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Three New Species of *Solanum* from Kenya: Using Herbarium Specimens to Document Environmental Change

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Abstract*—**Herbarium specimens are an underutilized information resource on historic vegetation patterns. We record habitat loss and present evidence that visits to specimen collecting localities can document environmental change. The taxonomic study of *Solanum* in Africa continues to be plagued by confusion and ignorance. Despite the almost universal occurrence of *Solanum* in the flora of Kenya, there continues to be a significant gap in floristic knowledge of this important genus. As a result of studies of herbarium collections and visits to collection localities across Kenya, we have identified three new species and compiled a list of native species of spiny *Solanum*. We describe ***Solanum polhillii from the *Acacia-Commiphora* savanna, ***Solanum phoxocarpum*** from the Kenyan highlands, and ***Solanum malindiense*** from the coastal vegetation.

***Keywords*—**Habitat loss, herbarium specimens, Kenya, Solanaceae, *Solanum*, taxonomy.

Objective documentation of environmental change is difficult. Forest loss in tropical Africa during the twentieth century may have been exaggerated by the Food and Agriculture Organization of the United Nations (FAO) due to assumptions in model building, variable definitions of vegetation zones, problems with remotely sensed image data, recirculation of published figures combined with little primary data gathering, and political bias (Fairhead and Leach 1998; Grainger 2008). New information sources on changing habitats are needed (Grainger 2008). The herbaria of the world are extraordinary repositories of data on plant distributions through space and time. Herbarium specimens are increasingly used for recording geospatial data in general (Graham et al. 2004) and conservation assessments in particular (Willis et al. 2003; Nic Lughadha et al. 2005). We present evidence that specimen data can also be used to document changes in habitat when old collection localities are revisited, using *Solanum* L. in Kenya as an example.

The Solanaceae is an economically important, cosmopolitan family with approximately 3,000 species in ~90 genera. The family has members in almost all habitats, from the driest Australian deserts to the dense wet tropical rainforests of the Amazon and Southeast Asia. Life forms in the family range from canopy trees to minute ephemeral herbs, with incredible variation in between. The Solanaceae include globally important food crops such as the cultivated potato, tomato, and aubergine as well as a number of widely used drug plants such as tobacco and the source of belladonna. Approximately half of the species in the family are contained in five genera, the largest and most diverse of which is *Solanum* (Knapp et al. 2004).

Solanum encompasses around 1,500 species (J. Bennett and S. Knapp, pers. comm., Sep 2006) with 1,126 names currently accepted by Solanaceae Source (2009). It is one of the ten most species rich genera of flowering plants (Frodin 2004). Occurring on all continents, the genus occupies an immense range of habits and habitats, paralleling that of the family. *Solanum* diversified in circum-Amazonian tropical South America (Knapp 2002) with later radiations into the Old World (Weese and Bohs 2007). *Solanum* in Africa (including Madagascar) constitutes less than 10% of the species level diversity with 113 accepted species (Jaeger 1985), the majority of these endemic to the African continent.

African *Solanum* has suffered from widespread and cumulative confusion throughout its taxonomic history. Two of the Linnaean species names widely used during the last 200 years, *S. indicum* L. and *S. sodomeum* L., have been rejected following consistent misapplication and erroneous synonymy (Hepper 1978). It is common to see up to five different names applied to duplicates of the same collection held in different herbaria and around 80% of specimens are not correctly identified. No full treatment has been compiled since Dunal (1852) and Wright (1906), both of which were completed prior to the bulk of African botanical exploration. Extensive descriptive work took place in Germany, where Karl Lebrecht Udo Dammer (1906, 1912, 1915) described 126 new taxa and Georg Bitter (1913, 1917, 1921, 1923) described 148 new taxa and proposed a new classification system. Unfortunately Bitter did not finish the final part of his African *Solanum* treatment, section *Solanum*, and his work remained difficult to use due to the lack of an overall key, exceedingly lengthy descriptions, and Latin and German text. Many of the Dammer and Bitter holotypes for African *Solanum* species were destroyed during WWII when the Berlin herbarium suffered a direct hit by Allied bombers on the night of March 1–2, 1943 (Hiepko 1987).

