia olaciformis*, MERR. 1908. *C. flavescens*, MERR. (non KORTH.) 1909.

Inside of corolla tube and filaments glabrous. Corolla lobes slightly longer than the tube. Inflorescences corymbose united to panicles at the tops of the twigs; cymes short-peduncled and few flowered. Flowers very small. Stipules small, triangular, no hairy edges. Leaves elliptical or oval, shortly acuminate, smaller than 100 mm. number of secondary veins 4—5 on each side, hairless when full-grown, colour in sicco pale greenish grey or olive grey. Width of fruit at most 6 mm., broader than long, calyx consisting of free oval lobes.

Distribution. Hitherto endemic in the Philippines, in the following places: Mindanao, lake Lanao, camp. Keithly, Mrs. CLEMENS n. 1220, 1907 (type); Mindanao, prov. of Agusan, in mt. Urdaneta, 700 M. above sea-level ELMER n. 13355?; Luzon, San Antonio, prov. Laguna, mt. Ramos Bur. of Science, Manila, n. 396!

3. *C. flavescens*, KORTH. 1851. *Stylocoryna tomentosa* Bl., Bijdr. 1826; *Stylocoryne ovata*, MIQ. 1856; *Stylocoryne (Webera) macrophylla*, WALL non ROXB.; *Coptosapelta macrophylla*, K. SCHUM.

Inside of corolla tube and filaments glabrous. Inflorescences corymbose long-peduncled and dense flowered, united at the twig-tops to large thyrsus-shaped panicles. Leaves elliptical or oval or oblong. shortly acuminate, base as a rule broad, rounded, length 80—125 mm., number of secundary veins 4—5 on each side, colour in sicco usually olive-brown, undersurface of leaves, especially along the veins thinly covered with accumbent or crisp hair. Young twigs and inflorescences coated with dense, soft hair. Fruit obovate, sepals free, oval, erect. Stipules linear-lanceolate with broad base, hairy edges.

Distribution: Malay peninsula, Burma, Western Java, Sumatra: Palembang, (PRETORIUS[1]), 1837, in Herb. L B; Borneo S. E. Division, on sandy plains on the river Karrau (KORTHALS).

4. *C. hameliaeblasta* (WERNH.) VAL. nova comb. *Tarenna hameliaeblasta*

[1]) This species being rather widely spread, differs rather in habit according to the place where it is found. For instance the specimens from the Malay peninsula (KINGS collector 10384 and 10393) have stronger flowering-twigs and considerably greater leaves and flowers than the specimens from Java and Sumatra. The latter are again distinguished from the Javanese form by smaller, narrower leaves, in sicco coloured darker brown, covered with crisp hair on their undersides. Similar leaves also occur in a specimen from Malacca (MAINGAY, 908).

