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STUDIES IN THE GESNERIACEAE OF THE OLD WORLD

XI: THE GENUS ORNITHOBOEA

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Ornithoboea is a genus where, within less than a dozen species, there is a very sensible degree of structural variation; and yet in certain essential features, as in general facies, its species show a unity which gives confidence that almost any taxonomist, seeing them side by side, would rank them as congeneric. Furthermore, in all the shifting classification of the *Gesneriaceae*, there is no other genus with which *Ornithoboea*, as here understood, is in danger of being even momentarily confused. On close study it becomes clear that those differential characteristics that have resulted in the separation of the three genera *Lepadanthus* Ridley, *Brachiostemon* Handel-Mazzetti and *Sinoboea* Chun, do not result from any very remarkable innovations; they are seen to be natural and reasonable structural developments from one species to another. Not only general facies but the most important diagnostic feature of the genus, the palatal beard and the circlet of hairs round the mouth of the corolla, are maintained throughout.

This combination of intrinsic unity and extrinsic divergence is here more notable than in any other Old World genus of *Gesneriaceae*. The result is to present a peculiarly valuable opportunity of seeing the kind of change that can take place within the limits of a natural genus, and such changes, as well as the more constant features, are described and discussed in the morphological notes which follow. In dealing with corolla and androecium I write as though the simplest flowers stand at the base of an evolutionary series. This gives ease of exposition, but it is in no way claimed to represent actual phylogeny. Of the evolution of *Ornithoboea* nothing is known. Nor is any knowledge yet available of the relation of the different flower forms to the insects which pollinate them. Not until this gap is filled will it be true to say that we have any real understanding of the genus.

The history of *Ornithoboea* may be conveniently combined with a check list of species by giving all the published names in chronological order:—

1883	**O. Parishii** C. B. Clarke	
1909	*Lepadanthus flexuosus* Ridley	=O. flexuosa
1911	*Boea Feddei* Léveillé	=O. Feddei
1912	*Boea arachnoidea* Diels	=O. arachnoidea
1913	*Boea Darrisii* Léveillé	=O. Feddei
	O. Henryi Craib	
	O. Lacei Craib	
1914	*O. lanata* Craib	=O. arachnoidea
1916	**O. Wildeana** Craib	
1920	**O. arachnoidea** (Diels) Craib	
	O. Darrisii (Léveillé) Craib	=O. Feddei
	O. Forrestii Craib	=O. arachnoidea
1934	*Brachiostemon macrocalyx* Handel-Mazzetti	=O. Wildeana
1946	*Sinoboea microcarpa* Chun	=O. Feddei
1957	**O. barbanthera** B. L. Burtt	
	O. Feddei (Léveillé) B. L. Burtt	
	O. flexuosa (Ridl.) B. L. Burtt	
	O. leptonema B. L. Burtt	
	O. pseudoflexuosa B. L. Burtt	

Little more need be said. *Ornithoboea* has never, since it was first established, been reduced to synonymy, but the above list of names shows that Craib alone has effectively recognized it in the intervening period. It is unfortunate that at no time did Craib make clear the way in which the characters of the genus were extended by the additional species he included in it. He had the advantage of access to the original species (still known from only a single specimen) and had he provided an emended generic description it is quite likely that the genera *Brachiostemon* and *Sinoboea* would never have been proposed. Ridley's genus *Lepadanthus* was no doubt due to the fact that its fruits are too short to show any distinct torsion and thus comparison with *Ornithoboea* was probably never made.

MORPHOLOGY

HABIT. The correct reading of habit from herbarium material is often difficult. *O. Lacei*, *O. Wildeana* and *O. lanata* have all been in cultivation, but not for long enough to yield accurate data on their duration. When *O. Lacei* was described from a living plant (Bot. Mag. t. 8627), it was suggested that it might be a biennial. The herbarium specimens, however, lead me to believe that it is monocarpic in its natural habitats. The plants show, below the leaves of the current growth, numerous closely packed persistent and suberized leaf-bases; they may number more than 100, too high a figure for one season's growth. The inflorescences are apparently the first to be produced on such shoots and are terminal. The conclusion that the shoot system is monocarpic is thus inescapable. The fact that *O. Lacei* flowered in its second season may be attributable to the conditions of cultivation.

Each shoot is independent in the herbarium specimens and none shows any sign of reproducing itself. The first conclusion is, naturally, that these are individual plants. That may well prove to be correct, but the slight possibility remains that these shoots have been derived from stolons produced by an older plant. The stoloniferous habit, so well attested amongst American Gesneriaceae, is apparently rare amongst the Asiatic members of the group. Nevertheless it may occur more frequently than is recognized and the possibility deserves mention here, if only as an incentive to a collector to make a careful excavation of the root system.

All species of *Ornithoboea* are characteristically decumbent at the base and it is this feature which suggests origin from a stolon. However it also appears that they are saxicolous and it may well be that the sterile rosettes grow in sloping or vertical cracks in the rocks, so that the upturning of the inflorescence is responsible for the basal curvature seen in the herbarium.