In the early 1950s Polhill used Bitter's published treatments to identify the rapidly growing *Solanum* collection at the East African Herbarium, Nairobi. He made connections between Bitter's names and collections at Nairobi and Kew Gardens: no easy task with almost no available type material. Groups of specimens without a matching description were included as spp. nov. 1–2 and var. nov. 1. Polhill's unpublished manuscript together with copious specimen annotations has formed the basis for all work on African *Solanum* carried out since. Jaeger (1985) simplified Bitter's system and reduced the number of taxa in his doctoral thesis. This work was continued by Jaeger's supervisor, Richard Lester, but unfortunately was not completed before the author's death in 2005. Later projects that made use of Polhill's and Jaeger's work include the Solanaceae treatments for *Flora Zambesiaca* (Gonçalves 2005), *Flora of Ethiopia and Eritrea* (Friis 2006a), *Flora of Somalia* (Friis 2006b), and the on-going *Flora of Tropical East Africa* (Edmonds and Vorontsova, in mss). Agnew and Agnew (1994) used Roger Polhill's system as basis for their popular floristic guide *Upland Kenya Wildflowers*. They redesignated Polhill's

unnamed taxa at the East African Herbarium as spp. A-K and published descriptions for all of them. The temporary naming system using the letters A-K was maintained by Beentje (1994), a popular identification guide to woody plants. We studied these taxa as part of the work towards a worldwide taxonomic monograph of *Solanum* (Solanaceae Source 2009) and a preliminary list of spiny solanums in Kenya is presented in Table 1. We found that many of spp. A-K correspond to well-known species described from other parts of Africa, but three of them are distinct and have remained nameless to this day. The three new species are described in this paper.

The flora of Kenya is comparatively well documented by the 20th century plant collectors. The East African Herbarium (EA) in Nairobi was the regional colonial centre for botanists from the British Empire. Collection rates in Kenya between 1952–1981 were several times higher than that in any other East African or Central African country (Campbell 1990) and new angiosperm species discovery is rare compared to many other tropical regions. The genus *Solanum*, however, represents a significant gap in the floristic knowledge of Kenya. *Solanum* species are omnipresent throughout dry Kenyan landscapes, but they are perceived to be common weeds and are largely ignored by collectors and scientists. The complex morphological variability of solanums means that dichotomous keys are not reliable without additional specimen comparison. In spite of the popular keys available in Agnew and Agnew (1994) and Beentje (1994) most specimens in African and European herbaria are named incorrectly or not named at all, and the rich diversity of Kenyan solanums remains unrecognised. The new species described here were identified from three different vegetation zones: *Solanum polhillii* Voronts. from savanna, *S. phoxocarpum* Voronts. from highland forest, and *S. malindiense* Voronts. from coastal vegetation. We also briefly present evidence of habitat loss in all three vegetation zones.

Materials and Methods

This study was carried out as part of the Planetary Biodiversity Inventory (PBI) *Solanum* project, working towards a modern online monographic treatment of the entire genus (Solanaceae Source 2009). Collections of African *Solanum* were studied at the herbaria of the Royal Botanic Gardens, Kew (K) and the National Museums of Kenya (EA). Around 4,000 herbarium sheets were seen and 123 sheets belonging to three putative new species were identified. Specimen data were entered into BRAHMS (2009) and georeferencing was carried out using Polhill (1988). Coordinate data from GIS was manually standardized and duplicates were identified using BRAHMS. We used the African vegetation classification system established by White (1983) based on plant distributions, a system later confirmed by cluster analysis and ordination (Linder et al. 2005).

