

BEGONIA LORANTHOIDES HOOK. F. (SECT. TETRAPHILA A.DC.)

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SUMMARY

Analysis of *B. loranthoides* Hook. f. and *B. rhopalocarpa* Warb., African species formerly admitted to sect. *Squamibegonia* Warb., leads to the conclusion that these taxa must be placed in *Begonia* sect. *Tetraphila* A. DC. Both taxa are treated here as subspecies of *B. loranthoides*: *B. loranthoides* Hook. f. subsp. *loranthoides* and *B. loranthoides* Hook. f. subsp. *rhopalocarpa* (Warb.) J. J. de Wilde respectively. They are circumscribed and their synonymy, distribution, ecology and karyology is given. *Begonia* sect. *Tetraphila* A. DC. is circumscribed provisionally.

1. INTRODUCTION

In the course of our taxonomic revision of the African section *Squamibegonia* Warb. (in ENGLER, *Nat. Pflanzenf.* 1st ed. 3 (6a): 139, 1894), it has become evident that two taxa, viz. *B. loranthoides* Hook. f. and *B. rhopalocarpa* Warb., which have been assigned to the section occasionally (e.g. BARKLEY, *The species of the Begoniaceae*: 60. 1972 and Warburg in ENGLER, *Bot. Jahrb.* 22 (1): 40, 1895, respectively), do not belong in sect. *Squamibegonia*.

Begonia sect. *Squamibegonia*, as presently conceived, is characterized i.a. by persistent bracts subtending the proterandrous-androgynous (bisexual) inflorescences, flowers with 2 tepals, distinct axillary placentation and baccate indehiscent fruits. (A full circumscription of section *Squamibegonia* will be published before long). All the above-mentioned characters are not found in *B. loranthoides* and *B. rhopalocarpa*, and at the present stage of our knowledge these closely related taxa should be placed in the section *Tetraphila* A. DC.

Since the time J. D. Hooker (1871) validly published *B. loranthoides*, very little additional information concerning the species and its affinities have come to light. Even now it is still badly known. It is for this reason that, as a precursor of a full treatment of *Begonia* sect. *Tetraphila* A. DC., the following account is given.

2. PROVISIONAL CIRCUMSCRIPTION OF *BEGONIA* SECT. *TETRAPHILA* A.DC.

Sections *Tetraphila* A. DC., Prodrumus 15(1): 517. 1864.

Type species: *Begonia mannii* Hook.

Heterotypic synonyms: Sect. *Fusibegonia* Warb. in Engl., *Nat. Pflanzenf.* 1st ed. 3 (6a): 141. 1894. Syntype species: *B. preusii* Warb., *B. eminii* Warb., *B. poggei* Warb. and *B. molleri* (C. DC.) Warb.

Sect. *Irmschera* Ziesenh. in *The Begonian* 38: 161. 1971. Type species: *Begonia mauricei* Ziesenh.

Herbaceous or suffrutescent epiphytes, sometimes terrestrial but then usually growing on rocks or decaying trunks, probably always monoecious. Indumentum consisting of peltate, squamiform or stellate hairs almost always present. Inflorescences cymose, either of both male and female flowers or, more often, the male and the female flowers on separate inflorescences. Bracts small, often early caducous, never even partly enveloping the fruit. Tepals 4, white, pink or reddish, the outer 2 tepals as a rule somewhat bigger as compared to the inner tepals. Stamens 3 to many, filaments more or less connate at the base, anthers opening sublaterally by longitudinal slits or subterminal by pores. Styles (2-)3-4(-6), connate at the base, rarely almost free; stigmatic part often forked or horseshoe-shaped, rarely entire and linear. Ovaries fusiform, rarely obpyriform or club-shaped, apterous but sometimes sharply triangular in transverse section, otherwise terete or angular, (2-)3-4(-6)-locular.*

Mature fruits usually fleshy, always dehiscent, opening by valves from the apex towards the base (rarely by a longitudinal slit). A valve represents the fused halves of two adjacent carpels and the fruits are loculicide, opening along the dorsal carpellary vascular bundles. The pericarp after dehiscence rapidly disintegrating and almost never conserved on dried herbarium specimens. The "sep-ta" at dehiscence becoming detached towards the centre of the fruit, separating from the central, often spindle-shaped, seed-bearing column. The column composed of the connate seminiferous parts of the placentas, often bright yellow, delicate and transitory.

C. 30 species, confined to tropical West, Central and East Africa, southwards to Angola.

3. DESCRIPTION

Begonia loranthoides Hook. f. (J. D. Hooker) in Oliv., *Fl. Trop. Afr.*, 2: 580, 1871; ENGLER in Engl. and Drude, *Veg. der Erde*, 9, *Die Pflanzenw. Afr.* 3(2): 614, 1921; EXELL, *Cat. Vasc. Pl. S. Tomé*: 189, 1944.

Typification: See under subsp. *loranthoides*.

Differential characters: Monoecious epiphytes, rarely rupestral, confined to the Central African forest region and two islands in the Gulf of Guinea; usually at low and medium altitudes. Leaves rather thick and fleshy, nearly symmetric to asymmetric, with an entire margin, 5.5-14 × 2-6.5 cm. Stems, leaves and

* The "sep-ta" resulting from the inward extension of the originally parietal placentas along the line of fusion of two adjacent carpels. The placenta having approached the centre of the ovary branching, the branches, left and right, ovuliferous while the lower part remains sterile. By fusion of the placentas in the ovary-centre the placentation often seems axile. The finally (2-)3-4(-6)-locular ovary contains in each of its locules half of the ovules of two septiform placentas (see *photograph 2*).

inflorescences, in particular when young, covered with a more or less dense indumentum of roundish, peltate, sessile, squamulose, appressed hairs with a denticulate or fringed margin. Inflorescences unisexual, hence either male or female. Male inflorescence a (1–)3–7(–15)-flowered dichasial cyme. Female inflorescence made up of 1 (rarely 2) flower(s). Bracts early caducous. Perianth segments (tepals) 4 (viz. 2 + 2) in flowers of both sexes, pinkish or white. Androecium fasciculate, asymmetric; stamens 11–33. Ovary fusiform or club-shaped, apterous, square or up to 8-angular in transverse section, 4(–8)-celled. Each "septum" bearing 2 opposite fertile placentas, one in each of the adjoining locules. Fruit dehiscent.

Description: See under the subspecies.