Attention has been focussed on these very interesting specimens of *O. Lacei*: the other species do not show this habit in nearly so marked a degree and some of the plants (or shoots, if such they be) could well be of annual duration only. Two species, however, seem to be definitely perennial: *O. barbanthera*, which shows dead remains of the previous years flowering shoot at the base of that of the current year, and *O. flexuosa*, some specimens of which show a dead branch on the creeping stock.

LEAVES. On the herbarium sheet the leaves of nearly all species are thin and delicate (the exception is the densely woolly *O. arachnoidea*). In life they are probably thinly fleshy, resembling some gesneriads in cultivation such as *Chirita lavandulacea* and *Sinningia speciosa*. Only *O. barbanthera* seems as though it might have leaves of a slightly firmer texture. The leaves are always petiolate, more or less ovate in outline, crenate-serrate on the margins and unequal-sided at the base, which is usually more or less cordate. Both members of each pair are well developed, but one is usually somewhat larger than the other.

INDUMENTUM OF VEGETATIVE PARTS. One species stands quite apart from the remainder in its indumentum. This is *O. arachnoidea* and it is covered by a dense wool of very long slender much interlaced multicellular hairs. All the other species have an indumentum which may vary from villous through pilose to pubescent and usually consists of a mixture of glandular and eglandular hairs; hair length on any individual usually varies considerably and it is largely the proportion of long or short hairs which enables the indumentum to be characterized verbally.

INFLORESCENCE. The characteristic inflorescence of the Old World *Gesneriaceae* is a system of axillary pedunculate cymes in which the flowers, instead of being borne singly as in a normal cyme, are produced in serially opening pairs at each dichotomy. This form of inflorescence is also found in some of the American members of the family (e.g. species of *Kohleria*), in all (?) species of *Calceolaria* and in some species of *Penstemon*. The sub-sessile flower clusters of *Verbascum* have been analysed by Murbeck (Mon. Gatt. Verbascum in Lunds Univ. Arsskr. N.F. Avd. 2, xxix (2), 15: 1933) in terms of simple cymes with auxiliary flowers, but these are more complicated than the gesneriaceous inflorescence.

Ornithoboea has this characteristic form of cyme, but in many instances (as is well shown in *O. flexuosa*) it is modified by suppression of one branch of the inflorescence on alternate sides at each node: thus a pseudoracemose arrangement is produced, but the flowers are still paired and their relation to the bracts betrays the cymose origin.

CALYX. There is only minor variation in the calyx: the five segments are always divided to the base and are always green, hairy and about 0·75 cm. long. In some species (such as *O. arachnoidea*) the calyx is already reflexed at flowering time, in the others it becomes reflexed as the fruit ripens and it usually persists for some time.

COROLLA AND ANDROECIUM. There is so close a link between the form of corolla and that of the stamens that they may be appropriately considered under the same heading. The simplest condition is found in *O. leptonema*. This species has the longest tube in the genus (8–9 mm.) and it widens gradually and evenly to its mouth. The lower lip of the corolla is three-lobed and has a palatal beard of characteristic hairs (see below): on either side of this beard a line of hairs runs marginally across the sinus between the upper and lower lips of the corolla and then along a ridge of tissue at the base of the two-lobed upper lip so that a ring of hairs round the mouth of the corolla-tube is formed: this I call the circlet (*circulus*). Palatal beard and circlet are the most distinctive single feature of the genus *Ornithoboea*.

The hairs of the beard and circlet are in themselves remarkable structures. Whereas the much smaller hairs that form the normal indumentum of the plant are all multicellular, these, relatively huge, are unicellular. They vary in length, those of the beard being longer than those of the circlet; they are somewhat flattened, dilated at the tip and the wall is provided with scattered tubercles (see fig. 1, B, H). No general survey of the trichomes found on the inner surface of corollas appears to have been made as yet. The impetus which the present work on *Gesneriaceae* has given to the collection of such information has not yet carried it to the stage where generalizations are possible. However, a fair number of plants have been examined. The most obvious point of immediate interest is that the type of hair found in *Ornithoboea* is very similar to that found at the base of the corolla-lobes in *Ramonda Myconi* (L.) Rich. (formerly *Verbascum Myconi* L.!) and on the filaments and mouth of corolla-tube in *Verbascum* (*Scrophulariaceae*). By way of contrast it may be mentioned that the stiff palatal hairs of *Mimulus*, *Antirrhinum* and *Russelia* (all *Scropulariaceae*), though also unicellular, show no terminal dilation and are of a characteristic yellow colour. Other genera have multicellular hairs within the corolla, for example *Ourisia* (*Scrophulariaceae*), *Episcia* and *Chrysothemis* (*Gesneriaceae*).

The beard and circlet are constant features of the flower of *Ornithoboea*, but the form of the corolla and androecium shows an interesting range beyond that described above for *O. leptonema*. Four changes appear to go hand in hand: the shortening of the corolla-tube, the inflation of the tube in the upper part, the relative increase in size of the lower lip and the shortening and thickening of the filaments and the gradual retraction of the fertile arm so that finally it no longer points towards the mouth of the tube, but upwards and backwards. This latter stage is associated with

the development of a well marked thickened knee on the filament and eventually with the production at the knee of a distinct sterile process. This sterile process continues the original line of the filament along the floor of the corolla tube while the fertile arm branches off upwards and backwards. Terminally the sterile arm is swollen, wrinkled and yellow: it seems likely that it is visible when the flower is open and forms a central yellow mark such as is a frequent feature of flower colouration.* In all these more complex arrangements the anthers are firmly coherent face to face. The shortening of the filaments and their change of direction means that the anthers are held just below the roof of the corolla at the point where the narrow basal tube expands into the upper inflated portion.