Locations in many parts of Kenya were visited during May 2009. A thorough search for the plants was carried out at each site by driving and walking around the area and identifying all species of *Solanum* present. The exact herbarium specimen notes on the location, environment, and vegetation were brought to the field and directly compared to the environmental conditions and vegetation observed at the site. Patrick Muthoka and Paul Kirika have extensive personal knowledge of botanical collecting localities in Kenya and their knowledge was used to make sure that our locations corresponded to those cited in the specimens as accurately as possible. We spoke to park rangers who accompanied us in Mount Longonot National Park, Mount Kenya National Park, and Aberdare National Park, Kenya Wildlife Service staff in Ngong area, a Masai chief in Mount Suswa area, and numerous local people to find out about any changes to the local environment since the date(s) of original collection(s). Direct comparison between specimen notes and the current environment was combined with personal knowledge to decide whether significant environmental change has occurred since the original collection was made. Details of the herbarium collections, original specimen notes, records of the new environmental conditions when these have definitely changed, and our success in recollecting the species are recorded in Table 2. All collection sites are shown in Fig. 1. Three new species are described below and illustrated in Figs. 2–5; their diagnostic characters are summarized in Tables 3–5.

A total of 17 old collection sites, recorded by 40 botanical collections from 1922–1985, were visited (Table 2; Fig. 1). The plants were successfully located in only four out of 17 sites (24% of old collection sites). Evidence of vegetation change was seen in four out of 17 sites (24% of old collection sites).

Table 1. Preliminary list of the 34 native species of *Solanum* subgenus *Leptostemonum* in Kenya. Cultivated species are marked with an asterisk. Introduced species are not included. Further details and descriptions are available at www.solanaceaesource.org. The final list will be available in the forthcoming monograph of *Solanum* subgenus *Leptostemonum* in Africa and Madagascar, and in the Flora of Tropical East Africa.

Solanum aculeastrum Dunal, *S. aethiopicum* L.*, *S. anguivi* Lam., *S. arundo* Mattei, *S. campylacanthum* Hochst. ex A. Rich., *S. coagulans* Forssk., *S. cordatum* Forssk., *S. dasyphyllum* Schumach. & Thonn., *S. dennekense* Dammer, *S. forskalii* Dunal, *S. giganteum* Jacq., *S. goetzei* Dammer, *S. hastifolium* Hochst. ex Dunal, *S. incanum* L., *S. jubae* Bitter, *S. lanzae* J.-P. Lebrun & Stork, *S. macrocarpon* L.*, *S. malindiense* Voronts., *S. mauense* Bitter, *S. melastomoides* C. H. Wright, *S. melongena* L.*, *S. nigriviolaceum* Bitter, *S. pampaninii* Chiov., *S. phoxocarpum* Voronts., *S. polhillii* Voronts., *S. richardii* Dunal, *S. setaceum* Dammer, *S. schumannianum* Dammer, *S. somalense* Franch., *S. taitense* Vatke, *S. tettense* Klotzsch, *S. usambarense* Bitter & Dammer, *S. usaramense* Dammer, *S. zanzibarense* Vatke

Results and Discussion

The combination of habitat records with species presence information gives a more reliable indication of whether serious environmental change has occurred. In the following we will describe the habitat, collection attempts, and evidence for vegetation change for the three new species. We will consider *S. polhillii* in the savanna, known as White's (1983) Somalia Masai regional centre of endemism, *S. phoxocarpum* in the highland forest, White's Afromontane archipelago-like regional centre of endemism, and *S. malindiense* in the coastal region, White's Zanzibar-Inhambane regional mosaic.

Kenyan seasonally dry savanna with *Acacia* and *Commiphora* is the dominant vegetation type in the country, mostly below 1,500 m with an arid climate and scarce erratic rainfall. This area covers around 80% of Kenya and is traditionally occupied by nomadic pastoralists. The rainfall patterns prevent local communities from relying on agriculture; expanding human populations are accompanied by increased numbers of livestock and concomitant degradation of habitat. *Solanum polhillii* occurs in the higher escarpments of this vegetation type (Figs. 1A; 5A). We visited 10 localities from 30 collections made between 1931–1985 (Table 2), but *Solanum polhillii* was found in only two of these locations, Suswa volcanic caves and the top of Ngong escarpment (Fig. 1A). In both of these places it was growing in a position inaccessible to goats, either in an impenetrable thicket or high up on rocks. A collection from Mount Longonot made in 1962 notes "rocky outcrops in shade of *Ficus* sp.," but no *Ficus* was seen, all surrounding area was exposed and no *S. polhillii* was found. Mount Longonot National Park is a protected area with no cattle, but wild zebra, antelope and giraffe graze in the area in large numbers. A collection from the Suswa volcanic cave area in 1963 cites "on edge of hole but all over not specific to holes, common", but only a few individuals were found at edges of the

TABLE 2. Collection localities in Kenya visited during this study. Blank spaces indicate that no habitat information was available on the original collection label, and that no firm conclusions could be drawn about change in habitat on that site.