4. KEY TO THE SUBSPECIES

1. Petioles 15–70 mm long. Blades more or less trough-shaped, usually distinctly asymmetric, acuminate or rarely acute at the apex. Ovary (and probably the mature fruit) fusiform. Principe and São Tomé . . . **a. subsp. loranthoides**

1. Petioles 4–17 mm long. Blades rather flat, only slightly asymmetric, usually acute or obtuse at apex, rarely acuminate. Ovary and mature fruit club-shaped. On the continent from Cameroun to Zaire **b. subsp. rhopalocarpa**

5. SUBSP. *LORANTHOIDES*

Map 1

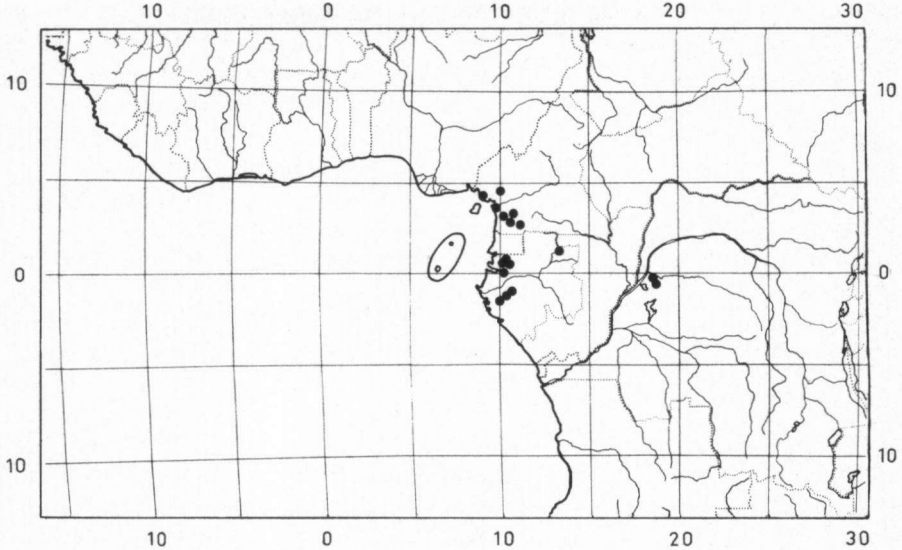
Literature: See references given under the species.

Syntypes: *Barter no. 1940*, mounted on a sheet together with *Barter no. 2010* representing the same taxon (Principe, "on trees", paratype, K); *Barter no. 1946* (Principe, "flowers pale pink, on trees", lectotype, K); *Barter no. 2010* (Principe, "on trees", paratype, K).

Synonyms: *Begonia henriquesii* C. DC. in *Bol. Soc. Brot.* **10**: 123. 1893: Warb. in *Engl., Nat. Pflanzenf.* 1st ed. 3(6a): 139. 1894; HENRIQUES in *Bol. Soc. Brot.* **27**: 191. 1917; ENGLER in ENGLER & DRUDE, *Veg. der Erde* **9**, *Die Pflanzenw. Afr.* **3**(2): 619. 1921; EXELL, *Cat. Vasc. Pl. S. Tomé*: 12, 34, 189. 1944. Type: *Quintas no. 7* (São Tomé: Traz-os-Montes, holotype in G; an isotype numbered *Quintas 899* is present in COI).

Begonia mauricei Ziesenh. in *The Begonian* **38**: 161, cum photogr. and figure of details, 1971. Holotype: *Mason no. 3109* in herbarium Rudolf Ziesenhenné, from a plant cultivated at 1130 North Milpas Street, Santa Barbara, California, not seen (according to Ziesenhenné collected as living material on Trinidad by Maurice Mason; but see note).

Note: There exists an interesting, and as yet unsolved, problem regarding the



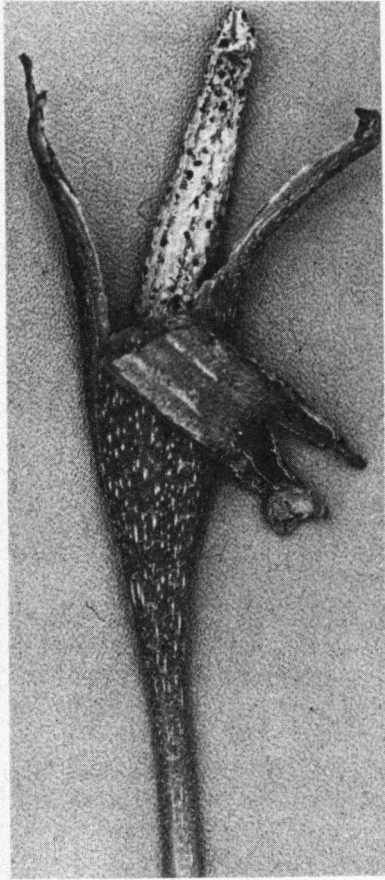
Map 1. Black dots indicate localities where *B. loranthoides* Hook. f. subsp. *rhopalocarpa* (Warb.) J. J. de Wilde was collected.

The distribution of subsp. *loranthoides* is confined to Príncipe and São Tomé (continuous line).

original provenance of *B. mauricei* Ziesenh. The author, ZIESENHENNE, stated (l.c. page 160) that his attention was drawn to this *Begonia* when he visited the Royal Botanic Garden at Edinburgh in 1969 where it was growing in a glass-house. At that time the plant was labelled: "M 64, No. 89 Trinidad. 3109 Mason". In 1970 a cutting of this plant was sent to Mr. Ziesenhenné in California, where it flowered and was subsequently described by him. According to the protologue (page 160) Mr. Maurice Mason (the original collector) reported: "that he collected this *Begonia*, to which he gave his collection number 3109, on the small island of Trinidad off the coast of Venezuela at 500 feet above sea level".

Studying this plant, Ziesenhenné concluded that it was different from any other American *Begonia* known to him, and that it did not fit into any of the American sections within *Begonia*. He noted however, that it appeared to be closely related to the African section *Fusibegonia* Warburg (= synonymous with section *Tetraphila* A. DC.). Probably because of its putative geographic distribution, as based on the information given by Mason, Ziesenhenné also proposed a new section viz. *Irmschera* for the new species.

Upon publishing of *B. mauricei* Ziesenh., a cutting from Edinburgh was acquired by Dr. J. Doorenbos, who cultivated it successfully at the Department of Horticulture of the Agricultural University at Wageningen, The Netherlands. The plant at Wageningen eventually produced mature fruits and seeds (see *photograph 1*). A transverse section of the ovary (*photograph 2*) of this particular plant shows the typical quadrangular outline diagnostic for *B. loranthoides*. The

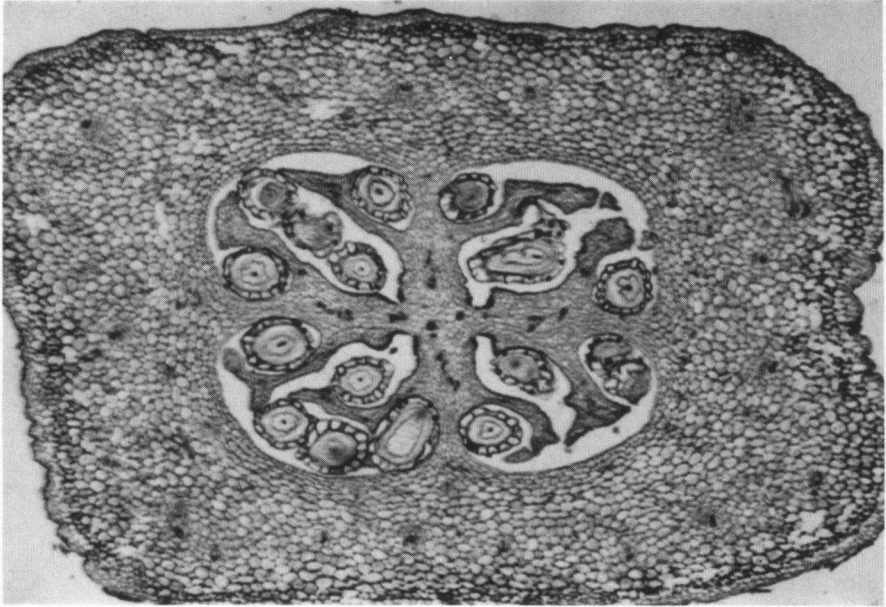


Phot. 1. Mature dehiscent fruit of *Begonia loranthoides* Hook. f. subsp. *loranthoides*, grown at the Department of Horticulture under the synonymous name *B. mauricei* Ziesenh., see text (phot. R. JANSEN).