O. lanata stands rather apart from the other members of the genus in the slight degree of inflation of the upper part of the corolla-tube. The marked resemblance of its flower to that of the orchid genus *Calanthe* is commented upon in the notes on the species.

GYNOECIUM AND FRUIT. The shape of the ovary in *Ornithoboea* provides a good generic character, for it is short and conical and passes rather abruptly into the well-developed style. This contrasts with the cylindrical, pod-like, gradually attenuated ovary of most allied genera. The T-shaped parietal placentae are ovuliferous on the somewhat swollen recurved ends, not on the inner faces which abut closely on one another without, apparently, fusing in this genus.

The mature fruit varies in length from 0·5–2·5 cm. and is spirally twisted. In *O. flexuosa*, however, the fruit is so short that the spiral twist is scarcely perceptible and it was not mentioned in the original description of the plant. Careful examination shows that the lines of dehiscence do in fact complete a quarter turn of the capsule in the short length of the fruit, and there is no doubt that the apparent exception to the generic character is due to the lack of opportunity for its expression, rather than to its genuine absence.

Pigment granules. A solid pigment in granular form is found on the external surface of certain members of Gesneriaceae and has been studied and described in at least two of them: *Didymocarpus pedicellatus*** and *Streptocarpus Dunnii*†. The distribution of such pigment granules in the family as a whole is not yet known, but they certainly occur in *Ornithoboea*, where they are especially well shown by *O. Wildeana*.

DISTRIBUTION

The range of *Ornithoboea* is quite limited, from southern China to Kedah, the northernmost of the Malay States. The Burmese species occur only east of the R. Irrawaddy and the genus does not reach India. No less

* The varied way in which this yellow mark is produced makes an interesting study. For instance, in *Chirita Trailliana* and other species there are two yellow lines on the floor of the corolla throat, whereas in those species of *Streptocarpus* which have a yellow throat there is most often a single median patch or stripe. The white flowers of *Petrocosmea Kerrii* have a yellow mark at the base of the upper lip of the corolla; but *P. Parryorum*, which has blue flowers, has a yellow swelling on the filament just below the anthers. In all species of *Saintpaulia* and in nearly all of *Boea* it is the anthers themselves that are bright yellow.

** S. Siddiqui in Journ. Indian Chem. Soc. xiv, 703 (1937).

† J. R. Price & R. Robinson in Nature, cxlii, 147 (23 July 1938).

than five of the ten species occur within the political boundaries of Thailand, but these boundaries have no phytogeographical significance. Northern Thailand shares *O. arachnoidea* and *O. Wildeana* with southern China; southern Thailand shares *O. flexuosa* with Kedah. No species ranges from north to south of the country and it is two species endemic to the isthmus which provide the geographical links.

The east to west extension of *Ornithoboea* is at its maximum scarcely over 750 miles, while the north to south range is some 1400 miles. The overall land area for this genus of ten species is some 800,000 square miles, within which, however, the species are of very restricted occurrence. It is true that much of the area still awaits thorough botanical exploration—and to this the apparently disjunct distributions of *O. arachnoidea* and *O. Wildeana* may well be due—but the species of *Ornithoboea*, like many other *Gesneriaceae*, are undoubtedly limited in their ecological tolerance.

At least three species, *O. flexuosa*, *O. pseudoflexuosa* and *O. barbanthera*, are found only on limestone outcrops and it seems likely that the other species are similarly limited, although collectors' notes are insufficient to establish the point with certainty. Many other members of the family are restricted to limestone habitats in the Indo-Malayan region (cf. M. R. Henderson, The Flora of the Limestone Hills of the Malay Peninsula, in Journ. Malayan Br. Roy. As. Soc. xvii, 13–87: 1939), but there is no clear evidence that they are obligate calcicoles. Indeed Henderson remarks that one of them, *Epithema*, is also widespread on granitic rocks. The fact is that the *Gesneriaceae* are characterized by a very shallow root system and this seems to result in their being found in three main habitats: in the humus of rock ledges and pockets, as epiphytes on trees (or growing on damp mossy rocks and banks) and on the humus of the forest floor. It is at least possible that the richness of the limestone flora in *Gesneriaceae* is due rather to the frequency of suitable physical habitats than to the chemical nature of the rock.

CLASSIFICATION

Ornithoboea C. B. Cl. in DC. Mon. Phan. v, 148 (1883) et in Hook. fil., Fl. Brit. Ind. iv, 365 (1884).

Syn.: *Lepadanthus* Ridley in Journ. & Proc. As. Soc. Bengal, lxxiv, 782 (1909) et Fl. Malay Penins. ii, 538 (1923).
Brachiostemon Hand.-Mazz. in Sinensia, v, 10 (1934).
Sinoboea Chun in Sunyatsenia, vi, 271 (1946).

Typus generis: *O. Parishii* C. B. Cl.

