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# A New Species of *Cytinus* (Cytinaceae) from South Africa and Swaziland, with a Key to the Southern African Species

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**ABSTRACT.** A new species of *Cytinus* L., *C. visseri* Burgoyne, a root holoparasite from Limpopo and Mpumalanga Provinces of South Africa and from Swaziland is described. Morphological and phenological differences separate it from the two existing South African species. The distributional range of *C. visseri* is also highly disjunct compared to that of the other two species, and the species is considered vulnerable (VU D2). Fruit morphology is described in detail for the new species; this is a first for the genus, as previous descriptions were based on flowering material only, and therefore fruit comparisons to the other South African species are not yet possible. A key to all known southern African species is given.

**Key words:** Cytinaceae, *Cytinus*, holoparasite, IUCN Conservation Status, Rafflesiaceae, South Africa, Swaziland.

A parasitic plant was found on the Long Tom Pass (Mpumalanga Province) in January 2001. Initially mistaken for a member of *Hyobanche* L. or *Orobanche* L. (Orobanchaceae), it was shown on closer examination to be a new species of *Cytinus* L. The genus comprises about ten species of root holoparasites occurring disjunctly in the Mediterranean region, southern Africa, and Madagascar. Traditionally placed in Rafflesiaceae, modern phylogenetic systems recognize *Cytinus* as belonging to a separate family, Cytinaceae, placed in order Malvales (Nickrent, 2002; Nickrent et al., 2004; Stevens, 2001). The family Cytinaceae comprises two genera, *Bdallophyton* Eichler from Central America (Nickrent, 1997) and *Cytinus*, the only genus representing this family in southern Africa. There are two centers of diversity for *Cytinus*: one around the Mediterranean and the other in southern Africa and Madagascar (Nickrent, 1997). Plants from the Northern Hemisphere are monoecious with flowers that are generally shades of yellow, while plants from the Southern Hemisphere are dioecious with flowers that are shades of red.

*Cytinus visseri* was first noted by Visser (1981) as a new species, but was never described by him because of his untimely death; it has since been

collected occasionally in the northern provinces of South Africa and in Swaziland. Information is provided here, for the first time, on the fruit morphology for the genus from southern Africa.

## FEATURES OF THE SOUTHERN AFRICAN MEMBERS OF THE GENUS *CYTINUS*

Plants of *Cytinus* in southern Africa are small and, if not for the bright crimson of the inflorescence axis borne just above the soil surface, could be easily overlooked. Two species (Jordaan, 2000) have been recognized: *Cytinus capensis* Marloth and *C. sanguineus* (Thunberg) Fourcade. In the past, distinguishing characters for these two species have not been clear, with Oliver (1967) suggesting they may be varieties of one species. In a recent publication (Goldblatt & Manning, 2000), *C. capensis* was considered to be a synonym of *C. sanguineus*.

Examination of specimens of all taxa revealed that *Cytinus capensis* has four perianth lobes (seldom more) that are deep wine-red, as can be seen from the plate in Marloth (1913: plate 43) comparing the two taxa (*C. sanguineus* and *C. capensis*). The flowers of *C. capensis* are shallower, with perianth lobes 8–12 mm long and 7–13 mm wide. Flowers of *C. sanguineus* generally have six perianth lobes (sometimes five), are orange or vermilion (the most common color) to a deeper red, and are generally longer and more slender than those of *C. capensis*, with lobes 6–32 mm long and 4–23 mm wide. The tops of the staminodial columns in *C. capensis* and *C. sanguineus* are tipped by single horn-like projections, while those of *C. visseri* are tipped by multicellular, forked, antler-like projections. While *C. sanguineus* is generally widespread in diverse habitats in the western, northern, and eastern Cape Provinces, *C. capensis* is confined to the Cape Peninsula and seemingly grows only on hosts in deep coastal sands. Perianth lobes of *C. capensis*, *C. sanguineus*, and *C. visseri* are lacinate at the margins and tips. In *C. capensis* and *C. visseri* the surfaces of the perianth lobes are densely covered in multicellular, appressed hairs. In contrast, the perianth lobes in *C. sanguineus*



sometimes have only a few multicellular, appressed hairs but are mostly smooth.