branching placentas shown in the picture illustrate the remarks as made in the footnote on page 358. At this moment this plant material is still alive (also conserved as herbarium *J. J. de Wilde no. 8762*, WAG), and it matches in every respect the description, photo and figures as given by Ziesenne.

Comparing the plant, originally acquired from Edinburgh, with at least half a dozen living African *Begonia* species all belonging to the section *Tetraphila* A. DC., Dr. Doorenbos concluded that *B. mauricei* Ziesenh. ought to be placed into this section. He further doubted the American origin of the plant (LEGRO & DOORENBOS in *Neth. J. Agric. Sci.* **21**: 169, 1973).

Dr. Doorenbos' surmise was confirmed when Mr. L. Maurice Mason from King's Lynn, Great Britain, visited Dr. Doorenbos' collection of living *Begonia* species at Wageningen in 1976, and upon seeing *B. mauricei* Ziesenh. "emphatically denied ever having seen this species, and felt absolutely sure that nothing like it was growing in Trinidad" (citation from a letter from J. Doorenbos to the Regius Keeper of the Royal Botanic Garden at Edinburgh, dated 21 June 1976,



Phot. 2. Transverse section of the ovary of the plant cultivated as *B. mauricei* Ziesenh. For comments see footnote on page 358.

concerning the question of a possible error in the labelling of the plant at Edinburgh).

Dr. J. Cullen, then Assistant Keeper of the Botanic Garden at Edinburgh, informed Dr. Doorenbos by letter of July 1st, 1976 that he checked the records of the plant and found that it came to the Garden in 1964 "among the batch of plants for Mr. Maurice Mason of King's Lynn". It was given the accession number 643109 and the annotation: "number 89 Trinidad". He added: "we have no doubt that this is the plant we received with the details as specified".

No further information could be gathered, and the inconsistency about the original provenance of *B. mauricei* Ziesenh. remains unsolved.

Description: Monoecious epiphyte growing on trees. Stems probably scarcely branched, woody in the lower parts, terete, up to 8 mm diam. in the available scanty herbarium material, smooth, somewhat glossy, grey to pale brown or pale reddish brown; young parts more or less densely scattered with roundish, pel-tate, sessile, squamulose, appressed hairs with a fringed or denticulate margin, the hairs transparent but brownish in the centre at the place of attachment; the stems becoming glabrescent with age. Nodes and scars as in subsp. *rhopalocarpa*, but the petiolar scars up to 5 mm diam. Minute, narrowly pointed, patent, up to 3 mm long axillary buds often present; adventitious roots not seen. Internodes up to 5,5 cm long, usually much shorter.

Stipules early caducous, 10–25 mm long, narrowly triangular, closely em-

bracing each other and the terminal bud, often curved at the pointed apex.

Leaves usually drying more greenish or greenish brown as compared to subsp. *rhopalocarpa*, rather thick and fleshy in vivo, and judging from the fact that in herbarium specimens they are often longitudinally folded, the leaves less flat and often more trough-shaped as compared to subsp. *rhopalocarpa*; petioles of fullgrown leaves 15–70 mm long, in general distinctly longer than in subsp. *rhopalocarpa*, otherwise similar. Blades asymmetric, more than in subsp. *rhopalocarpa*, narrowly elliptic to elliptic, narrowly oblong to oblong or narrowly ovate to ovate, 6–14 × 3–7 cm, cuneate, more rarely obtuse and sometimes slightly oblique at the base, acuminate or rarely acute at apex, otherwise as in subsp. *rhopalocarpa*.

Inflorescences in the axils of terminal leaves, bearing either male or female flowers (inflorescences unisexual).

Male inflorescence slender, usually only 3-flowered, not essentially different from those of subsp. *rhopalocarpa*. Peduncle slender, 12–27 mm long, bracts at the apex early caducous.

Male flowers supported by 0.5–1 cm long pedicels. Perianth segments (tepals) 4; the two bigger outer tepals opposite, 13–16 × 9.5–10 mm, elliptic to ovate, obtuse at apex, outside with a few scattered squamulose hairs, inside glabrous, pinkish and with 13–15 more or less parallel longitudinal veins; the pair of inner tepals smaller, 11–12 × 4.5–5 mm, obovate to narrowly obovate or spatulate, often emarginate at apex, sometimes obtuse, white, glabrous both sides and with c. 7 more or less parallel longitudinal veins. Androecium fasciculate, asymmetric; stamens c. 11–17. Filaments fused at the extreme base, otherwise free; the longest filaments of the bundle 1 mm long, the shortest stamens with nearly sessile anthers. Anthers 2–2.5 × 0.8–0.9 mm, narrowly elliptic to elliptic or obovate, obtuse at apex, otherwise as in subsp. *rhopalocarpa*.

Female inflorescence composed of one flower (only one specimen could be analyzed, viz. *Rose no. 465* from P) supported by a 3 mm long axis which, with a scar-bearing articulation, is implanted on top of a 4–5 mm long peduncle. The female flower subtended by two opposite narrowly triangular bracts which measure 5 × 1 mm and are seated at the apex of the axis 2nd order (from which it is judged that in this case the only female flower represents a lateral flower of a dichasial cyme of which the other flowers are suppressed).

Female flower: the single female flower present in *Rose no. 465* (see above) not analyzed but from all outside appearances similar to female flowers of subsp. *rhopalocarpa*. Styles 5. Ovary fusiform, thin, 17 × 2.5 mm (measured from above the still persistent bracts), tapering towards both sides but especially towards the base, tetrangular, otherwise as in subsp. *rhopalocarpa*. Placentation not seen.

Mature fruit and seed not seen.

Comments: Only scanty material was available (♀ flower not analyzed). The morphological variability is, possibly, much larger than was described here. This, however, must be verified on more material. The restricted (insular) distribution of subsp. *loranthoides* theoretically points to the contrary.

Not included in the description are the data of the cultivated (clonal) individuals on which the description of *B. mauricei* Ziesenh. was based (see notes to the synonym).