Herbs (annual ? or) perennial, perhaps some monocarpic. *Flowering stems* curved at the base, basal leaves usually withered at time of flowering, variable in number and aggregation, their position marked by scars or persistent corky peg-like leaf-bases. *Leaves* petiolate, more or less ovate, acute, subcordate and unequal sided at the base, crenate or bluntly serrate-dentate; the leaves of a pair often (always?) unequal in size. *Indumentum* of stems and leaves densely woolly in *O. lanata*, in the other species variously pilose or pubescent, with or without an admixture of glandular hairs. *Inflorescences* cymose with paired flowers; sometimes pseudoracemose by abortion of one branch at each dichotomy. *Bracts*

small and more or less linear (rarely the lower ones subfoliaceous). *Calyx* divided to the base into five green segments which are broadly lanceolate to elliptic, often acuminate at the tip; sometimes nearly as long as the corolla, often reflexed and persistent as the fruit ripens. *Corolla* tube broadly funnel-shaped or distinctly inflated in the upper part; limb bilabiate, the upper lip of two short blunt lobes, the lower much larger and variously trilobed; palate of the lower lip bearded with large unicellular hairs which are tuberculate and dilated at the tip; from the beard a line of hairs runs marginally across the sinus between the upper and lower lips and then across the base of the upper lip thus forming a circlet (*circulus*) around the mouth of the corolla. *Fertile stamens* two, the anticous pair; filaments either simple and straight, or geniculate, or with a definite sterile branch at the knee; when geniculate or branched the fertile arm is erect or sloping backwards towards the base of the corolla-tube; anthers usually cohering face to face (perhaps cohering by tips only in *O. Parishii* or even quite free in *O. leptonema*), reniform, cells confluent on dehiscence. *Staminodes* 2–3, usually well developed. *Ovary* conical, pubescent or pilose; placentae parietal, T-shaped, ovuliferous on the slightly swollen in-turned ends, not on the inner face. *Style* longer than the ovary, ending in a terminal stigma. *Fruit* a capsule twisting spirally except in the very short-fruited specimens in which only a quarter of a turn of the spiral may be completed, pilose or pubescent. *Seeds* small, ellipsoid, acute at both ends.

Key to the Species

1a. Petioles, stems and leaves loosely woolly; calyx membranous; lower lip of corolla projecting far beyond the very short upper lip which merely rims the mouth of the tube; filaments always simple. S.W. China and N.W. Thailand . . . . 1. *arachnoidea*

1b. Petioles, stems and leaves pilose, pubescent or glandular-pubescent:

2a. Filaments straight, simple, directed forwards in the corolla-tube:

3a. Lobes of lower lip of corolla acute. Burma . . 4. *Parishii*

3b. Lobes of lower lip of corolla obtuse.

4a. Corolla-tube 8–9 mm. long; filaments 4 mm. Indo-China 2. *leptonema*

4b. Corolla-tube 5 mm. long; filaments 2 mm. S.W. China 3. *Feddei*

2b. Filaments bearing either a thickened knee-like swelling or a definite sterile projection or arm; fertile arm always erect or directed upwards and backwards.

5a. Corolla 1 cm. long or less:

6a. Fruit 0·5 cm. long, scarcely twisted. S. Thailand and N. Malay Peninsula . . . . . 5. *flexuosa*

6b. Fruit 1·5 cm. long, distinctly twisted. S.W. China 6. *Henryi*

5b. Corolla more than 1 cm. long:

7a. Lobes of lower lip of corolla emarginate; anthers glabrous. Burma . . . . . 7. *Lacei*

7b. Lobes of lower lip of corolla entire; anthers bearded or slightly pilose at connective (rarely glabrous?):

8a. Lower part of plant densely yellow-villous between persistent corky bases of fallen leaves; anthers bearded. C. Thailand 8. *barbanthera*

8b. Lower part of plant pubescent only; fallen leaves marked by conspicuous raised scars, not by corky pegs:
9a. Calyx-segments long acuminate; anthers slightly pilose at connective (rarely glabrous?); fruit 2 cm. long. S. China and N.W. Thailand . . . . . 9. *Wildeana*
9b. Calyx-segments acute; anthers bearded; fruit 1 cm. long. C. Thailand . . . . . 10. *pseudoflexuosa*

1. **Ornithoboea arachnoidea** (Diels) Craib in Notes R.B.G. Edinb. xi, 251 (1920).

Syn.: *Boea arachnoidea* Diels in Notes R.B.G. Edinb. v, 225 (1912).
Ornithoboea lanata Craib in Kew Bull. 1914, 1930; Pellegrin in Lecomte, Fl. Gén. Ind.-Chine, iv, 551 (1930).
Ornithoboea Forrestii Craib in Notes R.B.G. Edinb. xi, 252 (1920).