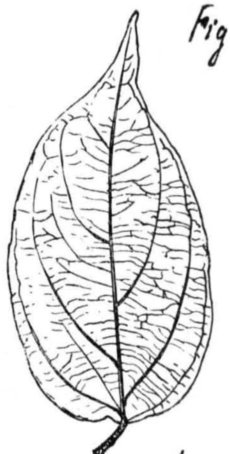


Fig. 1

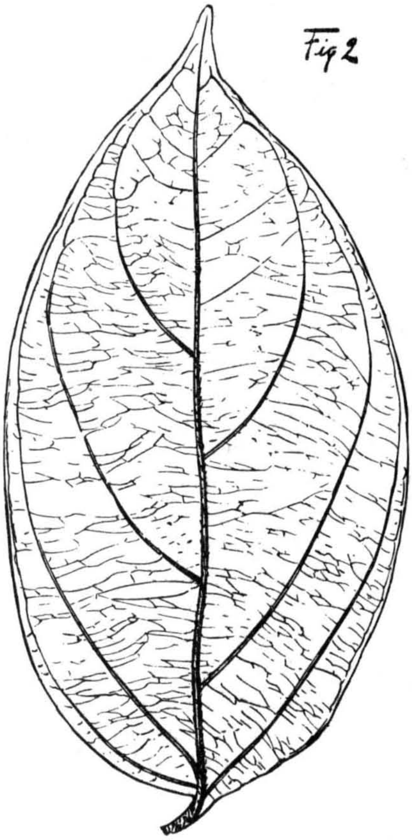


Fig 2

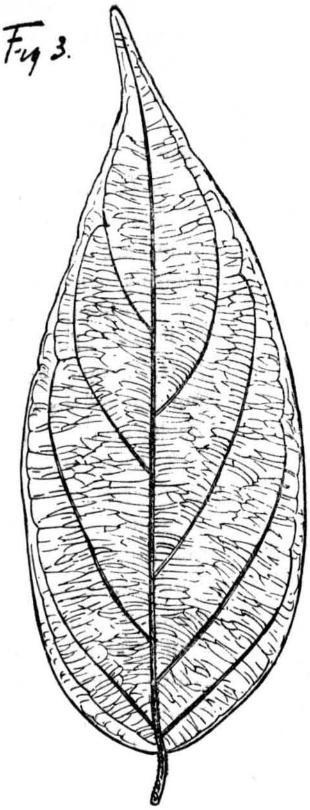
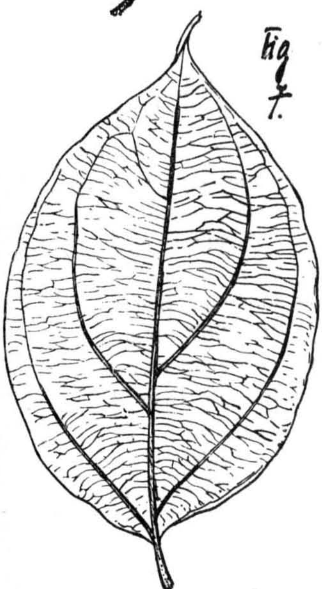


Fig 3.



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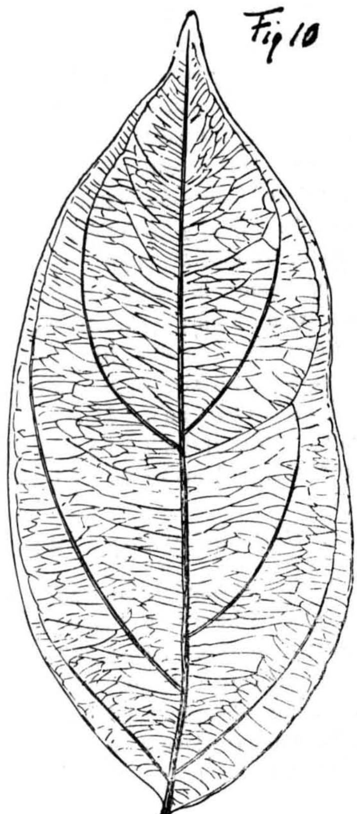


Fig 10

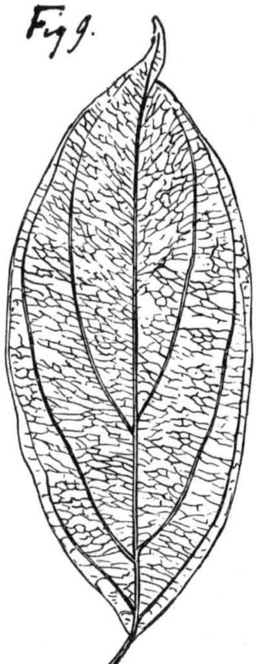


Fig 9.

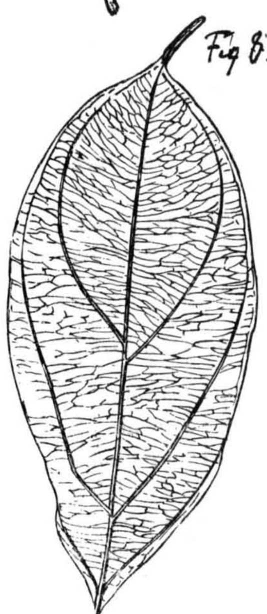


Fig 8.

