COMMENTS ON FOUR LEGUMES (*CLITORIA, CENTROSEMA*) REPORTED AS OCCURRING IN INDIA

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ABSTRACT

The South American species, *Clitoria arborescens* R. Br. in Ait., reported as new to India by Bhaumik and Das in 1983 was a misidentification. The plant belongs to a variety of *Clitoria mariana* L. which is newly described as var. ***orientalis*** Fantz. *Centrosema virginianum* (L.) Benth. reported by Subramanian in 1961 was a misidentification for *Centrosema pubescens* Benth. The authors question the validity of the conclusion proposed by Almeida and Almeida that *Clitoria annua* J. Graham (the name with priority) is equivalent to *Clitoria biflora* Dalz., but have no evidence to refute it. *Clitoria vaupellii* J. Graham is best treated as ambiguous since there is a lack of evidence as to its identity.

The Botanical Survey of India is sponsoring a taxonomic treatment of the genus *Clitoria* (Leguminosae) in India. Several recent publications on species occurring in India have promoted taxonomic confusion within this genus. Members of the South American species, *Clitoria arborescens* R. Br. in Ait., were reported by Bhaumik and Das (1983) as a new wild species in India. Subramanian (1961) reported *Centrosema virginianum* (L.) Benth. (syn. *Clitoria virginiana* L.) as an escaped ornamental introduction. Graham (1839) described two new species from India, *Clitoria annua* J. Graham and C. *vaupellii* J. Graham, neither name appearing in standard taxonomic references. The objectives of this article are (1) to correct the misidentifications made by Bhaumik and Das (1983) and Subramanian (1961), and (2) to discuss Graham's taxa.

CLITORIA ARBORESCENS REPORTED IN INDIA

Bhaumik and Das (1983) reported *Clitoria arborescens* R. Br. in Ait. as a new record from India (Khasi Hills) based upon the voucher *Bhaumik 60481* (ASSAM, CAL). Fantz examined and annotated a flowering specimen of *Bhaumik 60481* (CAL) on loan and returned in 1984. Also examined was a photograph of

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a fruiting specimen of *Bhaumik 60481* sent as a gift and later deposited at the University of Florida Herbarium (FLAS 151252). Dr. Bhaumik (pers. comm., 1984) indicated that he did not accept Fantz's conclusion that the specimen was misidentified. Predeep could not locate *Bhaumik 60481* in 1990 in either ASSAM or CAL. Predeep discussed the specimen with Dr. Bhaumik who is now uncertain regarding the location of his specimens. The photograph (FLAS) was re-examined by Fantz in 1990 along with data recorded from the specimen in 1984. This specimen is misidentified and belongs to *Clitoria mariana* L.

Fantz has examined and annotated over 8,000 specimens of *Clitoria. Clitoria arborescens* is distributed in northern South America, from French Guiana to eastern Venezuela with isolated collections from Colombia and northern Venezuela. It is distinguished easily from the plant described by Bhaumik and Das (1983) by elongated inflorescences with larger flowers and elongate, flat fruits. *Clitoria arborescens* does not occur in the Old World.

Clitoria macrophylla Wall. ex Benth. often is confused in Asian collections with *C. mariana*. *Clitoria macrophylla,* however, is distinguished easily by the contracted inflorescences of smaller, white flowers, and elongated calyx lobes, bracts, bracteoles and fruits. Table 1 contrasts the plant described by Bhaumik and Das (1983) with *C. arborescens, C. macrophylla* and *C. mariana. Bhaumik 60481* is *C. mariana,* not *C. arborescens* or *C. macrophylla.*

Clitoria mariana has a disjunct distribution, occurring in North America and Southeast Asia. Bentham (1858) noted that the Asian element is more luxurient when compared to American members. Fantz (1979) concluded that the Asian element repesents a subspecific entity, not a distinct species. This taxon is newly described as follows:

Clitoria mariana L. var. **orientalis** Fantz. var. nov.

Varietas nova optimo distinguitur a stipitibus, gynophoris et alis brevior, stipulis et alis latior, et inflorescentis longior.

TYPE: Sina. Yunnan: Szemao, 5500 ft., *Henry 12242* (HOLOTYPIS: E; ISOTYPIS: K, MO 107074, NY-hb. Henry). PARATYPIS: l.c., 4500 ft, *Henry 12242A* (CAL, NY-2 sheets); [Yunnan:] Doi Angká, Doi Pá Mawn, ca 1640 m, 30 Jun 1927, *Garrett B394* (BM).