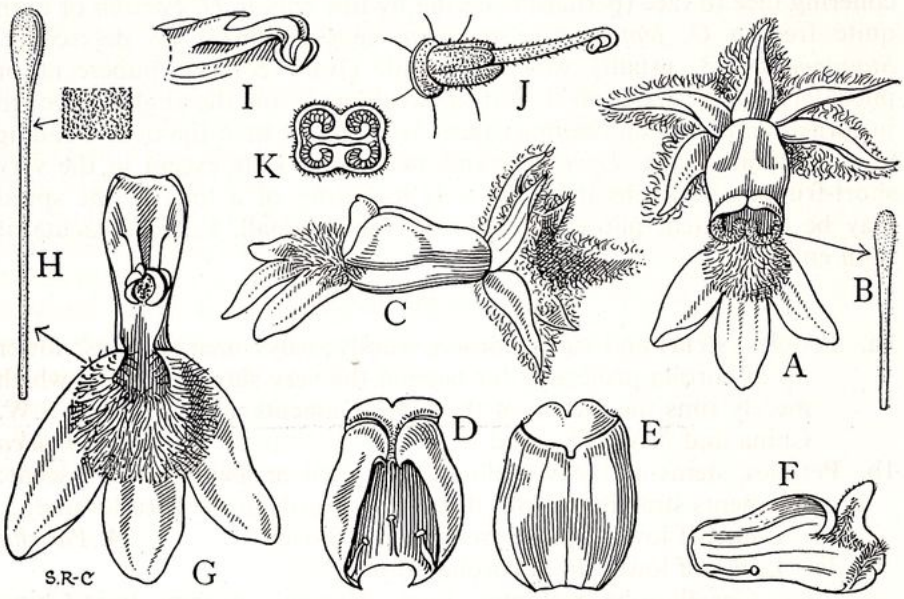

FIG. 1. *Ornithoboea arachnoidea* (Diels) Craib. A, flower, ×2; B, hair from circlet, ×46; C, flower in side view, ×2; D, innerside of upper half of corolla, with staminodes, ×3; E, outside of upper half of corolla, ×3; F, longitudinal section of upper half of corolla; G, lower half of corolla and stamens, ×3; H, hair from beard, ×46, and a portion of its surface greatly enlarged; I, stamens in side view, ×3; J. gynoecium, ×3; K, cross-section of ovary, ×8.

YUNNAN. N'Maikha-Salween divide, 26°30′N, 2100–2400 m., Sept. 1919, *Forrest* 18543 (E,K). Shweli-Salween divide, 25°45′N, 98°58′E, 2400 m., Oct. 1924, *Forrest* 25273 (holo. *O. Forrestii*, E,K); *ibid.*, 1800 m., Aug. 1913, *Forrest* 11962 (E, BM, K). Ming Kwang valley, near Pei-sha, 25°35′N, 1800–2100 m., Oct. 1905, *Forrest* 929 (holo. E, iso. BM, K). Shweli-Salween divide, 25°30′N, 2700 m., July 1918, *Forrest* 17557 (E, BM, K). Hills to the N.E. of Tengyueh, 25°15′N, 2100 m., Oct. 1912, *Forrest* 9272 (E). Tengyueh *Howell* 67 (E).

N.W. THAILAND. Doi Chieng Dao, 660 m., *Kerr* 2852 (holo. *O. lanatae*, K, iso. ABD, BM); *ibid.*, 23 Oct. 1926, *Put* 429 (ABD, K, BM); *ibid.*, steep slope S.W. of Ban Tam, 730 m., fl. stem covered with white flocci, front petals blue-violet, in vertical position on limestone rock face, 15 Aug. 1935,

Garrett 979 (K, E, ABD); *ibid.*, N. of Ban Tam, c. 950 m., 17 Aug. 1935, *Garrett* 982 (K). Cult. in hort. bot. reg. Kew, 7 July 1912, seed coll. *Kerr* (K); *ibid.*, 5 Aug. 1942, seed coll. *Garrett* (K).

I have felt unable to follow Craib in maintaining three distinct species here. Apart from slight differences in size they appear to me entirely similar; indeed Craib himself only distinguished *O. Forrestii* by its general size, and nowhere does he indicate morphological differences by which the three may be separated.

O. arachnoidea was cultivated at Kew and at Trinity College, Dublin, about 1912, and at Kew in 1942: in both instances from Siamese seed. On the latter occasion Miss Ross-Craig fortunately made a drawing of it for the Kew collection. It is from this, and from material preserved in spirit at the same time, that she has kindly prepared the figure now reproduced.

The flowers of *O. arachnoidea* show a superficial resemblance to those of some species of the orchid genus *Calanthe*; a resemblance which is quite remarkable when the divergent basic structure of the two flowers is remembered. The whole corolla of the *Ornithoboea* matches with the labellum alone of *Calanthe*, while the five sepals of *Ornithoboea* are matched by the three sepals and two lateral petals of the orchid. One cannot help wondering whether *Calanthe* and *Ornithoboea arachnoidea* are pollinated in nature by similar insects.

2. **Ornithoboea leptonema** B. L. Burtt, **sp. nov.** inter congeneros corollae tubo longiore et angustiore, filamentis longioribus tenuioribus facile distinguenda.