Locally, members of *Cytinus* are not host-specific and are found on roots of woody shrubs, favoring members of Asteraceae (Oliver, 1967), although our examination of numerous specimens has shown that many other plant taxa are involved. In the case of the new species, woody shrubs, mostly *Helichrysum reflexum* N. E. Brown (Asteraceae), but also *Cliffortia repens* Schlechter (Rosaceae) and *Phylica paniculata* Willdenow (Rhamnaceae), can be hosts. The peak flowering time of the parasite coincides with the peak flowering time of the host in the case of *H. reflexum* (Burgoyne 8173 in sched.). A large population of *C. visseri* has been found at Long Tom Pass. The density of ca. 61 plants per 500 m<sup>2</sup> is considerably higher than for the *Cytinus* species observed in the Cape, which grow only sparsely. This has provided unsurpassed material for the study of this taxon, including further studies on pollination and seed dispersal.

Male and female inflorescences in *Cytinus visseri* are always found on separate host plants (Visser, 1981), and recent observations support this claim.

#### DISTRIBUTION AND PHYTOGEOGRAPHY

The distributions of *Cytinus capensis* and *C. sanguineus* are centered in the Cape Floristic Region, with that of *C. sanguineus* stretching from around Nieuwoudtville to the Cape Peninsula and eastward to just past Port Elizabeth, with one plant found at Middelburg (Eastern Cape). *Cytinus capensis* is found only on the Cape Peninsula. Herbarium records are scant, possibly owing to the inconspicuous, cryptic nature of the plants, as well as to irregular flowering, which was observed in 2002 and 2003 when drought conditions prevailed.

*Cytinus visseri* occurs in the Limpopo (Visser, 1981) and Mpumalanga Provinces of South Africa and in Swaziland. Geographically and phenologically it differs from the other species mainly in its northern distribution and in its flowering time, which is much later in the season (January to May) and is probably coupled to rainfall (*C. capensis* and *C. sanguineus* flower mainly in August). The deep crimson floral color of *C. visseri* is characteristic, as the flowers of *C. sanguineus* tend to be more vermilion. The flowers of *C. capensis* (Marloth, 1912), however, are also deep red, making it closer to the new species than to *C. sanguineus*. Despite Oliver's (1967) claims to the contrary, receptacular pouches are present in the new species and produce copious amounts of nectar (over 100 µl per flower).

***Cytinus visseri*** Burgoyne, sp. nov. TYPE: South Africa, Mpumalanga Prov.: Lydenburg Distr., 15 April 2001, *Burgoyne 8173* (holotype, PRE; isotypes, BOL, K, MO). Figures 1, 2.

Haeec species *C. sanguineo* et *C. capensi* similis sed florescentia inter Januarium et Maium, habitatione in parte septentrionali Africae Australis, prominentiis multicellularibus ramosis in apice columnae antherarum (in speciebus aliis desunt) differt; arctius *C. capensi* propter flores atrorubros similis sed floribus sexpartitis non quadripartitis differt.

Perennial, upright, dioecious root holoparasite on woody species, male and female plants occurring on different individual host plants, color deep crimson; true roots absent but forming endophytic strands of cells within the tissue of host plants; inflorescence axis borne underground, branched or single; inflorescence formed by cells at the outer surface of the endophyte differentiating into an inflorescence primordium, growing, eventually bursting through the root epidermis of host forming buff-colored fleshy tissue growing upright to the soil surface, red upon emerging from soil; bearing red flowers at tips, underground parts not exposed to light remaining uncolored; inflorescence scales few, spiral, imbricate; surface smooth and buff-colored when borne underground, with multicellular appressed hairs and turning crimson upon appearing above ground; margins, lacinate (ragged); inflorescences with solitary flowers or in 1- to 16(21)-flowered racemes, female inflorescences with up to 16 carpellate flowers, male inflorescences with up to 21 staminate flowers; inflorescence axes indeterminate, developing centripetally, 30–120 mm; bracteoles 1 or 2 per flower, bright crimson, 1.2–3.4 mm, with appressed hairs few or absent in central part; flowers with petals absent; perianth as one whorl comprising (5)6 tepals per flower; tepals 12–16 mm long, bright crimson, covered with multicellular, appressed hairs, lacinate, basally imbricate, with a hinge-like fold; *carpellate flowers* ovary inferior, epigynous, with a stout column terminated by a globose, viscous stigma with a velvety surface, with 6 receptacular pouches below these lined by blunt glandular hairs, nectariferous, ovary unilocular, forming a swelling at base of the flower, placentation intrusive parietal with 6 to 14 placental lobes; *staminate flowers* more slender than carpellate flowers, stamens fused into a column 12–14 mm diam., anthers united into a stout ring, pollen loculi 9 to 16, bithecal, extrorse, dehiscent longitudinal, with 6 receptacular nectariferous pouches lined with numerous blunt glandular hairs, top of staminal column tipped by multicellular antler-like projections; *pollen* pale, cream or white borne in tetrads; *fruit* a fleshy berry 12–17.1 mm diam. with a jelly-like



