

## The existential crisis in Indian *Brachystelma* (Apocynaceae)

We intend to express through this correspondence the concerns on the existence and very survival of members of *Brachystelma* (Apocynaceae: Asclepiadoideae). The genus was described by Robert Brown in 1822 based on Meerburgh's *Stapelia tuberosa* from the Cape of Good Hope, South Africa. It shares commonalities with *Ceropegia* L. (erect/twining leafy herbs with terete stems) than with *Frerea* Dalzell (pendulous, succulent leafy herbs with terete stems) or *Caralluma* R. Br. (leafless herbs with fleshy four-angled stems) of the same tribe Ceropegieae. *Brachystelma* has distinctive features from others with slender stems (stout in *Ceropegias*, and stout and fleshy in *Frerea*), corollas being rotate (tubular in *Ceropegias*) and the lobes relatively narrow (compared to *Ceropegias*). The genus ranks second in the tribe Ceropegieae and is represented by about 160 species distributed chiefly in sub-Saharan Africa, India, Sri Lanka, southeast Asia and northern Australia<sup>1,2</sup>.

The members of *Brachystelma* are essentially herbaceous bearing medium-sized tubers and fleshy roots, stems terete, unbranched to 1.5 m high (a couple of them are twiners) with opposite leaves; variedly ornamented flowers, either solitary or few (more than 20 flowers in *B. swarupa*), usually in umbels, free calyx lobes, corolla tube absent, rarely much smaller (*B. beddomei* and *B. parviflorum*); lobes rotate, usually broad (filiform in *B. attenuatum*), glabrous (*B. elenaduense* and *B. mahajanii*), hairy (*B. laevigatum*, *B. vartakii* and *B. naorojii*) and with striations (*B. nallamalayanum*), gorgeously coloured (brown/black with pink hairs in *B. malwanense*; white to whitish-pink in *B. vartakii*; deep purple in *B. elenaduense*; greenish-yellow in *B. mahajanii*), either spreading and star-like (*B. penchalakonense* and *B. pullaiahii*), rarely reflexed and the whole flower resembling the Ashoka emblem (*B. ciliatum*) or fused at tips to give the appearance of a bird's cage (*B. beddomei*, *B. kolarenses* and *B. malwanense*), and corona uniquely structured and brilliantly coloured (yellow in *B. pullaiahii*, greenish or reddish-yellow in *B. penchalakonense*, black in *B. nallamalayanum*, pinkish in *B. vartakii*, greenish-yellow spotted purple in *B. mahajanii*), biseriate, outer cup-like, either annular or angled,

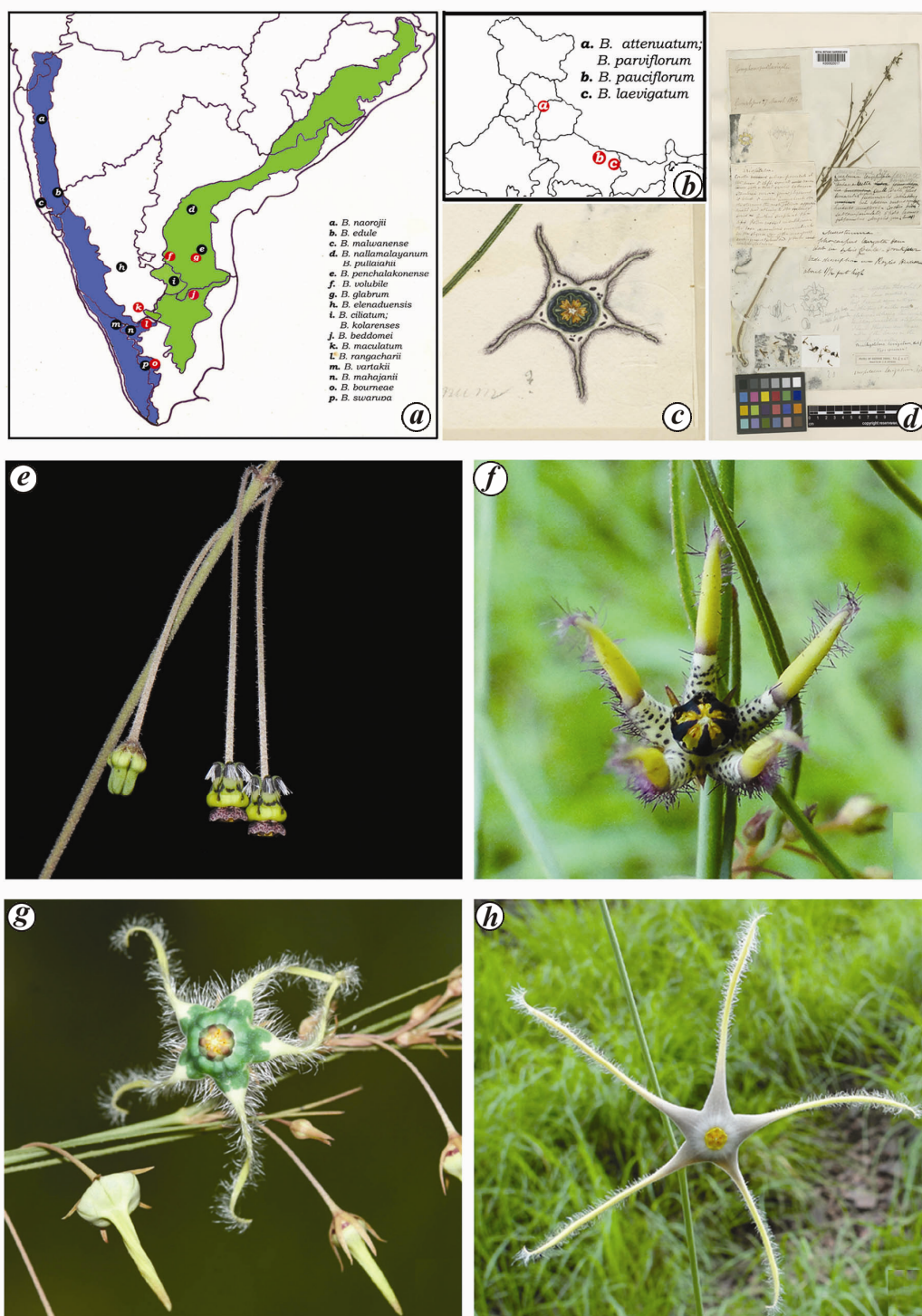
shallowly undulate or five-lobed (which is often further lobed), inner forming a cup or not, with five simple oblong segments, incumbent over stigma; pollen masses solitary in each locule, with extra pellucid margins on the inner side of pollinia. Follicles solitary or in pairs, linear, bearing comatose seeds. On the whole, with brilliant display of corolla and coronal structures, they appear small but beautiful.

