EDINBURGH JOURNAL OF BOTANY 59 (2): 273–281 (2002)
DOI: 10.10M/S0960428602000082

A NEW ENDEMIC SPECIES OF *BEGONIA* (*BEGONIACEAE*) FROM THE SOCOTRA ARCHIPELAGO

M. Hughes* & A. G. Miller*

The new species *Begonia samhaensis*, in section *Peltaugustia* (Warb.) Barkley, is described from the island of Samha in the Socotra archipelago. It differs from the only other species in the section, *B. socotrana* Hook.f., in a number of gross morphological characters and is likely to be a relict taxon rather than the result of more recent dispersal and divergence. A revision of sect. *Peltaugustia* is presented.

Detailed surveys have been carried out on both species. The new species has a restricted distribution and a total population of fewer than 1000 individuals, and is recommended to be placed in the IUCN category VU D1, 2. *Begonia socotrana* has been found in new sites, and is locally common in parts of its range. Its current placing in the IUCN 'Vulnerable' category is considered to be unwarranted, and it is recommended that the species should be listed as 'Least Concern'.

Keywords. Begonia, conservation, sect. *Peltaugustia*, seberbeher, Socotra.

Introduction

The first *Begonia* to be described from the Socotra archipelago was *B. socotrana* Hook.f., discovered by Isaac Bayley Balfour during a British Association expedition to the island of Socotra in 1880 while he was Regius Professor of Botany at the University of Glasgow. Upon his return, living material of the plant was donated to the Royal Botanic Gardens, Kew, where it was described by Hooker (1881), who noted that Socotra was 'one of the last places in the world in which a *Begonia* could have been expected to occur', as the island suffers a prolonged and severe dry season during the summer months. Upon its introduction to cultivation the plant was an immediate horticultural success (Gleed, 1961) because, being a strictly short-day plant, it made possible the production of the first winter-flowering cultivars. It is endemic to the granitic Haggier mountains and adjacent high limestone plateaux of eastern Socotra.

Hooker considered *B. socotrana* to be closely allied to *B. geranioides* Hook.f. of South Africa and placed it in the same section, *Augustia* (Klotzsch) A. DC.: 'From the geographical position of the island, the affinity of this discovery may be considered to be either Asiatic or African, and, upon the whole, though referable to none of the sixty sections of the genus founded by Klotsch [1854] and De Candolle [1864], it must, I think, be placed in the African one of *Augustia*, from the character

* Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, UK.

of which it differs chiefly in the male perianth having four segments, in the shorter filaments, rounded top of the anther, the six lobes of the female perianth (instead of five), and the intwisted arms of the style, characters all of which, except the last, occur in the Natal *B. geranioides*, to which *B. socotrana* is unquestionably closely allied' (Hooker, 1881).

Warburg (1894: 140) considered the species to be distinct enough to warrant the creation of a subsection within *Augustia* to accommodate it: (translated from German) '*B. socotrana* has been placed in a separate subsection *Peltaugustia* due to it having peltate leaves, one-winged fruit and bulbils on a swollen rootstock. This subsection is transitional with section *Reichenheimia*'. Although *Peltaugustia* was not recognized by Irmscher in his monograph of *Augustia* (Irmscher, 1961), it was elevated to sectional status by Barkley (1972), reflecting its unusual anatomy and isolated position within the genus.

A second species of *Begonia* from the archipelago was discovered on the island of Samha by an expedition from the Royal Botanic Garden Edinburgh (RBGE) in 1996. Until more recently (1999) the species was known only from a single plant found on the northern side of the highest point of the island, which is a limestone outcrop approximately $50m^2$. Only bulbils were seen as the plant had died back for the dry season, and it was thought to be *B. socotrana*. The bulbils were cultivated at RBGE, where it became apparent that the collection represented a new species. Samha could be considered an even less likely place than Socotra in which to find a *Begonia*, as it reaches an altitude of only 779m. It therefore attracts a reduced amount of moisture in the form of mist and lacks the lush montane vegetation associated with *B. socotrana*. The new species has been placed in sect. *Peltaugustia* with *B. socotrana* as it possesses bulbils and peltate leaves which are the definitive characters of the section, although it is distinct from *B. socotrana* in a number of gross morphological characters, summarized in Table 1. The morphological differences and the marked divergence in nuclear ribosomal ITS sequences (M. Hughes, unpublished data) suggest the species is relict on the island rather than the result of more recent dispersal and divergence. The distribution of both species is shown in Fig. 1.