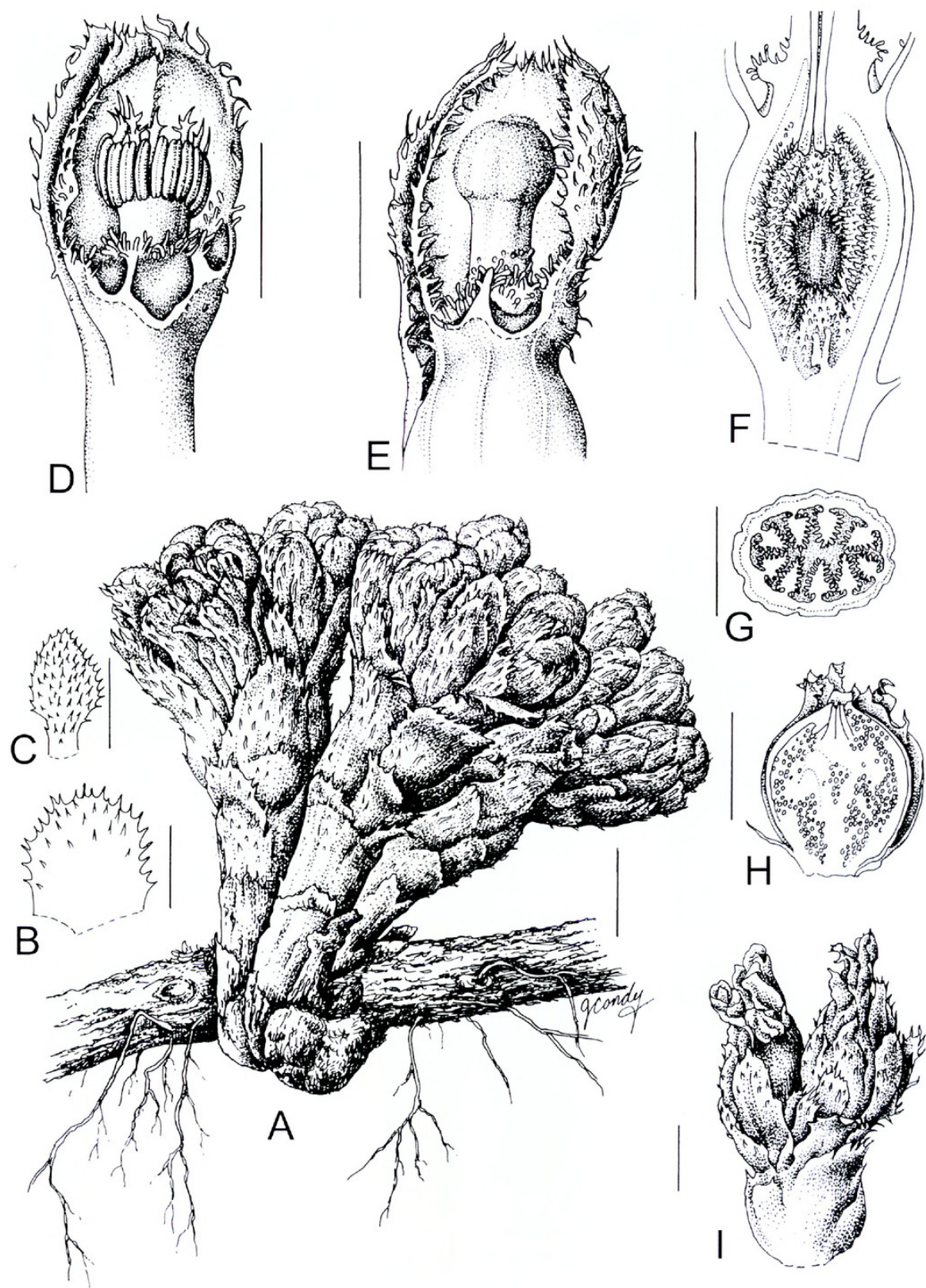


Figure 1. *Cytinus visseri* Burgoyne. —A. Habit of parasite. —B. Bract. —C. Perianth lobe. —D. Staminate flower with foremost perianth lobes removed. —E. Carpellate flower with foremost perianth lobes removed. —F. Longitudinal section through ovary. —G. Transverse section through fruit. —H. Longitudinal section through fruit. —I. Fruit. A–I from Burgoyne 8173. Drawn by G. Condry. All scale bars = 1 cm.