The first account of Indian *Brachystelma* was presented by Hooker<sup>3</sup>, enumerating seven of them discovered by him; four species from peninsular India, three of them based on Beddome's collections (*B. glabrum*, *B. beddomei* and *B. volubile*) and one of Law's collection (*B. maculatum*); two from northwestern India based on Royle's collections (*B. parviflorum* and *B. attenuatum*) and one from sub-Himalaya (Uttar Pradesh), based on Hamilton's collection (*B. laevigatum*). All these species exhibit either erect (five species) or twining habit (two species). They show highly restricted distribution and are yet to be collected outside the type localities. Hooker had stated that his specific descriptions were 'imperfect' since these species project very complex coronal processes and he faced difficulties in the description of the colours as well coronal structures of flowers in dried specimens. He assumed that future explorers, with newer collections and dissections on fresh materials, would possibly enrich diagnostics and species delimitations.

As predicted by Hooker, later published floras added a few more new species, *B. bourneae* and *B. rangacharii* by Gamble<sup>4</sup> from Madras Presidency and *B. pauciflorum* Duthie<sup>5</sup> from Bahariach district in Uttar Pradesh. Thus of the 10 species listed till 1930s, excluding 2, which have been claimed to be recollected (*B. volubile* from Kadapa hills, Andhra Pradesh<sup>6</sup> and *B. beddomei* from Thiruvannamalai district, Tamil Nadu<sup>7</sup>), others remained hidden and evaded recollections by the explorers. Unfortunately, the latter Floras<sup>8-10</sup>, merely cited these species based on the old, often single collections, cited by earlier workers. Even the generic review was done based on old collections in the revision of Asclepiadaceae<sup>11</sup>, with no additional data. It is pertinent to mention that about 15 of the 22 known species are devoid of description on intricate details regarding coronal structures and fruits/seeds crucial for better delimitation of species and perhaps the genus itself. *B. attenuatum* and *B. parviflorum* are based on mere illustrations (both in Wight herbarium) and without any specimens; an illustration along with a single collection as old as 200 years is the basis of description for *B. laevigatum*; *B. pauciflorum* has neither a specimen nor an illustration for the basis of the name. We have nothing but representation of types in the case of *B. bourneae*, *B. glabrum*, *B. maculatum* and *B. rangacharii*. This has in fact forced reconsideration on their continued existence in India.