J. D. HOOKER, loc. cit., in his diagnosis to *B. loranthoides*, stated: "Anthers 3". This is remarkable as already a superficial examination of the only fullgrown male flower present on *Barter no. 1946* (the lectotype) shows that there are many more stamens. A possible explanation of this discrepancy might be found in the frequent occurrence of small beetles which we observed in the few male otherwise undamaged flowers we could analyze. Do these beetles eat anthers and might this explain the stated number of 3? Or is it due to a misprint, e.g. recto "13"?

Notes to the synonyms: On describing *Begonia henriquesii*, C. DE CANDOLLE (l.c., 1893) stated in the protologue only: "in altitude 1000 m (F. Quintas)"; no Quintas number was cited. In the De Candolle herbarium at Geneva, however, is found *Quintas no. 7*. The label going with this specimen bears the annotations: "*Begonia henriquesii* C. DC. (C. DC. scripsit). Ins. St. Thomé (1000 m). Legit F. Quintas: 10.85. Sp. unicum". From this it was decided that *Quintas no. 7* in G is the holotype. Furthermore, in COI is conserved *Quintas no. 899*. The label is in the handwriting of Quintas and i.a. has as the finding-locality: "Roca Traz-os-Montes. Alt. 1000 m". Added in a different handwriting on this label is "D.C. 7".

According to EXELL, l.c.: 383. 1944, where he explains in a special note the method employed by Henriques in numbering and distributing the collections of Moller and Quintas, this indicates that a duplicate of *Quintas no. 899* was sent by Henriques to De Candolle in Geneva as *Quintas no. 7*. Therefore it is decided that *Quintas no. 899* in COI is an isotype of the name *B. henriquesii* C. DC.

The protologue to this last name matches the type material; the isotype in COI is vegetative, but the holotype in G includes flower fragments. This material fits the circumscription of *B. loranthoides* subsp. *loranthoides* as conceived by the present authors, and as a result the name *B. henriquesii* C. DC. is placed here in its synonymy.

It is with some diffidence that *B. mauricei* Ziesenh. is placed here in the synonymy of *B. loranthoides* Hook. f. subsp. *loranthoides*. However, all circumstantial evidence put together this decision is unavoidable. The facts are as follows:

- (1) There is no doubt whatsoever that Ziesenh. when describing *B. mauricei*, used a plant for it which originated from a plant found in cultivation at the Botanic Garden at Edinburgh. In addition the living plants seen by the authors at Wageningen are a living clone from Ziesenh.'s nomenclatural type.
- (2) The geographic origin from the plant cultivated at Edinburgh is uncertain (see note, page 359–362).
- (3) All characters found in *B. mauricei* Ziesenh. perfectly fit into *Begonia* section *Tetraphila* A. DC., an African section in *Begonia*. Already Doorenbos (see above) presumed this affinity, and also Ziesenh., loc. cit. pages 160 and 161, found it most closely related to this section.

(4) Considering the cultivated clonal background of *B. mauricei* it is clear that the available material does not account for any natural variation possibly present in the natural population.

(5) As regards specific characters of flowers and fruits of the three taxa involved, the following survey is given in *table 1*.

Table 1. Specific characters of flowers and fruits. The data for *B. mauricei* are based on the protologue given by Ziesenhenné; data for female flowers and fruits observed by the authors on living material at Wageningen are added in parentheses. The data mentioned with *B. loranthoides* subsp. *loranthoides* and subsp. *rhopalocarpa* respectively, are based on the full range of the herbarium specimens examined.

♂	<i>B. mauricei</i>	<i>B. loranthoides</i> subsp. <i>loranthoides</i>	<i>B. loranthoides</i> subsp. <i>rhopalocarpa</i>
peduncle	21–38 mm	12–27 mm	5–10 mm
bracts	25 × 9 mm	?	7–11 × 3–5 mm (folded)
tepals (outer)	26 × 13 mm	13–16 × 10 mm	8–13 × 7–8 mm
tepals (inner)	13 × 6 mm	11–12 × 4.5–5 mm	6–10 × 3–3.5 mm
stamens	18	11–17	14–33
anthers	4.5 mm long	2–2.5 mm long	1.5–2.5 mm long
♀			
peduncle	18 mm (in WAG 20–30 mm)	4–5 mm	7–25 mm
tepals (outer)	15 × 6 mm (in WAG 26–38 × 15–26 mm)	?	9.5–25 × 7.5–15 mm
tepals (inner)	9 × 6 mm (in WAG 17–26 × 12–22 mm)	?	7–14 × 4–8 mm
styles	4 (in WAG 4, 5 or 6 on the same individual)	5	4(–6)
ovary	35 × 5 mm	17 × 2.5 mm	10–17 × 4–7 mm
mature fruit	(in WAG fusiform, 50–75 × 8–10 mm, opening at maturity)	not known	club-shaped, 15–40 × 10–20 mm, opening at maturity

Scrutinizing the data given above, it appears that many floral characters of *B. mauricei* Ziesenh. fall within the range of *B. loranthoides* s.l. The outer tepals of the male flowers of *B. mauricei*, according to Ziesenhenné, are markedly bigger as compared to those of *B. loranthoides*, but given the great variability found in the dimensions of the same parts of the female flower of this material, we very much doubt the constancy of this character. The dimensions of the bracts of the male inflorescence, the anthers and the ovary of *B. mauricei* are also at variance with those found in *B. loranthoides* s.l., but as these quantitative data as far as *B. mauricei* is concerned, are based on one specimen in cultivation only, and as phenotypic plasticity is a common feature both in wild and cultivated begonias, we feel this is not enough to keep it apart from *B. loranthoides* s.l.

As concerns fruits, in 1978, the year of observation, living plants of *B. mauricei* Ziesenh. cultivated at Wageningen produced abundantly female flowers, but no male flowers at all. However, those female flowers developed mature fruits (herb. *J. J. de Wilde no. 8776*, WAG, spirit material only, *phot. 1*) within just two months after pollination with pollen from a living specimen of *B. loranthoides* subsp. *rhopalocarpa*, recently collected in Gabon by Breteler and De Wilde (*no. 205*, WAG). The seeds eventually germinated normally.

Mature fruits of wild plants of *B. loranthoides* subsp. *loranthoides* are hitherto unknown. The only female flower of this subspecies available (*viz. Rose no. 465*, P), shows the ovary longer and smaller as compared to ovaries of subsp. *rhopalocarpa*. The shape and dimensions of the mature fruits obtained from *B. mauricei* Ziesenh. as given in table 1 do, in our opinion, not interfere with a place of this taxon in *B. loranthoides* s.l. and, more in particular, in subsp. *loranthoides*.

Once taken the decision that the name *B. mauricei* Ziesenh. must be considered a later synonym of *B. loranthoides* Hook. f. s.l., it had to be decided into which of both the subspecies recognized within this taxon by the present authors the material on which the name *B. mauricei* Ziesenh. is based had to be placed. We finally concluded that the characters found in the length of the petiole and the shape of the leaf-base, even although not always sharply diagnostic between both subspecies, warranted a place within *B. loranthoides* Hook. f. subsp. *loranthoides*.

The result of this decision still leaves the question unanswered how it did come about that living material of *B. loranthoides* Hook. f. subsp. *loranthoides*, a taxon endemic to Principe and São Tomé, small islands in the Gulf of Guinea, reached the Royal Botanic Garden at Edinburgh with a label: *Mason No. 89, Trinidad*.