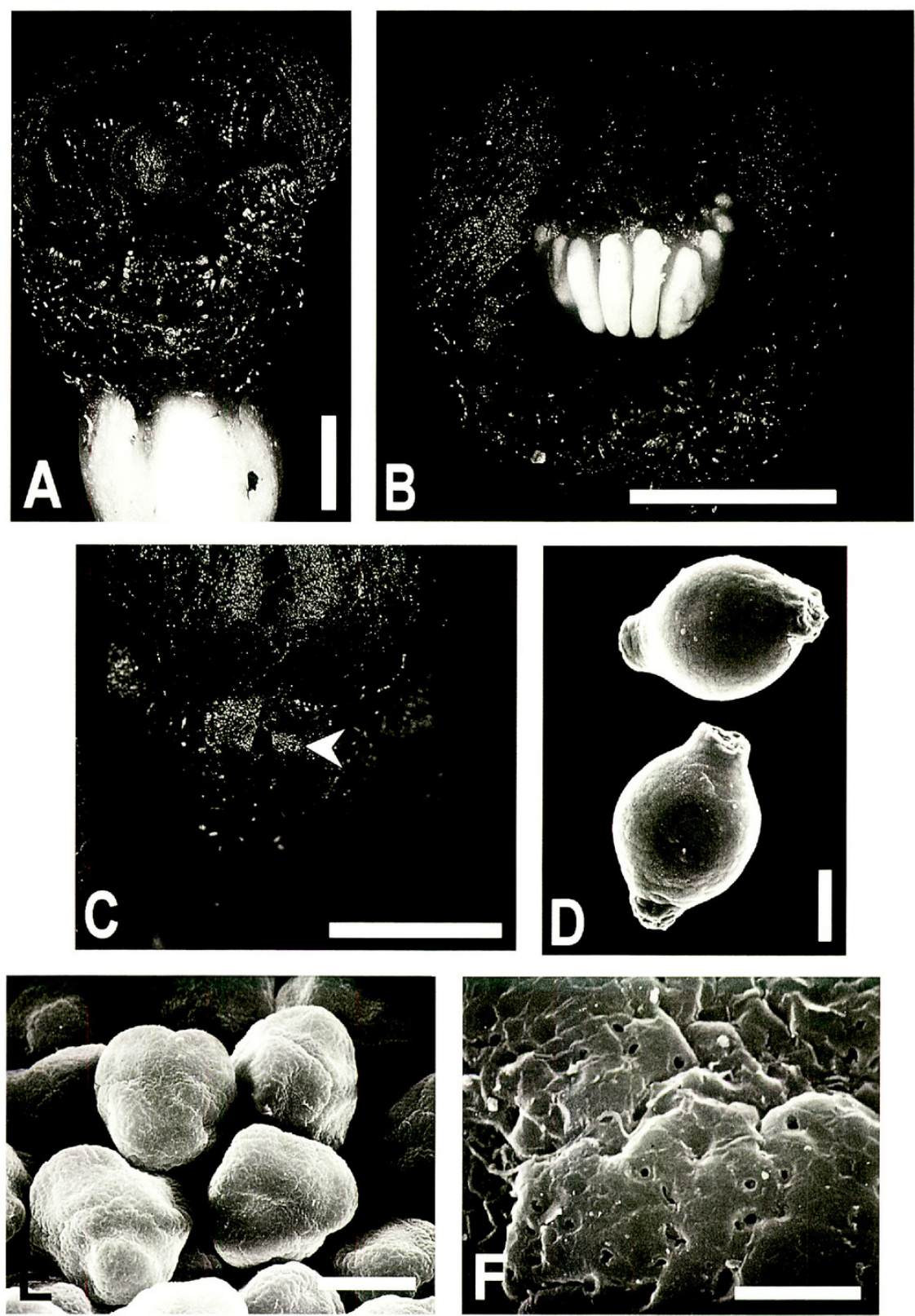


Figure 2. *Cytinus visseri* Burgoyne. —A. Carpellate flowers with foremost perianth lobes removed. Scale bar = 5 mm. —B. Staminate flower with foremost perianth lobes removed. Scale bar = 6 mm. —C. Base of perianth lobes, showing a hinge-like fold. Scale bar = 5 mm. —D. Urceolate seeds with smooth surfaces. Scale bar = 125  $\mu$ m. —E. SEM micrograph of pollen, critical point dried tetrads. Scale bar = 21  $\mu$ m. —F. Pollen surface. Scale bar = 4  $\mu$ m.



center, falsely 6- to 14-locular; *seeds* numerous, surrounded by a jelly-like substance in fruit center, urceolate, 0.2–0.4 mm long, surface smooth, ripening in winter.

*Distribution and habitat.* *Cytinus visseri* is known only from South Africa and Swaziland from rocky sandstone outcrops, ca. 1400–2000 m above sea level from no more than four localities.

*Phenology.* Racemes were observed annually from January to May; fruits ripening in May to July.

*Conservation status.* *Cytinus visseri* has been evaluated as VU D2 (Vulnerable with a limited distribution; IUCN, 2000), and the individuals were not abundant where collected. An exception to this is the population at Long Tom Pass, but numbers of plants are not constant, as for two years (2003–2004) no plants were found there because of drought.

*Etymology.* The species is named in honor of Johannes [Johann] Hendrik Visser (1931–1989), South African plant physiologist and expert on parasitic plants, who first recognized this taxon as a new species.