**Table 1.** List of new species/new records of *Brachystelma* species from India between 1970 and 2015

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| 1971–1980 | <i>B. elenaduense</i> Sathyan., <i>Proc. Indian Sci. Congr. Assoc.</i> , 1971, <b>58</b> , 435 and Sathyan, <i>Curr. Sci.</i> , 1978, <b>47</b> (24), 965.  |
| 1980–1990 | <i>B. ciliatum</i> Arekal & T. M. Ramakrishna, <i>Curr. Sci.</i> , 1981, <b>50</b> , 145.<br><i>B. kolarenses</i> Arekal & T. M. Ramakrishna, <i>Proc. Indian Acad. Sci., Plant Sci.</i> , 1981, <b>90</b> , 203.   |
| 1990–2000 | <i>B. edule</i> Collett & Hemsl., <i>J. Linn. Soc. Bot.</i> , 1890, <b>28</b> , 89 (new record for India).<br><i>B. malwanense</i> S. R. Yadav & N. P. Singh, <i>Kew Bull.</i> , 1993, <b>48</b> , 59.<br><i>B. naorojii</i> P. Tetali & al., <i>Rheedea</i> , 1998, <b>8</b> , 75.   |
| 2001–2015 | <i>B. swarupa</i> K. K. Kumar & Goyder, <i>Kew Bull.</i> , 2001, <b>56</b> , 210.<br><i>B. pullaiahii</i> B. R. P. Rao & al., <i>Taiwania</i> , 2011, <b>56</b> (3), 223.<br><i>B. nallamalayanum</i> K. Prasad & B. R. P. Rao, <i>J. Threat. Taxa</i> , 2013, <b>5</b> (14), 4904.<br><i>B. penchalakonense</i> Rasingam & al., <i>Kew Bull.</i> , 2013, <b>68</b> , 663.<br><i>B. mahajanii</i> Kambale & S. R. Yadav, <i>Kew Bull.</i> , 2014, <b>69</b> (1), 9493 (2).<br><i>B. vartakii</i> Kambale & S. R. Yadav, <i>Kew Bull.</i> , 2014, <b>69</b> (1), 9493 (4). |



**Figure 1.** a, b, *Brachystelma* distribution in (a) peninsular India and (b) north and North East India; c, *B. parviflorum* (illustration: K000820014); d, *B. laevigatum* (200-year-old specimen: K000820017); e, *B. ciliatum*; f, *B. nallamalayenum*; g, *B. penchalakonense*; h, *B. pullaiahii*.

There were no additions in Indian *Brachystelma* for almost 40 years (1930–1970), but altogether 12 taxa got added between 1970 and 2015 (Table 1). It is unfortunate that except *B. ciliatum*, other names are associated with single collections and single reports.

Till date 22 species have been reported from India (majorly from peninsular India; Figure 1); 21 of them are endemic and 20 (about 90%) had no recollections after the types. Majority species occur in small areas with localized populations. There is also a chance that many species

might be evading collections because they are small, tender, delicate with short growing/flowering periods, more grassy than any distinctive appearance in grasslands/grass-dominated habitats. It is unfortunate that grasslands/grass-dominated habitats where its members often thrive,

are regarded as waste and unproductive with no worthwhile protection. They are encroached for agriculture and often fragmented by habitations, urbanization, forest fires and invasive species. The habitats are also prone to elimination since many grass species, primarily those of *Cymbopogon*, are harvested as fodder or for thatching by locals. There is likelihood of these species being removed along with them. The edible tubers of the members of this genus and allied genus *Ceropegias*, known variedly as Nematai, Nematigaddalu, Potha Jougu Nimatayalu, Petta Jougu Nimatayalu, Singati galya, are often dug out by the locals. Wild animals, rodents, wild boar and langurs also relish these tubers and thus threaten their natural regeneration.

Many focused publications on endemic and threatened species of India surprisingly omitted this genus as a whole<sup>12,13</sup>. Rao *et al.*<sup>14</sup> and Nayar<sup>15</sup> placed *B. bourneae* under 'indeterminate' and 'possibly extinct' categories respectively. In spite of their rarity and distinctiveness from African *Brachystelma*<sup>16,17</sup>, they were neither considered for any focused collection nor attempted for IUCN conservation status. The genus as a whole falls in the most deserving zone for focused conservation. The whole group is to be attempted in a project mode primarily for recollections of all the documented species, taxonomic revision, assessing their distribution in the field and assigning IUCN conservation status, promoting studies on coronal structures, pollination ecology, *ex situ* conservation and rehabilitating them in protected natural habitats by acclimatizing and multiplying

them in gardens, thereby giving a whole insight into their taxonomy and conservation. They are true blinking stars of angiosperms and require due care.

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## Multicoloured seed coat and flower in *Abrus precatorius* (Leguminosae), India

There is growing evidence that intra-specific trait variability can play a fundamental role in plant community responses to environmental change and community assembly<sup>1</sup>. Regarding these aspects, variations have been studied in different hierarchical positions, viz. intra familiar relationship<sup>2,3</sup>, the evolutionary position of genera<sup>4</sup>, the origin and evolution of species<sup>5</sup>, and the degree of portioning of cpDNA variation within species at molecular level<sup>5,6</sup>. However,

the first report<sup>7</sup> on the morphological variation in size of the leaves of *Calotropis gigantea* was recorded during 1913. Different kinds of climatic races or ecotypes in many species from coast to high altitude, north to south and maritime to inland were studied<sup>8,9</sup>, which showed that the ecotypes of different species have parallel variation with regard to both morphological and physiological properties. Biogeographic and phylogenetic studies<sup>10–12</sup> showed that

variations are more in higher elevations; rather the variations are low at lower elevations<sup>13</sup>.

In India, classical records of intra-specific variations among the angiosperms are available for the last 5 decades. For example, variations in leaf morphology were recorded in *Naravelia zeylanica*, family Ranunculaceae<sup>14</sup> and *Lepisanthes tetraphylla*, family Sapindaceae<sup>15</sup>. Actinomorphic flower form of *Clitorea ternatea*<sup>16</sup>, floral asymmetry in