TABLE 1. Morphological differences between *Begonia socotrana* and *B. samhaensis*

	B. socotrana	*B. samhaensis*
Tuber	Absent	Present
Leaf shape	Orbicular	Ovate
Male tepals	Equal	Unequal
Male bud	Conical	Purse-shaped
Stigmatic surface	Helical	Irregular
Capsule wings	One enlarged	Equal

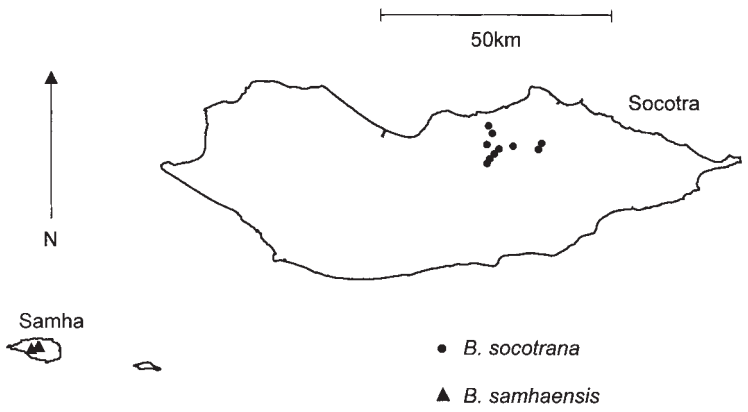

FIG. 1. The distribution of *Begonia* sect. *Peltaugustia* on the Socotra archipelago.

CONSERVATION STATUS

Begonia socotrana has been rumoured to be very rare in the wild since an expedition to Socotra in 1967 by Lavranos and Radcliffe-Smith. In their list (Lavranos & Radcliffe-Smith, 1969: 3) the plant was recorded only from two of the highest peaks of the Haggier mountains, and was described as 'not common, but not in immediate danger owing to virtual inaccessibility to man and goat'. In the 1978 *IUCN Plant Red Data Book* (Lucas & Synge, 1978: 79) it is listed as 'Endangered', based largely upon the information from the 1967 expedition but stating 'the population of this island endemic has reached critically low levels', and citing grazing as the probable cause of its decline. The fact that it was found on only two high peaks in 1967 is highlighted, although reference is made to an earlier expedition by Popov (1957) who found *B. socotrana* on the Reiged limestone plateau to the west of the Haggier. The listing of *B. socotrana* in the *IUCN Red Data Book* (1978) has caused it to be highlighted in other publications on threatened plants. Koopowitz & Kaye (1983: 63) suggested that 'the population of begonias has steadily eroded', and Belousova & Denisova (1992: 323) described the populations as at a 'critically low level'. Both cite overgrazing by goats as the main threat. The latest *IUCN Red List of Threatened Plants* (Walter & Gilliet, 1998: 73) lists the species as 'Vulnerable', a category one step below the 'Endangered' status that the species was awarded in 1978.

Observations during RBGE expeditions in 1989, 1990, 1992, 1993, 1996 and 1998 suggested that *B. socotrana* was more common than the previous publications state, and this prompted detailed surveys of both *Begonia* species in spring 1999 and 2000. These surveys confirmed that *B. socotrana* is locally common and has a far wider distribution in the Haggier than stated by Lavranos & Radcliffe-Smith (1969), and still occurs in sizeable populations on the limestone plateaux of Reiged and Rewged, as found by Popov (1957). Part of the reason for the apparent scarcity of the species in 1967 is likely to be the timing of the trip, which occurred in March and therefore coincided with the start of the dry season and the die-back of low altitude populations

of *Begonia*. The threat of grazing seems to have been overstated, given the large size of some of the populations found growing within potential reach of livestock. Goats will eat the leaves, but they are quite acidic and during the wet season there is plenty of other more palatable fodder, which is eaten in preference. Even if grazing pressure were to increase, many of the populations of *B. socotrana* grow on inaccessible cliffs and outcrops, making it less vulnerable than many other Socotran endemics. Although the area of occupancy for the species is less than 50km^2, given the negligible impact of livestock and of collecting by locals and the fact that many populations are inaccessible, it is not especially 'prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future' (IUCN, 1994). Thus, *B. socotrana* does not meet the criteria for 'Vulnerable' as defined in either the current (IUCN, 1994) or the recommended changed version (IUCN/SSC Criteria Review Working Group, 1999) of the IUCN red list criteria, and we recommend that it should therefore be placed in the 'Least Concern' category.