Herba usque ad 40 cm. alta, caule basi curvata, ut videtur annua, internodiis 3–4 cm. longis. *Folia* infima subanthesi iam delapsa, haud aggregata; superiora opposita, inaequalia, petiolatis (petiolis 8 cm. usque longis); lamina oblique ovata, ad 12 cm. longa et 9 cm. lata, apice acuta, basi altero latere cordata, altero brevior et rotundata, margine grosse dentato-crenata (dentibus saepe crenulatis), supra atque infra parce pubescens. *Cymae* axillares, pedunculis c. 4 cm. longis pubescentibus suffultae. *Bracteae* lineares, inferiores c. 4 mm. longes, superiores breviores. *Calyx* fere ad basin in segmenta quinque partitus; segmenta, late lanceolato-acuminata, 5 mm. longa, 1·75 mm. lata, viridia, marginibus piloso-pubescentibus. *Corolla* tubo 8–9 mm. longo, bilabiata; labium superius 4·5 mm. longum, 5 mm. latum, fere ad basin bilobatum; labium inferius fere 1 cm. longum et latum, breviter trilobatum, lobis rotundatis, in palato dense barbatum et lineis piliferis e barba lateraliter extensis ore tubi circumcingentibus circulum formantibus praeditum. *Stamina* prope basin corollae inserta; filamenta gracilia, recta, 4 mm. longa, glabra; antherae ut videtur liberae, loculis basi leviter divergentibus, 1 mm. longae. *Ovarium* 2·5 mm. longum, glanduloso-pubescens, cylindrico-conicum, in stylum 4 mm. longum angustatum; stigma capitatum. *Fructus* 10–15 mm. longus, 2 mm. diametro, spiraliter tortus, calyce persistente suffultus.

TONKIN. Roches calcaires de Notre Dame, en face de Tu-Vu, corolle blanche, août 1887, *Balansa* 4310 (holo. P, iso. K), 4311 (P, K).

This species is easily distinguished by the long corolla-tube and the straight, slender filaments. The anthers appear to be free from one another, but light attachments are easily broken when a flower is pressed and insufficient material has been available to set this point beyond doubt.

Nevertheless, whether the anthers be free or lightly coherent, the structure of the androecium is the most simple found in the genus.

There is a specimen from Bassac (106°E, 15°N,) in Laos which might belong to this species (*Thorel* 2347—P, K). It is however in fruit only and cannot be determined with certainty. The basal part of the specimen looks more woody and shows a few crowded leaf-bases; it may therefore be a plant of longer duration than *O. leptonema* which, judging from the herbarium sheets, could well be an annual.

These specimens were referred to *O. Parishii* by Pellegrin (in Lecomte, Fl. Gén. Ind.-Chine, iv, 551: 1930).

3. **Ornithoboea Feddei** (Léveillé) B. L. Burtt, **comb. nov.**

Syn.: *Boea Feddei* Léveillé in Fedde, Rep. Sp. Nov. ix, 249 (1911).
Boea Darrisii Léveillé in Fedde, Rep. Sp. Nov. xi, 494 (1913).
Ornithoboea Darrisii (Léveillé) Craib in Notes R.B.G. Edinb. xi, 252 (1920).
Sinoboea microcarpa Chun in Sunyatsenia, vi, 271 (1946).

KWEICHOW. *Esquirol* 730 (holo. E). *Equirol* (?) 3975 (E). Pin Jao, Chenfeng [105°44′E, 25°24′N], fl. purplish-white, 23 Sept. 1936, *S.W. Teng* 91032 (A—iso. *Sinoboeae microcarpae*).

Boea Feddei and *B. Darrisii* are both based on *Esquirol* 730. Léveillé's herbarium contains only a single specimen of this number and it is written up *B. Darrisii* in his own hand. The inference is that he omitted to label *B. Feddei* when publishing that species and that, when he came to the same specimen again some two years later, he failed to recognize it as one he had already described.

The type specimen is in fruit only, but one loose flower was found on *Esquirol* 3975 and this proved a good match with that from the isotype of *Sinoboea microcarpa*. Chun realized that there was a possibility of this, but Léveillé's skimpy description made it impossible for him to reach a decision. It is most unfortunate that his own epithet based on good well-described material has now to be abandoned.

4. **Ornithoboea Parishii** C. B. Clarke in DC. Mon. Phan. v, 148 (1883), et in Hook. fil., Fl. Brit. Ind. iv, 366 (1884).

BURMA. Moulmein, 1862, *Parish* 434 (holo. K).

Knowledge of this species is still based on the original specimens collected by the Rev. C. Parish nearly a hundred years ago. Until further material becomes available it will not be possible to put together a satisfactory account of the morphology of the genus—particularly that of the androecium, as it is not certain whether the anthers really cohere by their tips, as drawn by Parish and Fitch, or face to face as in other species: the latter seems most likely. The illustrations must certainly be corrected in one particular: while the beard of hairs on the palate of the corolla is well shown, there is no sign of the circlet which I have described as a feature of the genus. The circlet is, however, present: the smaller size of its hairs, compared with those of the beard, doubtless accounts for its having been overlooked.

5. **O. flexuosa** (Ridl.) B. L. Burtt, **comb. nov.**

Syn.: *Lepadanthus flexuosus* Ridl. in Journ. & Proc. As. Soc. Bengal, lxxiv, 782 (1909); Fl. Malay Penins. ii, 538 (1923); Henderson in Journ. Malay. Br. Roy. As. Soc. xvii, 61 (1939).