Fig. 4

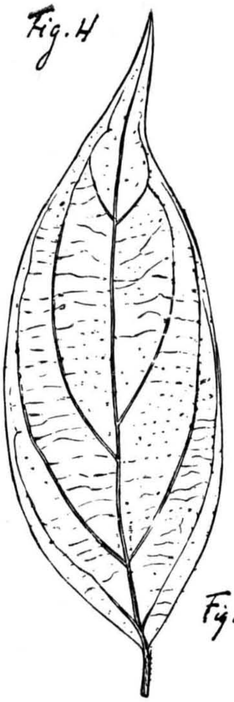


Fig. 5

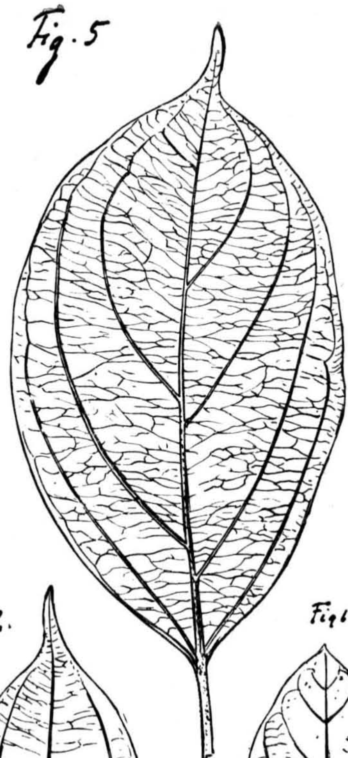


Fig 6.

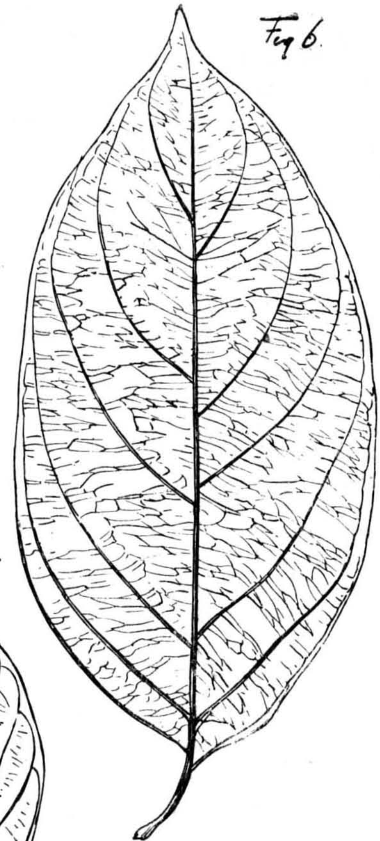
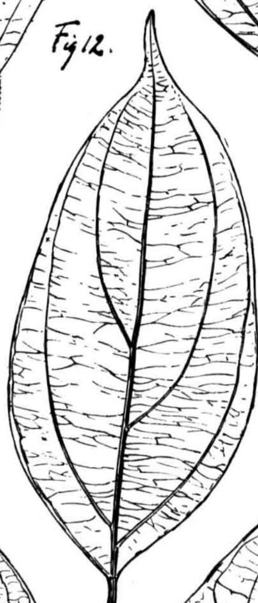


Fig 12.



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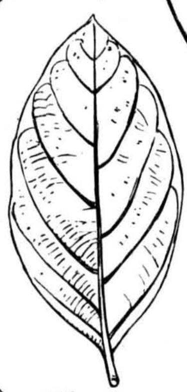


Fig 11.