Begonia samhaensis was also surveyed in detail during spring 1999, and was found to be growing in quite dense groups where conditions were suitable at the original collection site (i.e. north to north-east facing vertical limestone faces or more southern aspects with shading overhangs), and possibly numbering up to 200 individuals. The increase in the number of plants compared with the single specimen seen in 1996 is due in part to the earlier timing of the 1999 trip, which managed to catch the end of the wet season. Approximately 30 more plants were found growing in two new sites on the northern edge of the island's limestone plateau at an altitude of 650m, over 100m lower than the original collection site. This raised the possibility that the vertical cliffs on the northern side of the island might also harbour *B. samhaensis*, though these are very difficult to survey. However, during the January 2000 expedition, an examination of these cliffs using binoculars failed to reveal any new sites, and it now seems likely that the total area of occupancy is restricted to the three known sites, in an area of 2km by 500m, which probably harbour fewer than 1000 plants. This small total population size and the fact that *B. samhaensis* exists only in a specific microclimate at the very highest parts of Samha do make the plant prone to the effects of human activities (e.g. livestock herders chewing the leaves) and stochastic events such as those due to climate change. This species should therefore be listed under the IUCN red list criterion VU D1, 2.

Revision of *Begonia* sect. *Peltaugustia*

A revision of sect. *Peltaugustia* is presented here, in order to include a modified description of the section and to allow comparison to be made between the two species.

Sect. **Peltaugustia** (Warb.) Barkley, Phytologia 24: 156 (1972). *Begonia* sect. *Augustia* subsect. *Peltaugustia* Warb. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 3 (6a): 140 (1894). Type: *B. socotrana* Hook.f.

Perennial herbs. *Tuber* present or absent; bulbils crowded around stem bases, encased in papery bracts, inner scales fleshy. *Stipules* boat-shaped, persistent. *Leaves* peltate, ovate to orbicular, crenate-dentate, funnel-shaped around the insertion of the petiole, edges recurved, hypodermal layer present, stomata in clusters of 2–15. *Inflorescence* a dichasial cyme, bracts boat-shaped, tepals pink. *Male flowers*: tepals 4, subequal to unequal; anthers distinctly hooded; filaments free. *Female flowers*: bracteolate, tepals (5) 6, persistent, subequal; styles 3, bifid, stigmatic surface papillose and helically twisted or irregularly lobed; ovary 3-locular, 3-ribbed, one rib sometimes developed into a beak; placentae entire, triangular. Endemic to the Socotra archipelago.

Key to Begonia *sect.* Peltaugustia

1a. Leaves ovate, male tepals unequal ——— **1. B. samhaensis**
1b. Leaves orbicular, male tepals subequal ——— **2. B. socotrana**

1. Begonia samhaensis M. Hughes & A.G. Mill., **sp. nov. Figs 2 and 3.**
B. socotranae Hook.f. similis sed foliis late ovatis; floribus masculis tepalis non aequalibus; capsula alis aequalibus haud rostratis.
Type: Samha, highest point of the island, shady north-facing cliffs, frequently mist-covered, c.750m, 16 ii 1999, *Miller* 17092 (E).

Perennial caulescent herb to 30cm tall. *Tuber* irregular, pink in cross-section, upper surface covered with bulbils encased in papery bracts. *Stipules* boat-shaped, not keeled, persistent, c.13 × 13mm, tip retuse to rounded, entire, with scattered short glandular hairs and longer (c.1.5mm) simple hairs present around the margin, papery when old. *Leaves* peltate; petiole centrally inserted perpendicular to the leaf blade, up to 6cm long, fleshy, deep pink, with scattered short glandular hairs; leaf blade fleshy and succulent, brittle, asymmetric, ovate, base rounded, apex acute, up to 8cm wide × 12cm long, more commonly c.5cm wide × 7cm long, with 6–8 palmate main nerves, funnel-shaped near the insertion of the petiole, hypodermal layer present; margin recurved, slightly undulate, crenate; the upper surface uniformly green, matt, glabrous, primary and secondary nerves distinctly sunken; the undersurface paler green with scattered short glandular hairs, primary and secondary nerves prominent, the stomata in clusters of 5–15. *Inflorescence* a dichasial cyme; bracts persistent, in pairs, subtending each branching point, boat-shaped, not keeled, retuse to rounded, entire, with scattered short glandular hairs. *Male flowers*: buds purse-shaped; tepals 4, unequal, pink, glabrous; outer broadly orbicular, rounded at base, the edges slightly recurved, appressed, 15–22mm long × 17–25mm wide; inner obovate elliptic, 14–20mm long × 8–14mm wide, cuneate at base; stamens 30–45 in a globose cluster; anthers c.1.5mm long, hooded, narrowing towards their bases; filaments c.1.5mm long, free. *Female flowers*: tepals (5) 6, persistent, subequal, pink, glabrous, obovate, 10–18mm long × 10–17mm wide; styles 3; stigmatic surface irregularly lobed, bright yellow; ovary triangular in cross-section, 3-locular, bracteolate, the bracteoles linear;