THAILAND. Kaw Si Kaw Ha, Patalung [c. 7°40′N, 100°8′E], 12 Apr. 1928, *Kerr* 15145 (ABD, BM, K). Kao Changloni, Songkla [c. 7°15′N, 100°30′E], c. 50 m., 24 Jul. 1928, *Kerr* 15892 (ABD, BM, K). Banang Sta, Pattani [6°17′N], 14 Jun. 1930, *Kiah* 24336 (SING, K); *ibid.* c. 50 m., 23 Jul. 1923, *Kerr* 7307 (ABD); *ibid.*, c. 100 m., 26 Jul. 1923, *Kerr* 7307A (ABD, BM, K) Koh-si-kah, 17 Jan. 1916, *Annandale* 1581 (SING, K).

KEDAH. Alor Star, Gunong Geriang, March 1910, Ridley 14912 (SING, BM, K); *ibid.*, 18 May 1938, Kiah 35419 (SING); *ibid.*, 15 Nov. 1915. *M. Haniff* 640 (SING, K). Bukit Tapang, nr. Biserat, Jalor, *D. T. Gwynne-Vaughan* 480 (K). Koh Murang, near Talesap, *D. T. Gwynne-Vaughan* 259 (K).

At first sight *O. flexuosa* stands apart from all other species of the genus in not having a spirally twisted fruit. Closer examination shows that the line of dehiscence does not run straight: it is curved as in a very loose spiral and the shortness of the capsule (which is only some 6 mm. long) prevents more than about a quarter turn of the spiral being completed.

6. **Ornithoboea Henryi** Craib in Kew Bull. 1913, 115.

YUNNAN. Pu-erh, cliffs, 1350 m., *Henry* 13378 (holo. K, iso. E).

The isotype at Edinburgh is in fruit only, but a good flower is preserved on the Kew specimen. No other material has been seen. The affinity is clearly with *O. flexuosa* but that is a much more floriferous plant with short fruits and is restricted to southern Siam and the Malay States; from the other Chinese species, *O. Feddei*, the thickened filaments and larger corolla are adequate distinctions. *O. pseudoflexuosa* and *O. barbanthera* differ not only by their larger corollas, but by their bearded anthers; *O. Lacei* and *O. Wildeana*, on the other hand, are much more robust plants. Despite the scanty material and the lack of any outstanding feature *O. Henryi* therefore maintains its position as a distinct species.

7. **Ornithoboea Lacei** Craib in Kew Bull. 1913, 115; Bot. Mag. t. 8627 (1915).

BURMA. Ani Sakan, near Maymo, 900 m., 25 Aug. 1912, *Lace* 5926 (holo. K, iso. E).

This species has never been re-collected, but the quality of Lace's material is such that the original description was full and complete. The emarginate corolla lobes are apparently unique in the genus and make recognition of the species easy. For a discussion on the habit of *O. Lacei* see p. 288.

8. **Ornithoboea barbanthera** B. L. Burtt, **sp. nov.** et habitu humili et foliis parvis et flore magno insignis. Ob bases foliorum suberosas persistentes *O. Lacei* similis sed aliis notis (corollae lobis integris, antheris barbatis, fructibus brevibus) longe recedit.

Herba perennis, saxicola; caules inferne curvati, 12 cm. usque alti, basi basibus foliorum suberosis praediti, patenter piloso-villosi. *Folia* petiolata;

petiolus c. 3·5 cm. longus ut caulis piloso-villosus; lamina inaequaliter late ovata, c. 5 cm. longa, c. 3·5 cm. lata, apice subacuta, basi inaequali rotundata vel subcordata, utrinque parce piloso-pubescens, margine crenato-dentata. *Inflorescentiae* axillares, unilateraliter cymosæ et ideo pseudo-racemosae; flores geminati; pedunculus infra flores 1–1·5 cm. longus; bracteae lineari-oblanceolatae, 5 mm. longae; pedicelli c. 1·5 cm. longi; omnia piloso-pubescentia. *Calyx* ad basin in segmenta quinque elliptica vel lanceolato-elliptica acuta extra pilosa intra pubescentia partitus. *Corolla* tubo inflato c. 6 mm. longo untrinque glabro; labium superius 5 mm. longum e lobis duobus obtusis compositum; inferius 1 cm. longum et 1·3 cm. latum vix ad medium in lobos tres obtusos c. 5 mm. longos et latos divisum; palatum pilis magnis unicellularibus tuberculatis apicibus incrassatis barbatum, utrinque lineis pilorum circum corollae orem excurrentibus circulum formantibus praeditum. *Stamina* filamentis 1 mm. longis retrorso-erectis prope basin ramo sterili luteo crasso 1·5 mm. longo porro directo praeditis; antherae reniformes fere 1 mm. longae, 1·5 mm. latae, connectivo pilis multicellularibus conspicue barbatae. *Staminodia* duo, 1·5 mm. longa. *Ovarium* conicum, 2 mm. altum, pilosum, in stylo 8 mm. longo pubescente subito contractum. *Fructum* (vix maturum) late cylindricum, 5 mm. longum, dense pilosum, stylo glabrescente adhuc persistente terminatum.

THAILAND. Sam Roi Yawt, Prachuap [11°50′N], 300–500 m., 12 July 1926, *Kerr* 10956 (ABD, BM); *ibid.*, under 50 m., 13 July 1926, *Kerr* 10977 (holo. ABD., iso. BM); *ibid.*, 14 Sept. 1926, *Put* 249 (ABD, BM); *ibid.*, 3 Dec. 1929, *Put* 2513 (ABD, BM).