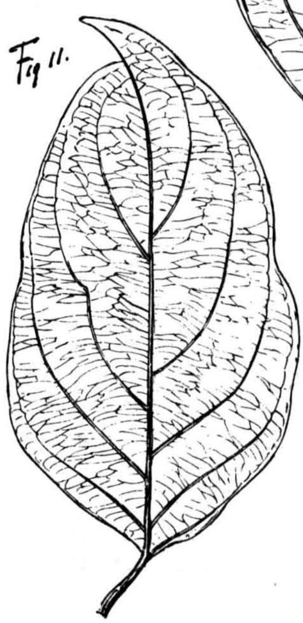


Fig 13.

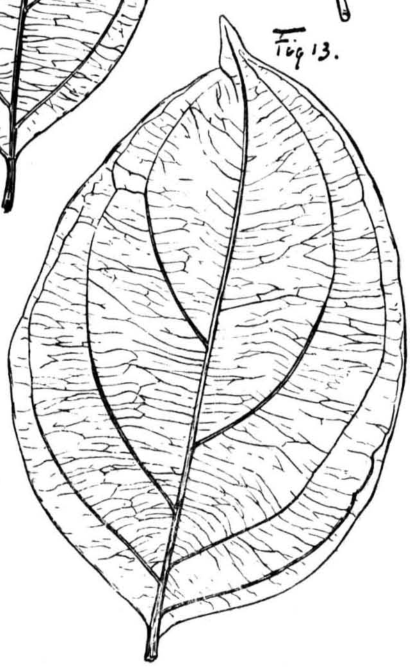
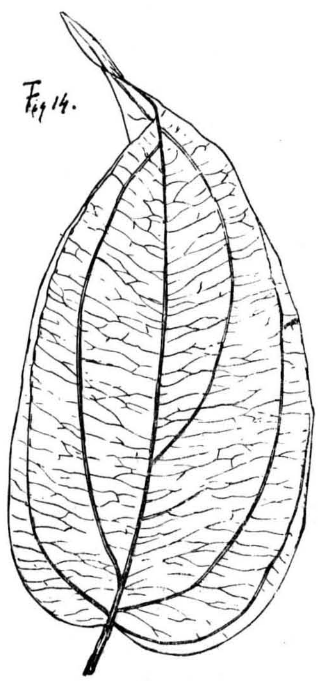


Fig 14.



WERNH. Inside of the upper part of the corolla tube and the filaments densely hairy, the former not inflated. Corolla lobes about as long as the thin corolla tube. Axillary cymes longpeduncled and dense-flowered; terminal thyrsi many-flowered. Corolla tube (in sicco) covered with appressed whitish hairs. Calyx lobes about as long as the ovary, erect, curved outward. Leaves oblong or elliptical, with very short acumen. Secondary veins 3—4 on each side, sometimes with an additional thin basal vein; veins erect. Stipules very small, triangular, the edges covered with dense hair. Colour of the leaves in sicco yellow-olive-green. Stalks and inflorescences hirsute, leaf-veins at the backside with remote procumbent hairs.

Distribution: British New-Guinea, Sogeri-region, 950—1400 metres above sea level. (FORBES).

5. *C maluensis*, VAL. n. sp.

Upper part of the corolla tube not inflated, hairy as are the filaments. Corolla lobes a little shorter or of equal length as the corolla tube. Axillary inflorescences with long stalks; terminal thyrsi with abundance of flowers. Flowers the smallest of the genus. Outside of corolla covered with short appressed hair. Calyx-limb divided for half its length, lobes oval, erect. Leaves usually broad, elliptical with 3—4 rarely 2 secondary veins on each side (together 5—7), acrodromous. Fruit crowned by the very small calyx-lobes. Underside of leaves with a very thin hairy covering near the edge, for the rest bare. Stipules pointed, with thin indument.

Distribution: North-East New-Guinea, at 190—200 metres above sea level, in primeval wood. (LEDERMANN).

6. *C. Beccarii*, Val n. sp.

Upper part of corolla tube not inflated and at the inside covered with long and dense hairs, as are the filaments. Corolla grey velvety externally, lobes about as long as the corolla tube. Axillary inflorescences long-peduncled, thyrsus-shaped. Terminal thyrsi with abundance of flowers. Leaves broadly oblong, ending in a caudate acumen, large, with 3—4 secondary veins on each side. Petiole fairly long; underside of leaf covered with crisp soft hair.