Variety *orientalis* is slightly more robust in stature than the typical variety with larger leaflets, longer petioles and stipules 3 – 5 mm wide. The inflorescences are 2 – 4-(8-) flowered, with the peduncle 1 – 6 cm long, subarcuate and weakly stiff, becoming slender and subtwining at upper nodes, elongating to 15 cm long. Flowers exhibit wings extending beyond the keel by 3 – 5 mm with the blade 13 – 16 mm long and 3 – 6 mm wide. Gynophores are 2 – 4 mm long in flower becoming 5 – 8 mm long stipes in fruit.

Stems of young plants of var. *orientalis* are suberect to nearly prostrate with weakly zigzag to nearly straight internodes, with the upper portion of the stem soon exhibiting the twining appearance. Xylopodia collected appear similar to

TABLE 1. Comparison of some morphological characters of Bhaumik's plant with *Clitoria arborescens, C. mariana* and *C. macrophylla.*

CHARACTER	Bhaumik's Description	*Clitoria arborescens*	*Clitoria mariana*	*Clitoria macrophylla*
LEAVES:				
Adaxial Veins	Uncinate pubescent	Glabrous	Uncinate pubescent	Uncinate pubescent
Abaxial Pubescence	Strigose	Rufotomentose	Strigose to glabrate	Sericeous to strigose
Petiolule Length	5 – 6 mm	6 – 9 mm	4 – 6 mm	4 – 6 mm
INFLORESCENCE:				
Number of Flowers	Few-flowered	Multiflowered	Few-flowered	Several-flowered
Bracteole Length	8 mm	10 – 15 mm	4 – 9 mm	7 – 12 mm
Pedicel Length	3 – 5 mm	5 – 9 mm	3 – 7 mm	3 – 6 mm
FLOWERS:				
Standard Color	Violaceous	Violaceous	Violaceous	White
Calyx Tube Length	18 – 20 mm[1]	12 – 17 mm	10 – 14 mm	9 – 12 mm
Calyx Tube Width	6 – 9 mm	8 – 11 mm	5 – 8 mm	5 – 8 mm
Calyx Lobe Length	4 mm, long acumen[2]	5 – 8 mm	5 – 8 mm	9 – 15 mm
Ovary Length	7 mm	15 – 18 mm	7 – 9 mm	7 – 9 mm
FRUIT:				
Stipe Length	12 mm	14 – 20 mm	12 – 17 mm	6 – 9 mm
Fruit Length	3.5 – 6.5 cm	16 – 23 cm	3 – 7 cm	4 – 5.5 cm
Fruit Curvature	Convex	Flat	Convex	Convex

[1]*Bhaumik 60481* (CAL), calyx tube was measured as 11 – 14 mm long; we believe that Bhaumik & Das description cited is measurement of calyx length (tube plus lobes), not tube length.
[2]*Bhaumik 60481* (CAL), calyx lobe length was measured as 6 – 8 mm long, including length of broadened base plus acumen; we believe that Bhaumik & Das description cited does not include the acumen portion in the length.

the American variety. Lower leaves have shorter petioles and leaflets that are similar to the American variety. Climbing portions often exhibit much larger leaflets and longer petioles. Inflorescences borne on lower nodes have somewhat stiff, shorter axes, commonly 2-flowered apically. These are similar to the American variety. Upper nodes frequently bear inflorescences that are more slender, elongated, sometimes somewhat twining bearing apically 4 flowers or occasionally 6 – 8 flowers.

The E specimen designated as the holotype has a mature, viney section of the stem with the typical broader stipules, longer petiolate leaves, and slender 4-flowered inflorescences borne on slightly elongated axes. The isotype from MO is similar; however, those specimens from K and NY represent lower stem portions with associated characteristics.