This dwarf species is evidently perennial, for some specimens show the dead remains of the flowering stems of a previous year. The leaves are not only smaller but also somewhat thicker than those of other species and all the features of *O. barbanthera* suggest that it may be adapted to a relatively dry or exposed habitat.

9. **Ornithoboea Wildeana** Craib in Kew Bull. 1916, 268.

Syn.: *Brachiostemon macrocalyx* Handel-Mazzetti in Sinensia, v, 10 (1934).

KWANGSI. Pu-hi, 25 km. W. of Tang-han, 730 m., on shady rocks, rare, 27 July 1928, *R. C. Ching* 6565 (W—holo. *Brachiostemonis macrocalycis*). Pan Shan, Ching Sai, herb on rock under woods, fl. bluish-white, 9 Sept. 1935, *S.P. Ko* 55754 (A).

N.W. THAILAND. Doi Chiengdao, c. 19°N., 99°30′E, seed coll. *Dr. A. Kerr*, cult. Trinity College, Dublin, 5 Aug. 1914 (holo. K); *ibid.*, 1600–2000 m., 3–6 Nov. 1922, *Kerr* 6552; *ibid.*, 18 Oct. 1926, *Put* 394. Doi Tam Yap, north face, West of Chiengrai [99°48′E, 19°54′N], 390 m., 21 Sept. 1924, *Garrett* 200. Lampang [99°32′E, 18°16′N], Me Ngow, 590 m., 28 Aug. 1922, *Khoon Winit* 755.

Some specimens (e.g. *Put* 394) have more acuminate calyx-lobes than the type and there is also variation in the development of the sterile process on the filament. Both these variations occur among the plants of N.W. Thailand and do not serve to differentiate these from the Chinese material: the type specimens of both the specific names have the sterile process on

the filament well developed. There is also a rather wide range in stature: from 20 cm. (*Ko* 55754) to 60 cm. (*Garrett* 200). The species is in fact more variable than others and further analysis might yield results when more material is available.

10. **Ornithoboea pseudoflexuosa** B. L. Burtt, **sp. nov.** habitu *O. flexuosae* similis sed flore multo majore, filamentis geniculatis longioribus, antheris barbatis facile distinguenda. Ab *O. Henryi* antheris barbatis inter alia differt.

Herba (fortasse biennis vel monocarpica) saxicola, caule basi valde curvato c. 15–20 cm. alto cicatricibus foliorum paucorum notato. *Folia* (in vivo subcarnosa?) in sicco pertenuia, 18 cm. usque longa, 9 cm. usque lata, plus minusve elliptica, apice acuta, basi inaequali, altero latere rotundata altero brevius subito angustata, utrinque parce piloso-pubescentia; petiolus 10 cm. usque longus piloso-pubescens. *Inflorescentiae* axillares unilateraliter cymosae et ideo pseudo-racemosae; flores geminati; pedunculus infra flores c. 1·5 cm. longus; bracteae lineares c. 2–3 mm. longae; pedicelli 1–1·3 cm. longi; omnia piloso-pubescentia. *Calyx* ad basin in segmenta quinque 7 mm. longa et 2 mm. lata acuminata partitus. *Corolla* tubo basi angusto deinde inflato, 7 mm. longo, extra glabro intra pilis paucis atropurpureo-glandulosis sub tecto praedito; labium superius c. 4 mm. longum, leviter bilobatum, lobis semiorbicularibus; inferius fere 1 cm. longum et latum, in lobos tres 3–4 mm. longos et 4–5 mm. latos obtusos divisum; palatum pilis magnis tuberculatis apicibus incrassatis unicellularibus barbatum, utrinque lineis pilorum circum corollae orem excurrentibus circulum formantibus praeditum. *Stamina* duo circiter medium tubum inserta; filamenta 4 mm. longa, 1 mm. supra basin incrassato-geniculata; antherae reniformes, 1 mm. longae, fere 2 mm. latae, connectivo pilis multicellularibus barbatae. *Staminodia* duo, 1 mm. longa. *Ovarium* breviter conicum, 1·5 mm. altum, piloso-pubescens, subito in stylum fere 1 cm. longum contractum. *Fructus* 1 cm. longus et 3 mm. latus, fusco-viridis, pubescens, semitorquatus. *Semina* ellipsoidea, utrinque acuta, 0·3 mm. longa, castanea.

THAILAND. Siepynan, Chumpawn [10°30′N], 6 Sept. 1927, *Put* 964 (holo. ABD, iso. BM). Kao Talu, Ranawng [10°N], c. 50 m., 3 Feb. 1927, *Kerr* 11790 (ABD).

Because of its rather large leaves, longish inflorescences and short fruits this species bears a resemblance to *O. flexuosa*, but its much larger flowers with bearded anthers show it to be quite distinct and indicate that it is also related to *O. Wildeana* and *O. barbanthera*. The fruits, too, are longer than in *O. flexuosa* and although their spiral line of dehiscence completes but half a turn, they are more obviously twisted than those of *O. flexuosa*.