Distribution: Principe, São Tomé.

Ecological notes: The collectors' notes of the scarce herbarium material that came to our attention do not reveal much pertinent information. Barter did not give the precise locality where he collected it on Principe, he only stated: "Flowers pale pink, on trees" (*teste Barter nos. 1940, 1946 and 2010*, K). Rose (*nos. 465 and 497*, P) found it on the same island near Porto Real, a locality which could not be traced. Finally there are three collections made on the same island by Rozeira, all located near Infante D. Henrique, a locality which receives annually about 4000–4500 mm precipitation. One of these (*Rozeira no. 463*, COI) bears the annotation that it was collected at an altitude of about 400 m.

According to EXELL (l.c.: 23. 1944) the highest mountain on Principe reaches 948 m. Most of the forest on the island seems to be destroyed, and most probably, because of habitat destruction, *B. loranthoides* subsp. *loranthoides* has become a rare and endangered plant.

On São Tomé *B. loranthoides* Hook. f. subsp. *loranthoides* was collected by Chevalier (*no. 14274*, P). Already EXELL (l.c.: 192. 1944; *Begonia* sp. 4) recognized that this specimen was close to *B. loranthoides*, but found it insufficient for identification. It was collected in the mist-forest region on the Pico between

1500 and 1800 m above sea-level; a high rainfall area with almost constant mist and a distinctly cool climate. F. Quintas made two collections of this taxon at Tráz-os-Montes between 750 and 1000 m altitude. He noted that the flowers were carmine or pink (teste *Quintas no. 7* in G (numbered 899 in COI), and *Quintas no. 1460* in COI).

Specimens examined: Principe: sin. loc., *Barter 1940* (K, paratype, composite sheet, together with *Barter 2010*, fragments in B); *ibid.*, *Barter 1946* (K, lectotype); *ibid.*, *Barter 2010* (K, paratype); Porto Real, *Rose 465* (P); *ibid.*, *Rose 477* (P); Infante D. Henrique, base of Moncorne, *Rozeira 309* (COI); *ibid.*, on slope towards Neves Ferreira, *Rozeira 463* (COI); *ibid.*, on the road to Neves Ferreira, *Rozeira 2354* (COI).

São Tomé: the Pico, *Chevalier 14274* (P); Tráz-os-Montes, *Quintas 7* (G, holotype of *B. henriquesii* C. DC.; numbered 899 in COI, isotype); *ibid.*, *Quintas 1460* (COI).

Culta: University for Agriculture, Wageningen, the Netherlands, *J. J. de Wilde 8762* (WAG); *ibid.*, *J. J. de Wilde 8776* (WAG, spirit material only).

6. SUBSP. *RHOPALOCARPA* (WARB.) J. J. DE WILDE, STAT. NOV. *Fig. 1; Map 1*

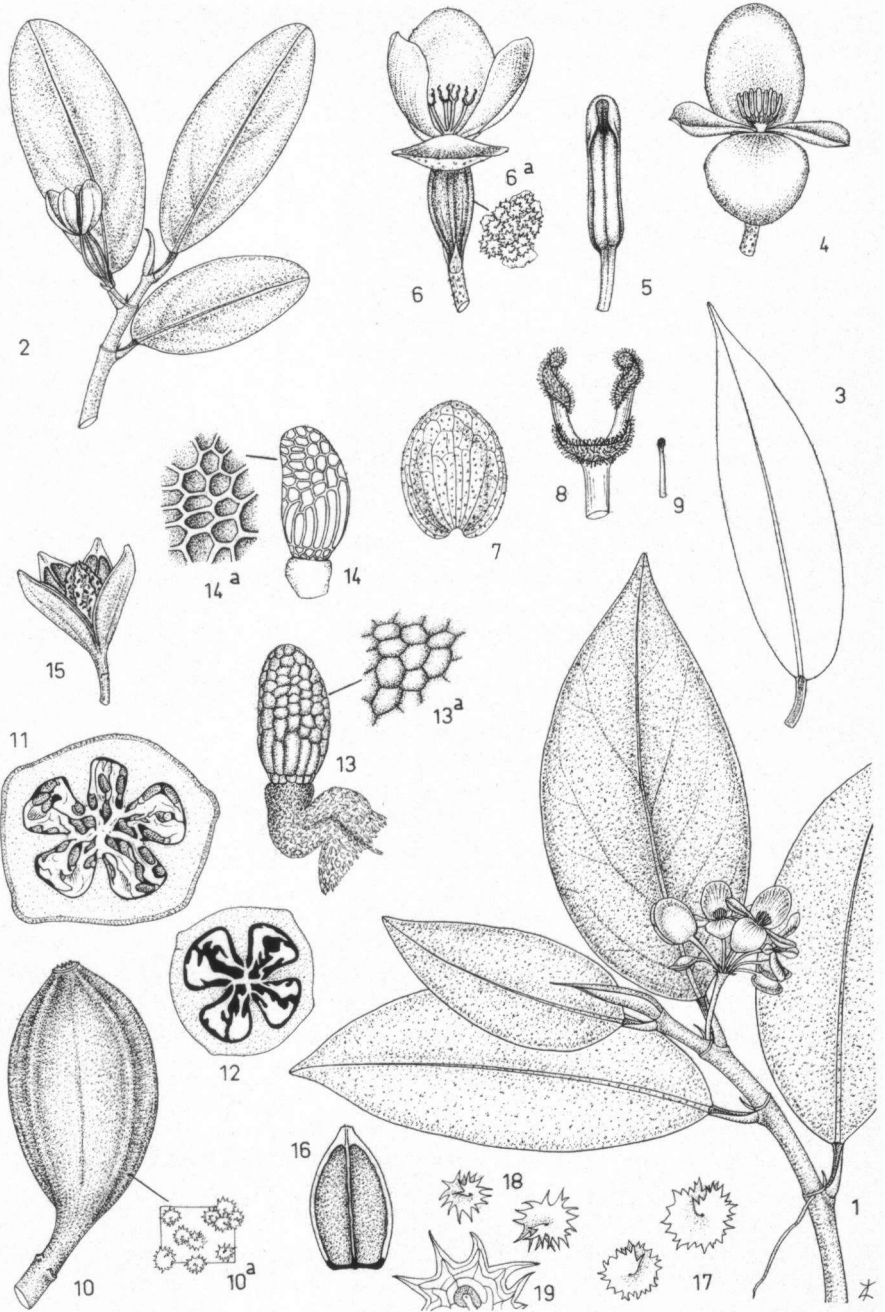
Begonia rhopalocarpa O. Warburg in Engl., Bot. Jahrb. 22(1): 40. 1895; De Wild. in Ann. Mus. du Congo, Sér. 5 (Bot.) 3: 451. 1912; Engler in Engl. and Drude, Veg. der Erde, 9, Die Pflanzenw. Afr. 3(2): 614. 1921; Hutch. and Dalz., Fl. W. Trop. Afr. 2nd ed. 1 (1): 219. 1954; R. Wilczek in Fl. du Congo, Begoniaceae: 10, fig. 1. 1969.