Distribution: Borneo (BECCARI 2271).

7. *C. fuscescens* VAL n. sp. Upper part of the corolla tube not inflated, inside covered with dense hairs, as are the filaments. Corolla lobes twice as long as the tube. Axillary cymes long-stalked and repeatedly remotely branched; terminal thyrsi many-flowered, spreading. Outside of corolla tube covered with short silky hairs, lobes hairless. Calyx small, lobes detached nearly to the base. Leaves elliptical, glabrous. Usually 3 secondary veins, or in a single specimen 2, on each side. Stipules very small, obtuse, triangular, hairy,

Distribution: Nord-East New-Guinea in mountain woods 600—1500 metres above sea level, in the Kani and Torricelli mountains (SCHLECHTER) on the Felsspitze at 1500 metres (LEDERMANN).

8. *C. lutescens*, VAL. n. sp.

Flowers as in *C. fuscescens*, but a little larger. Leaves with 2 secondary veins on each side, in sicco greenish-ochreous-yellow.

Distribution: North-East New-Guinea, on the Etappenberg at 850 m. in dense high wood (LEDERMANN).

9. *C. Griffithii*, HOOKER. f.

Upper part of corolla tube inflated, inside covered with long dense hairs, as are he filaments, lobes more than twice the length of the short wide tube. Axillary cymes rather many-flowered; terminal thyrsi densely. Outside of corolla grey velvety all over. Calyx-limb wide by cup-shaped, divided for half its length into broad lobes. Leaves elliptical, at the underside crisp hairs. Secondary veins 3—4 on each side.

Distribution. Gathered in numerous places in the Mal. peninsula, in the low lands.

10. *C. Janowskii*, VAL, n. sp.

Upper half of the corolla tube inflated, inside covered with long, dense hair, as are the filaments Corolla lobes half the length of the tube. Axillary flower-stalks with 1-3-5 flowers. Terminal inflorescences simple racemose. Flowers the largest in the genus. Outside of corolla-tube thin-velvety, lobes hairless. Calyx large, cup shaped, not incised, with short broad acute teeth. Leaves lanceolate, long-acuminate.

Distribution: Northern New-Guinea. Jabi mountains.

11. *C. montana*, KORTH. msc., in Herb. L. B.

Flowers unknown. Fruits in the leaf axils isolated or in peduncled cymes of 3-5-flowers, forming simple closed racemes at the twig-tops.

Calyx-lobes persistent on the fruit, only connected at the base, linear-subulate. Leaves lanceolate or elliptical, rather firm, with long tapering points and acute, obtuse or rounded base. Secondary veins 2-3 on each side. Stipules small, triangular, having long hairs. Stems, inflorescences and under sides of leaf-nerves thin-velvety, in sicco ochreous yellow. Fruit obovate oblong.

Distribution. S.E. Borneo. Summit of the Sakoembang, 1000 metres above sea level.

EXPLANATION OF THE FIGURES.

Fig. 1 Coptosapelta montana; Leaf of an old plant.
Fig. 2 „ flavescens, flowering plant.
Fig. 3 „ „ very young plant.
Fig. 4 „ montana; young fruiting plant.
Fig. 5 „ hameliaeblasta.
Fig. 6 „ olaciformis.
Fig. 7 = Fig. 1.
Fig. 8 and Fig. 9 Coptosapelta fuscescens.
Fig. 10 „ flavescens, flowering plant.
Fig. 11 = Fig. 6.
Fig. 12 „ lutescens.
Fig. 13 and Fig. 14 „ maluensis.
Fig. 15 „ Hammii.

The figures have been obtained by carbon-impressions according to the method of ELMER D. MERRILL. Fig. 4 is not retouched, only retraced with ink.

The others have all been worked up by the designer with the aid of the original print and of the leaf; the tertiary vein system is consequently a little too prominent!