TABLE 2. Comparison of some morphological characters of Subramanian's taxon with characteristics distinguishing *Centrosema pubescens* and. *C. virginianum.*

CHARACTER	Subramanian's Taxon	Centrosema pubescens	Centrosema virginianum
LEAVES:			
Petiolule Length	—	3 – 4 mm	2 – 3 mm
Stipel Length	—	2 – 4 mm	4 – 7 mm
INFLORESCENCE:			
Axis Length	4 – 5 cm	2 – 7 (9) cm	0.5 – 2 cm
Bract Length	6 – 7 mm	6 – 7 mm	3 – 4 mm
Pedicel Length in flower	5 mm	5 – 8 mm	2 – 5 mm
Pedicel Length in fruit	—	8 – 13 mm	4 – 8 mm
CALYX			
Upper & Lateral Teeth	ca 4 mm, subequal length of tube[1]	2 – 4 mm, subequal length of tube	6 – 8 mm, much longer than length of tube
Ventral Tooth Length	6 mm	5 – 8 mm	8 – 10 mm
LEGUME			
Valve Width	6 – 8 mm	6 – 8 mm	4 – 5 mm
Beak Length	10 – 15 mm[2]	8 – 10 mm	10 – 15 mm
Indumentum	Sparingly puberulous	Glabrate	Puberulent
Valve Dehiscence	ca 1 – $1^1/_4$ spiral turns	1 – $1^1/_2$ spiral turns	$1^1/_2$ – 3 spiral turns

[1]Characteristic expressed based upon Subramanian's illustration of the taxon, not his description.
[2]Illustration of two fruits has beak length measurement as ca 8 – 10 mm.

Henry 12242A is designated a paratype since it was collected from the same vicinity as the holotype, but at a lower elevation. Floral examination is difficult as the large flowers are glued to the herbarium sheet in most collections of *Clitoria. Garrett 394* (BM) is designated as a paratype because it bears a dissected flower in the packet glued to the herbarium sheet.

Variety *mariana* has stipules 1 – 3 mm wide. The inflorescences are stout, 2-flowered (rarely 4-flowered), with the peduncle typically stout and straight, and 1 – 4 cm long (rarely 6 – 9 cm long). Flowers exhibit wings extending beyond the keel by 7 – 12 mm with the blade 21 – 24 mm long and 5 – 10 mm wide. Gynophores are 5 – 8 mm long in flower becoming 12 – 17 mm long stipes in fruit. It occurs in the United States of America with two collections known from adjacent Mexico.

SUBRAMANIAN'S MISIDENTIFICATION

Subramanian (1961) reported that an introduction of *Centrosema virginianum* in the early 19th century had escaped and become naturalized in the forests of Kerala and elsewhere in India. Thothathri and Prasad (1970) extended the range to Pasighat, 24 Parganas, West Bengal. Several regional floras of Indian states or districts follow Subramanian.

Subramanian provided an excellent description and illustration of his plant, one that easily indicates it is misidentified. His plant is *Centrosema pubescens* Benth. Both species are morphologically plastic in their vegetative characteristics. Neotropical specimens are often misidentified as the other species. Table 2 contrasts distinguishing characteristics of these two species. *Centrosema virginianum* is not known to occur in India based upon Predeep's investigation of herbarium specimens (ASSAM, BLAT, BSA, BSD, BSI, BSIS, BSJO, CAL, CALI, DD, MH).

GRAHAM'S TAXA

John Graham (1839) listed four species (no. 351 – 354) of *Clitoria* in his catalogue as *C. ternatea, C. brasiliana, C. annua* G., and *C. vaupellii* G. respectively. Two of Graham's species are correctly known today as *C. ternatea* L. and *Centrosema brasilianum* (L.) Benth. (syn. *Clitoria brasiliana* L.). The other two species were newly described with a brief diagnosis by John Graham.

John Graham's diagnoses are ambiguous and were described as "sketchy" by Burkill (1965) in his work on Indian botanical history. Examination of Graham's herbarium collections would provide insight into his circumscription of the new species. However, the present location of Graham's herbarium and types are unknown according to Stafleu and Cowan (1976).

The circumscription of *Clitoria* was applied more broadly in John Graham's era and included species that are now recognized as belonging to several other genera (e.g. *Centrosema, Galactia, Periandra*). The two known plants listed by John Graham (*C. ternatea and C. brasiliana*) are assigned presently to different genera, *Clitoria* and *Centrosema* respectively. We believe that there exists the possibility that Graham's two new taxa may also belong to *Centrosema* or to another genus.