Syntypes: *Dusén no. 89* (Cameroun: Bibundi according to the protologue, but no precise locality mentioned on the collector's label, ("Josojo"?), lectotype, B; a sheet without number but annotated: "*P. Dusén*, ad Bibundi emporium, *Sept. 1891*" in G is almost certainly an iso-lectotype); *Dusén no. 274* (Cameroun: Bibundi, paratype, B); *Braun no. 85* (Cameroun; Malimba, paratype, B).

Note 1: The collection *J. Braun no. 85* mentioned above bears a collector's label on which is written in pencil: "Aug. 88. Malimba 85 (Begoniae)". Another collection by J. BRAUN, also numbered 85, but marked differently viz. *Braun no. 85* ("No 1168") belongs in *B. poculifera* Hook. f.

Note 2: *Braun no. 85* is cited by WARBURG, l.c. 1895, among both the syntypes of *B. rhopalocarpa* Warb. and *B. oxyanthera* Warb. These two taxa are well distinguished and there is no doubt as to the identity of *Braun no. 85*, which belongs to *B. rhopalocarpa* Warb. However, to avoid any confusion in the future, the lectotype of *B. rhopalocarpa* Warb. was selected from among Dusén's collections (see above).

Synonym: *Begonia injoloensis* De Wild. in Ann. Mus. du Congo, Sér. 5 (Bot.) 2: 317. 1908; Th. and Hél. Durand, Syll. Fl. Cong.: 234. 1909; De Wild. in Ann. Mus. du Congo, Sér. 5 (Bot.) 3: 451. 1912 (in synonymy to *B. rhopalocarpa*); Engler l.c.: 614. 1921 (in syn. to *B. rhopalocarpa*); R. Wilczek in Fl. du Congo, Begoniaceae: 10. 1969 (in syn. to *B. rhopalocarpa*).



Syntypes: *Laurent no. 1091* (Zaire: Injolo, lectotype, BR); *Laurent no. 1703*, 2 sheets (Zaire: Injolo, paratype, BR); *Pynaert no. 428* (Zaire: cultivated at Eala, paratype, BR).

Description: More or less heliophilous monoecious plant, usually growing epiphytic in the crown of tall forest trees, sometimes rupestral among rocks on places exposed to the light. The stems often somewhat branched, up to 1.50 m long, woody in the lower parts. Some plants shrublike and the distinctly woody basal parts reaching 2 cm diam., with greyish-brown rhytidoma. Stems terete, finely grooved lengthwise, glossy, greyish to brown; the youngest parts more brown and covered with loosely scattered, very inconspicuous, squamulose, peltate, sessile, appressed, more or less roundish hairs with a denticulate margin; the stems soon becoming glabrous. The nodes very slightly thickened, with annular stipular scars distinct on the young stems but these scars gradually disappearing on older parts, petiolar scars distinct, round to broadly obovate, 2–4 mm diam., often with one or two smaller also roundish scars above pertaining to an axillary inflorescence and/or a fallen axillary bud; small, narrowly pointed, patent, up to 5 mm long axillary buds often present on the younger still leaf-bearing stems; adventitious roots sometimes present. Internodes up to 6 cm long, usually 2–3 cm long.

Stipules enveloping the terminal bud readily caducous, 9–25 × 2–4 mm in folded position, narrowly triangular, gradually tapering towards the pointed apex, often curved (in sicco). The outermost stipule of each pair closely embracing the smaller inner one, rather densely covered with pale brownish squamulose hairs outside, nearly glabrous inside. The innermost stipule smaller, with less indumentum outside.

Leaves rather early caducous, usually confined to the upper part of the stem or its branches, rather thick and fleshy in vivo, leathery and sometimes papery in sicco; petioles flattened or slightly furrowed above, otherwise terete, 4–17 mm long, finely wrinkled lengthwise, dark wine-red in vivo, covered with a very inconspicuous loose indumentum of squamulose, roundish, peltate, sessile hairs and scattered with minute flattened pale brown or whitish glandular secretions

Fig. 1. *Begonia loranthoides* Hook. f. subsp. *rhopalocarpa* (Warb.) J. J. de Wilde – 1: branch with male inflorescence (× 3); 2: idem, female inflorescence (× 3); 3: narrowly elliptic leaf (× 3); 4: ♂ fl. (× 2); 5: stamen, front side (× 12); 6: ♀ fl. (× 2); 6-a: matted indumentum on ovary (magnified); 7: tepal, ♀ fl., outer side (× 2); 8: one style, abaxial side (× 10); 9: stigmatic papilla (magnified); 10: almost mature fruit (× 2); 10-a: indumentum of fruit (magnified); 11: transverse sect. of fruit slightly above the middle (× 4); 12: idem, placentation, schematic, ovules omitted; 13: immature seed sitting on placenta tissue (× c. 26); 13-a: idem, detail, the testa slightly bubbled in between

the alveolate ribs (× 52); 14: seed, mature (× c. 26); 14-a: idem, detail of testa with pronounced ribs (× 52); 15: dehisced fruit (× 3); 16: valve of dehisced fruit, inner side, showing remnant of septiform placenta, schematic (magnified); 17: squamulose hairs found on the leaves (× 20); 18: idem, from stipules (× 20); 19: segment of the same at a larger magnification, showing details. – 1: reconstructed from *Braun 85* and *Breteler and De Wilde 316*; 2: reconstructed from *Villiers 859* and from colour slides by N. Hallé from *Hallé and Villiers 5411*; 3: *Hallé and Villiers 5411*; 4–5: *Breteler and De Wilde 316*; 6–9: *Villiers 859*; 10, 15: *Dusèn 89*; 10-a–13-a, 16–19: *Breteler and De Wilde 205*; 14–14-a: *Chevalier 28044*.

(?). Blades slightly asymmetric, variable in shape and size, ovate to narrowly ovate or obovate to narrowly obovate or elliptic to narrowly elliptic, 5.5–14 × 2–6.5 cm, obtuse to cuneate and sometimes slightly oblique at the base, usually acute or obtuse at apex, more rarely acuminate; margin entire, often narrowly revolute; young leaves on both surfaces loosely covered with appressed squamulose hairs, the indumentum gradually diminishing with age and the leaves becoming glabrescent; the midrib continuing the petiole, not or very slightly prominent on both surfaces; nerves mostly one pair on each side arising from near the base of the midrib, other nerves widely spaced along the midrib and often rather indistinct, straight or somewhat bent but curving and anastomosing before reaching the margin; veins indistinct.

Inflorescences found in the axils of the terminal leaves, bearing either male or female flowers (inflorescences unisexual) but male and female inflorescences never simultaneously on the same shoot.