FIG. 2. *Begonia samhaensis* M. Hughes & A.G. Mill. (×0.7). Photograph of a painting by Lizzie Sanders.

wings 3, reduced, fleshy, subequal, semicircular, cordate at apex and base; placentae entire, thickened, triangular. *Fruit* pendulous, dehiscent either side of the wings.

Additional specimen examined. SAMHA. Summit of limestone plateau, sheltered cliffs c.700m, 16 iii 1996, *Miller & Plana* 14208 (spirit material from cultivated specimen, E).

Notes. Endemic to Samha. *B. samhaensis* has a restricted distribution, its entire range being the north-western part of the high plateau on Samha in an area no more than 2km by 500m. It occurs in shaded cracks or pockets in north-facing vertical limestone faces from altitudes of 650m up to the highest point on the island at 779m. Its local name is 'seberbeher'. Local uses are as listed under *B. socotrana*.

2. B. socotrana Hook.f., Gard. Chron. 15: 8, fig. 1 (1881) and Bot. Mag. CVII: t. 6555 (1881); Irmscher, Bot. Jahrb. 81: 123 (1962). Type: Socotra, *I.B. Balfour* B.C.S. 419 (K).

Perennial caulescent herb, with contracted internodes at the base of the stem, to

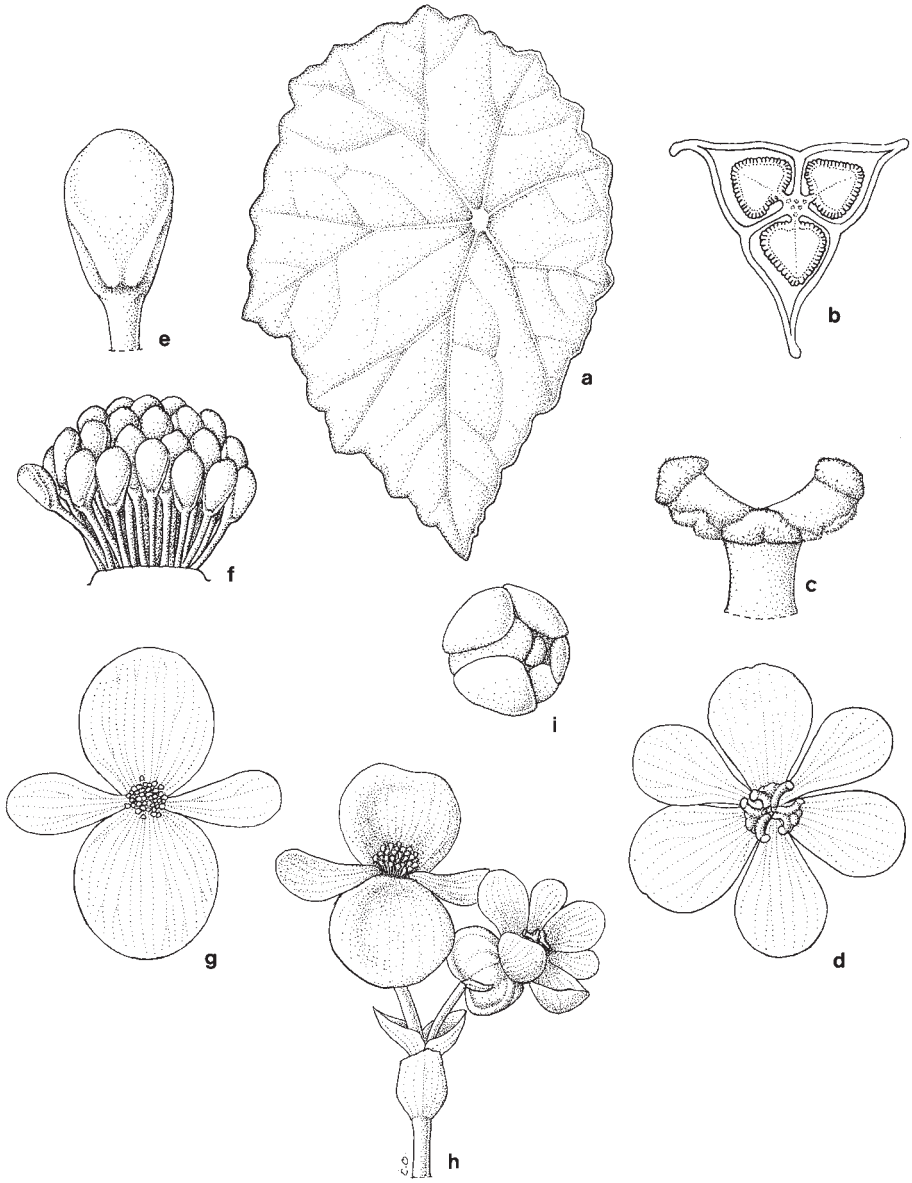

FIG. 3. *Begonia samhaensis* M. Hughes & A.G. Mill. a, leaf (×1); b, cross-section of ovary (×2); c, stigma (×4); d, female flower (×1); e, anther (×6); f, androecium (×4); g, male flower (×1); h, part of inflorescence (×1); i, bulbil (×2). Drawn by Christina Oliver.

45cm tall. *Tuber* absent, bulbils encased in papery bracts crowded around stem base. *Stipules* shallowly boat-shaped, not keeled, persistent, c.9 × 9mm, tip rounded, with scattered short glandular hairs and longer (c.1.5mm) simple hairs present around

the margins, papery when old. *Leaves* peltate, basal ones appearing pseudo-rosulate; petiole centrally inserted perpendicular to the leaf blade, up to 20cm long, fleshy, green, covered in short glandular hairs; leaf blade fleshy, orbicular, up to 20cm diam., most commonly around 10cm diam., sometimes shallowly lobed, 7–8 palmate main nerves, funnel-shaped near the insertion of the petiole, hypodermal layer present; margin