Clitoria annua was listed in Graham's catalogue as "Herbaceous, annual species. - Common on Malabar Hill & c. during the rains." Almeida and Almeida (1987) noted that "there is only one erect herbaceous species of this genus [*Clitoria*] found within the present boundaries of India" and they found plants of *C. biflora* Dalz. growing on Malabar Hill. Almeida and Almeida (1987) described *C. biflora* as "stems suberect, angular, petioles very short, leaflets 5, flowers blue, 2-flowered, bracteoles large." This description is based upon Dalzell and Gibson (1861) and has some diagnostic characteristics, none of which were noted in Graham's diagnosis (e.g., an erect habit).

Almeida and Almeida (1987) proposed that the name *C. annua* Graham be recognized as the correct name for the Indian endemic presently known as *C. biflora* Dalz. They concluded (1) that "Graham's binomial and diagnostic description of the taxon are sufficient for the identification of the species," (2) that there is only one erect herbaceous species of *Clitoria* in India and a typical specimen has been collected from Malabar Hill in 1986 (*Almeida 5890,* BLAT), (3) that Graham's species is equivalent with Dalzell's species, and (4) "according to Article No. 32.2 of ICBN, Dalzell's *Clitoria biflora* should be a synonym."

Clitoria heterophylla Lam. commonly is described as a herbaceous annual. It is known to have been in cultivation in western India since 1815. Could John Graham's plant be *C. heterophylla* introduced onto Malabar Hill or possibly some other species from a genus such as *Centrosema* that was included in de Candolle's circumscription of *Clitoria?* We question the validity of the arguments leading to the conclusion that Graham's taxa is a true *Clitoria* and an erect herbaceous species, but without any evidence to the contrary, reluctantly accept the argument proposed by Almeida and Almeida.

The identity of *C. vaupellii* still remains a mystery. *Clitoria vaupellii* J. Graham was cited as "A suffruticose, erect and growing, much branched species: in Mr. Vaupell's garden, at Bandora." Three of the species of *Clitoria* as listed by Graham (1839) are known to be in cultivation. *Centrosema brasilianum,* native to South America, and *Clitoria ternatea,* native to East Africa, were introduced into India. The only known erect, suffruticose species of a true *Clitoria* known from India at this time was a voucher (E: Calcutta, *B.C.D. s.n.*) collected in 1830 of *Clitoria laurifolia* Poir. It would be pure speculation without any hard evidence to equate these two names as synonymous. We find the description lacking diagnostic characters for identification in view of the present knowledge of the circumscription of *Clitoria* and its taxa. The name *C. vaupellii* J. Graham is best treated taxonomically as ambiguous or dubious.

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REFERENCES

ALMEIDA, M.R. and S.M. ALMEIDA. 1987. Two little known flowering plants from Maharashtra. J. Bombay Nat. Hist. Soc. 84(3):719 – 722.

BENTHAM, G. 1858. Synopsis of the genus *Clitoria.* J. Linn. Soc., Bot. 2:33 – 44.

BHAUMIK, G.H. and G.C. Das. 1983. *Clitoria arborescens* R. Brown (Fabaceae) - A new record and rare plant from India. J. Econ. Tax. Bot. 4(2):607 – 608.

BURKILL, I.H. 1965. Chapters on the history of botany in India. Pub. Govt. of India Press, Delhi, India.

DALZELL, N.A. and A. GIBSON. 1861. The Bombay flora. Education Society's Press, Bombay, India.

DE CANDOLLE, A.P. 1825. Prodomus systematis naturalis regni vegetabilis. 2:233 – 236. Victoris Masson, Paris.

FANTZ, P.R. 1979. A monograph of the genus *Clitoria* (Leguminosae:Glycineae). 1066 pp. Ph.D. Dissertation. University of Florida. Univer. Microfilms Internat. no. 7806693.

GRAHAM, J. 1839. A catalogue of plants growing in Bombay and vicinity. p. 46 – 47. Government Press, Bombay.

STAFLEU, F.A. and R.S. COWAN. 1976. Taxonomic literature. Vol. I:A-G, p. 978. 2nd ed. Bonn, Scheltma & Holkema, Utrecht, Neth.

SUBRAMANIAN, K.N. 1961. A note on *Centrosema virginianum* (L.) Benth. Bull. Bot. Surv. India. 3(2):201 – 203.

THOTHATHRI, K. and R. PRASAD. 1970. On *Centrosema virginianum* (Linn.) Benth. in India. Curr. Sci. 39:353.

WIGHT, R. and G.A. ARNOTT. 1834. Prodromus florae peninsula Indiae orientalis. Abbreviations: xxxiv. Parbury, Allen & Co., London, England.