Male inflorescence in principle consisting of a slender dichasial cyme, the lateral branches (1st order) often branched again. All axes terminated by a male flower and in this way the inflorescence usually (3–)7-flowered. Sometimes the branches 2nd order dichasially branched again, resulting in a potentially 15-flowered inflorescence (as was observed in *Zenker s.n.*, BR). Flowers on branches of higher order however often reduced and not developing. All axes of the cyme suppressed and the inflorescence seemingly umbellate. The terminal flower of the dichasial cyme opening first, followed by the flowers terminating the lateral branches of the first order, etc. Peduncle slender, 5–10 mm long by ca 1 mm in diam., bright red in vivo, scattered with squamulose hairs. The two opposite bracts found at the apex of the peduncle (subtending the primary dichasial branches) early caducous, boat-shaped, the margins overlapping, in folded position 7–11 × 3–5 mm, scattered with squamulose hairs outside, in a young stage enveloping the rest of the inflorescence. Subsequent bracts much smaller, boat-shaped but not really folded, narrowly ovate, up to 2.5 × 0.5 mm, successively becoming smaller with higher branching order.

Male flower supported by a 0.7–1.3 cm long, in vivo pinkish or white pedicel, the length of which varies with its place in the cyme. Perianth segments (tepals) 4; the two bigger outer tepals opposite, 8–13 × 7–8 mm, obovate to broadly obovate, obtuse at apex, scattered with a few minute squamulose hairs outside, white or outside sometimes pink and with ca 15–16 more or less parallel longitudinal veins; the pair of inner tepals alternate with the outer ones, smaller, 6–10 × 3–3.5 mm, obovate to narrowly obovate, often spatulate and somewhat emarginate at apex, usually white, also veined. Androecium fasciculate, asymmetric; stamens 14–33. Filaments fused at the extreme base over less than 0.5 mm, otherwise free; the longest filaments up to ca 2 mm; the adaxial stamens of the bundle with nearly sessile anthers. Anthers 1.5–2.5 × 0.3–0.5 mm, narrowly oblong to narrowly obovate, obtuse, truncate or acute at apex, opening more or less laterally, lengthwise, the slits however directed towards the centre of the bundle.

Female inflorescence composed of one – very rarely two – female flower(s), supported by a 7–25 mm long, in vivo dark wine-red peduncle. The one female

flower subtended by only 2 early caducous, opposite, often very minute bracts which are seated at the very apex of the peduncle (from which it is judged that the only female flower represents the terminal flower of a dichasial cyme of which the lateral branches are suppressed; hence the flower stalk presenting itself like a pedicel is termed here peduncle!). The bracts pale green, convex, $2-11 \times 0.5-5$ mm, more or less translucent, appressed against the ovary, glabrous inside, outside scattered with squamulose hairs.

Female flower more or less sessile (but see above). Perianth segments (tepals) 4; the two bigger outer tepals opposite, flat or concave, $9.5-25 \times 7.5-15$ mm, white or often (especially outside) pinkish-red, otherwise as in male flowers; the pair of inner tepals alternate with the outer ones, smaller, $7-14 \times 4-8$ mm, boat-shaped, folded along the median, usually white, otherwise as in male flowers. Styles 4(-6), fused at the very base over 0.2-1.0 mm, otherwise free and spreading. Free parts of the styles ca 3 mm long, glabrous, horseshoe-shaped forked thereupon, the arms of the horseshoe 1.5-2 mm long, each arm covered with a narrow spirally twisted band of stigmatic glanduliferous tissue which makes about 1.5-2 turns around the arm, the second turn concentrated in the upper part, the arms otherwise glabrous, the stigmatic tissue continuous from one arm to the other on the side away from the centre of the flower. Ovary club-shaped, tapering towards both sides but especially towards the base, usually square, sometimes up to 8-angular in transverse section, $10-17 \times 4-7$ mm, covered with a more or less dense but sometimes very dense indumentum of small roundish squamulose hairs, olive-green and scattered with pale green lenticels in vivo. Perianth segments only shedding quite long after anthesis and especially the styles rather often long persistent. The ovary 4-(sometimes up to 8?)-locular; placentas arising from the ovary-walls, septiform, branched left and right towards the centre of the ovary and the branches ovuliferous on all surfaces, one branch in each of 2 adjacent locules. The septiform placentas fused in the centre of the ovary.

Mature fruit supported by the peduncle (see above), club-shaped, shortly stipitate at base, 4-8-ridged, still scattered with appressed squamulose hairs, $1.5-4 \times 1-2$ cm, finally bursting by 4 (up to 8?) valves and exposing the seed-bearing placenta tissue.

Mature seeds glossy light brown, oblong, $0.7-0.8 \times 0.3-0.4$ mm, slightly constricted and finally flattened at the very base; the brittle testa with pronounced ribs forming small roundish alveolae around the hilum, the ribs more or less parallel thereupon up till about the middle, and finally on the upper half and obtuse apex of the seed forming again an alveolate reticulum.

Note to the synonym: Already De Wildeman, the publishing author, decided that *B. injoloensis* ought to be placed in the synonymy of *B. rhopalocarpa* Warb. (De Wild., l.c., 1912). This was followed by all later authors. The complete type material, which we were able to examine, fits the above given description of *B. rhopalocarpa* Warb. perfectly. *B. injoloensis* De Wild. is a later heterotypic synonym of *B. rhopalocarpa* Warb.

Known distribution: Cameroun, Gabon, Zaire.

Ecological and biological notes: In the various herbaria we could examine *B. loranthoides* subsp. *rhopalocarpa* is not very richly represented. This, probably, is due to the fact that it grows mainly as an epiphyte on big branches in the crown of tall forest trees. Several collectors' notes point to this fact. e.g. Letouzey, who collected it in coastal forest rich in *Sacoglottis gabonensis* (Baill.) Urban and *Lophira alata* Banks ex Gaertn. f. in Cameroun, in the crown of a big *Baillonella toxisperma* Pierre, ca 50 m above groundlevel (*Letouzey no. 14.914*, P). Also in Gabon it was found growing in the crown of trees felled in forest-exploitation (teste *N. Hallé no. 2148*, P, and *Hallé and Villiers no. 5411*, P). Under these circumstances it will easily escape from casual observation. Only in very special conditions it is found as a rupestral. This seems to be the case where relatively small rocky hills emerge from the closed lowland rainforest. The ecological conditions of such a habitat combine a high relative humidity of the air with sufficient insolation (teste *Letouzey no. 10.274*, P, and *Villiers nos 841* and *859*, P; all from Cameroun). From the above-mentioned field-observations it may be concluded that *B. loranthoides* subsp. *rhopalocarpa* is photophilous but dependent on a high humidity of the air of its environment. The rather thick coriaceous leaves represent a character suited to this habitat.

Although not testified by field observation we suspect the placenta-tissue exposed in the mature opened fruit to be rather brightly coloured, zoochory being mandatory.