*Paratypes.* SOUTH AFRICA. **Mpumalanga Prov.:** Lydenburg Distr., Long Tom Pass, Mauchsberg, at top of Pass, *P. M. Burgoyne 8184* (PRE); *P. M. Burgoyne & S. Smithies 1* (PRE); *M. Mort 05.190* (PRE); Mount Anderson, *A. A. Mauve 4637* (PRE). **Limpopo Prov.:** Pietersburg [Polokwane] Distr., Helpmekeer River, Haenertsburg Mtns., 23 March 1936, *E. A. Thompson & H. H. Mockford s.n.* (PRE); Zoutpansberg Distr.: Louis Trichardt, 27 March 1953, *B. G. Mackay s.n.* (NBG). SWAZILAND. Mbabane, near spring, *R. J. Rodin 4528* (PRE).

KEY TO THE SOUTHERN AFRICAN SPECIES OF *CYTINUS*

- 1a. Flowers produced from July to September; projections at the top of staminodial column single, horn-like; western, northern, or eastern Cape Provinces, South Africa. . . . . 2
- 1b. Flowers produced from January to May; projections at the top of staminodial column multicellular, forked, and antler-like; northern South Africa Limpopo and Mpumalanga Provinces, Swaziland . . . . . *C. visseri*
- 2a. Perianth lobes mostly 6, vermilion orange, or deeper red, 6–32 × 4–23 mm, mostly smooth, sometimes with few multicellular appressed hairs; widespread in western, northern, or eastern Cape Provinces, South Africa . . . . . *C. sanguineus*
- 2b. Perianth lobes 4 (seldom more), deep wine-red, sometimes almost black, 0.8–1.2 × 0.7–1.3 mm, densely covered in multicellular appressed hairs, restricted to Cape Peninsula, hosts growing on deep coastal sands . . . . . *C. capensis*

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