recurved, crenate to crenate-dentate; the upper surface uniformly green, matt to slightly glossy, glabrous; the undersurface paler green, with short glandular hairs, longer hairs present on the veins, the primary and secondary nerves distinctly sunken, the stomata in clusters of 2–8. *Inflorescence* a dichasial cyme; bracts persistent, in pairs, subtending each branching point; bracts shallowly boat-shaped, not keeled, apex rounded, margin shallowly denticulate to entire, covered in short glandular hairs with longer hairs present at tip. *Male flowers*: buds conical; tepals 4, imbricate, subequal to equal, deep pink, obovate to broadly obovate-orbicular, cuneate at base, 18–20 × 13–19mm; stamens 25–35 in a globose cluster; anthers c.1.5mm long, hooded; filaments c.1.5mm long. *Female flowers*: tepals 6, persistent, subequal, obovate, 14–17 × 7–10mm, deep pink, glabrous; styles 3, forked; stigmatic band helically twisted, bright yellow; ovary triangular trilobed in cross-section, 3-locular, bracteolate, the bracteoles linear; wings 3, not fleshy, cordate to rounded at base with dorsal wing beaked, the beak sometimes reduced; placentae entire, thickened, triangular. *Fruit* pendulous, dehiscent either side of the wings.

Additional specimens examined. Socotra. Reiged plateau, 4km SW of Hadiboh, thickets with grassland clearings on slightly north-dipping limestone plateau, dominated by *Boswellia ameero*, *Commiphora* sp., *Dracaena*, *Trichocalyx* sp. and *Croton socotranus*, shady cracks in cliffs, flowers pink, bulbils at base, 740m, 21 ii 1989, *A.G. Miller et al.* M 8335 (E); Aduno Pass, small cliffs by spring, scrub dominated by *Cephalocroton* and *Hypericum* spp., flowers pink, leaves fleshy, 775m, 6 iii 1989, *A.G. Miller et al.* M 8667 (E); Muqadrihon Pass, c.10km SW of Hadiboh, granite slopes south of pass, deciduous woodland with *Buxus*, *Boswellia elongata*, *Commiphora elongata*, *Dracaena* and *Acacia pennivenia*, growing in shady damp cracks by spring, flowers pink, stems bulbiferous at base, very common in the area, 700m, 26 i 1990, *A.G. Miller et al.* M 10061 (E).