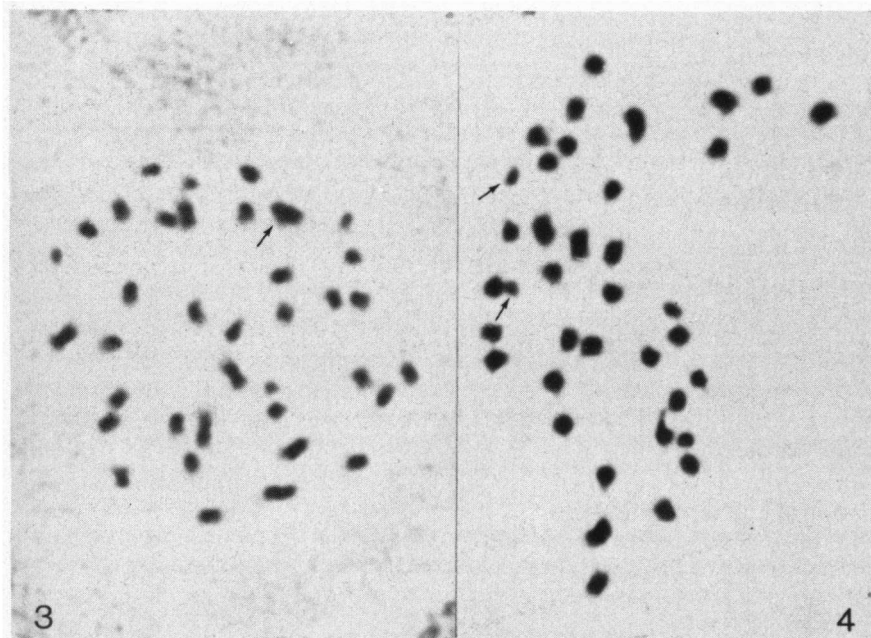
Specimens examined: Cameroun: Malimba, *Braun 85* (B, paratype); sin. loc., *Braun s.n.* (HBG); sin. loc., Bibundi according to the protologue, *Dusén 89* (B, lectotype); Bibundi, *Dusén 274* (B, paratype); sin. loc., herb. *Gandoger s.n.* (COI); Zingui, 24 km on the road Ebolowa-Kribi, *Letouzey 10.274* (P, YA); ca 25 km S. of Yabassi, *Letouzey 14.914* (P, YA); Nboltsia hill, near Gouap, 18 km NW of Bipindi, *Villiers 841* (P); *ibid.*, *Villiers 859* (P); Bipindi, *Zenker 836* (B, BM, G, HBG, K, P); near Bipindi, on the bank of the Lokundje R., *Zenker 3347* (B, BM, K); Herrmanshof near Lolodorf, Paako, *Zenker 4066* (B); near Bipindi, *Zenker s.n.* (BR, P).

Gabon: Cristal Mountains, ca 5 km along the road Asok towards the dam in the Tchimbélé R., *Breteler and De Wilde 205* (WAG); Cristal Mountains, Mount Méla, ca 1,5 hours walking distance S. of the village Méla, *Breteler and De Wilde 316* (WAAG); road between Bélinga and Mayibout I, *Breteler and De Wilde 685* (WAG); Abanga, *N. Hallé 2148* (P); *ibid.*, *N. Hallé 2163* (P); Cristal Mountains, Afoga-Fina (Atogafina), *Hallé and Villiers 5411* (P); *ibid.*, Balakabo R., *Hallé and Villiers 5413* (P); Nzamba, between Mouila and Sindara, *Le Testu 5043* (BM, P); Ganda, *Le Testu 5728* (BM, BR); Agouma, *Le Testu 5831* (BM, BR, MO).

Zaire: cultivated at Eala, *Chevalier 28.038* (P); *ibid.*, *Chevalier 28.039* (P); *ibid.*, *Chevalier 28.042* (P); *ibid.*, *Chevalier 28.044* (P); Injolo, *Laurent 923* (B, BR); *ibid.*, *Laurent 1091* (BR, lectotype of *B. injoloensis* De Wild., iso-lectotype in B); *ibid.*, *Laurent 1703* (BR, paratype of *B. injoloensis* De Wild.); cultivated at Eala, *Pynaert 428* (BR, paratype of *B. injoloensis* De Wild.); Lake M'Paku, *Seret 1080* (B, BR); Injolo, *Seret 1211* (BR, K).

7. SOMATIC CHROMOSOME NUMBERS

Root tips pretreated in 0.002 M 8-hydroxyquinoline were stained with Giemsa solution according to the method outlined by GERLACH (1977), omitting however the acetic-alcohol fixation. Squash preparations were made permanent by



Phot. 3. $2n = 36 + 1$ chromosomes in *B. loranthoides* subsp. *loranthoides*,
 Phot. 4. $2n = 38$ chromosomes in *B. loranthoides* subsp. *rhopalocarpa*.
 The arrows indicate small, probably B-, chromosomes, further explanation see text. Magnification $3000 \times$.

freezing and subsequent embedding in DPX.

Both subspecies as distinguished by De Wilde are represented by a few specimens in the living collection of the Laboratory of Plant Taxonomy and Plant Geography: *B. loranthoides* subspecies *loranthoides* by *B. mauricei* Ziesenh. (prosyn.), collection number 00-648, vouchers *J. J. de Wilde nos 8762* and *8776*, both in WAG; *B. loranthoides* subspecies *rhopalocarpa* by collection number 78-527, voucher *Breteler & De Wilde 205* (WAG) and 78-537, *Breteler & De Wilde s.n.* respectively.

The observations indicate a number of $2n = 36 + 1$ for *B. loranthoides* subsp. *loranthoides* (photograph 3, slide 2-029) and $2n = 38$ for *B. loranthoides* subsp. *rhopalocarpa*, number 78-527 (photograph 4, slide 3-021) and $2n = 36 + 2$ for number 78-537 (slide 3-015).

The notation of $2n = 36 + 1$ or $2n = 36 + 2$ is deliberately used since it indicates a particular feature of the karyotype of many African *Begonia* species. Next to the majority of the chromosomes, which in fact are small, having a size of about 0.6 to 1.0 μm , some chromosomes can be observed which are equal or often smaller than 0.6 μm . Moreover these small chromosomes usually do stain somewhat fainter. Nevertheless in many cases it is difficult to distinguish these particular chromosomes. Occasionally there is a continuous gradation within

the karyotype in respect to size as well as staining. The arrow in *photograph 3* indicates such a hardly visible small chromosome, laying closely to a larger one. Two arrows in *photograph 4* indicate similar small chromosomes in the karyotype of *B. loranthoides* subsp. *rhopalocarpa*. These two chromosomes are, however, hardly distinct from some other small ones. Therefore the somatic number of this specimen is given as $2n = 38$.

Another feature which has to be discussed, but which is not shown in the photographs, is the occurrence of still smaller grainlike stained particles in the cytoplasm, laying astray between the chromosomes. It is not certain whether these particles represent chromosomal material, although they have similar staining properties. As their number is quite variable they have not been considered in determining the somatic chromosome number.

Concerning the numbers found here, it is concluded that they corroborate the findings of LEGRO & DOORENBOS (1969, 1971, 1973), who recorded $2n = 36$ to 38 for the section *Tetraphila*. The number of $2n = 36 + 1$ found here slightly deviates from the number of $2n = 38$ which they recorded for the same specimen mentioned in their publication (1973) as *B. mauricei*.

It is postulated that the small chromosomes which are present in many of the cells analyzed represent B-chromosomes.

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