Notes. Endemic to the Haggier mountains and adjacent high limestone plateaux in the north-east of Socotra. It occurs at altitudes from c.700m to 1500m, growing mainly in shaded north-facing sites around the bottom of boulders and in crevices in rock faces, but also occurs terrestrially under the cover of montane shrubland. Its local name is 'seberbeher', with two variants, 'seberbeher sa'alhul' and 'seberbeher kikehe', for large-leaved and small-leaved plants respectively. The leaves and succulent petioles are eaten for their acidic taste and are considered a good tonic and stomach cleanser. The crushed leaves are used to make sour milk in the absence of a starter culture from a previous batch.

Acknowledgements

We thank Vanessa Plana for discovering *B. samhaensis*, Steve Scott, Fiona Inches and Andrea Fowler for their expertise in maintaining the living collections, Lizzie

Sanders and Christina Oliver for providing the illustrations, Dr Miranda Morris for ethnobotanical information, Dr Robert Mill for assisting with the Latin diagnosis and Dr Pete Hollingsworth for comments on the manuscript. M.H. is particularly grateful to the M.L. MacIntyre *Begonia* Trust for providing funding for this study and its associated fieldwork. A.G.M. would also like to thank the British Government Darwin Initiative, the Yemen Environmental Protection Council and GEF/UNOPS for providing support for research on Socotra.

References

Barkley, F. A. (1972). Nomenclatural notes on *Begonia*. *Phytologia* 24: 156.

Belousova, L. S. & Denisova, L. V. (1992). *Rare Plants of the World*. Rotterdam: A. A. Balkema.

Candolle, A. de (1864). Begoniaceae. In: *Prodromus systematis naturalis regni vegetabilis* 15, 1: 266–408. Paris: V. Masson & Sons.

Gleed, C. J. (1961). Hybrid winter flowering Begonias. *J. Roy. Hort. Soc.* 80: 319–322.

Hooker, J. D. (1881). New Garden Plants. *Gard. Chron. n.s.* 15: 8.

Irmscher, E. (1961). Monographische revision der Begoniaceen Afrikas 1. Sekt. *Augustia* und *Rostrobegonia* sowie einige neue Sippen aus anderen Sektionen. *Bot. Jahrb. Syst.* 81: 106–188.

IUCN (1994). *IUCN Red List Categories*. As approved by the 40th Meeting of the IUCN Council. Gland, Switzerland: IUCN.

IUCN/SSC Criteria Review Working Group (1999). IUCN Red List Criteria Review Provisional Report: Draft of the Proposed Changes and Recommendations. *Species* 31–32: 43–57.

Klotsch, J. F. (1854). Begoniaceen – Gattungen und Arten. *Abh. Königl. Akad. Wiss. Berlin*: 1–135.

Koopowitz, H. & Kaye, H. (1983). *Plant Extinction: A Global Crisis*. Washington: Stone Wall Press Inc.

Lavranos, J. & Radcliffe-Smith, A. (1969). *List of rare and endangered Socotran and Abd al Kuri endemics, with an account of their present status, as far as could be determined from observations made in 1967.* Middle East Command Expedition to Socotra, 1967. Unpublished.

Lucas, G. & Synge, H. (eds) (1978). *The IUCN Plant Red Data Book*. Morges, Switzerland: IUCN.

Popov, G. B. (1957). The vegetation of Socotra. *J. Linn. Soc., Bot*. 55: 706–720.

Walter, K. S. & Gilliet, H. J. (eds) (1998). *1997 IUCN Red List of Threatened Plants*. Morges, Switzerland/Cambridge, UK: IUCN.

Warburg, O. (1894). Begoniaceae. In: Engler, A. & Prantl, K. (eds) *Die natürlichen Pflanzenfamilien*, ed. 1, 3 (6a): 121–150. Leipzig: Wilhelm Engelmann.

Received 30 May 2000; accepted with moderate revision 20 March 2001