Species name	collector	Collection Year	Location summary	Habitat recorded on specimen	Definite change noted?	Plant found?
S. malindiense	*R. Polhill & S. Paulo 709*	1961	4 miles north of Malindi	Sandy soil, coastal bush with *Adansonia*, *Hyphaene*, and others	Yes. Land has been cleared and cultivated	Not Found
S. phoxocarpum	*T. C. E. Fries 632*	1922	Aberdare National Park			Found
S. phoxocarpum	*A. L. Campbell s.n.*	1978	Aberdare National Park			Found
S. phoxocarpum	*P. J. Greenway & Kanuri 13869*	1969	Lake Naivisha	Locally common but scattered in woodland		Not Found
S. phoxocarpum	*I. B. P. Evans & J. Erens 1468*	1938	Londiani turning	Growing in plains in moist conditions		Not Found
S. phoxocarpum	*J. Tweedie 4315*	1972	Londiani turning	In secondary scrub		Not Found
S. phoxocarpum	*P. E. Glover et al. 935*	1961	Mau Area	Found on the forest edge and forming communities around the sites of old bomas		Not Found
S. phoxocarpum	*E. H. Gillett 435/51*	1951	Molo			Not Found
S. phoxocarpum	*J. G. Williams 63*	1974	Mount Kenya Lodge near Nyeri	Forest undergrowth shrub, common		Not Found
S. phoxocarpum	*B. Verdcourt 3725*		Mount Kenya Naro Moru track	In *Podocarpus* zone		Found
S. polhillii	*M. G. Gilbert 4933*	1977	Kajiado	Basement complex rocks, *Acacia - Commiphora* bushland/low woodland on steep slopes		Not Found
S. polhillii	*P. G. Archer 208*	1960	Kajiado - Namanga Road	Rocky hill, red sandy soil		Not Found
S. polhillii	*B. Verdcourtet al. 2672*	1960	Kajiado - Namanga Road	In *Combretum* bush on big rocks on lava ridge		Not Found
S. polhillii	*M. G. Gilbert 5961*	1980	Lukenya	Basement complex ridge with massive outcrops, open bushland/woodland		Not Found
S. polhillii	*O. Kerfoot 1860*	1960	Mount Longonot			Not Found
S. polhillii	*O. Kerfoot 3393*	1961	Mount Longonot			Not Found
S. polhillii	*O. Kerfoot 3597*	1962	Mount Longonot	Rocky outcrops in shade of *Ficus* sp.	Yes. No shade and no *Ficus* seen	Not Found
S. polhillii	*O. Kerfoot 4001*	1962	Mount Longonot			Not Found
S. polhillii	*P. G. Archer 434*	1964	Namanga	Banks of rocky river		Not Found
S. polhillii	*P. R. O. Bally 2922*	1943	North east side of Mount Suswa	In caldera near stream jet on lava rock		Not Found
S. polhillii	*P. E. Glover 4570*	1964	North east side of Mount Suswa	On rough lava flow, fairly common		Not Found
S. polhillii	*P. E. Glover & Oledonet 4133*	1964	North east side of Mount Suswa			Not Found
S. polhillii	*P. E. Glover & Oledonet 4446*	1964	North east side of Mount Suswa	On rough lava flow, locally common		Not Found
S. polhillii	*P. E. Glover & Oledonet 4500*	1964	North east side of Mount Suswa	On the edge of collapse trough, locally common		Not Found
S. polhillii	*P. G. Archer 117*	1960	Suswa volcanic caves			Found
S. polhillii	*P. E. Glover & Samuel 2736*	1962	Suswa volcanic caves	Lava flow. Growing between lava boulders on edge of a small fault		Found
S. polhillii	*P. R. O. Bally 12657*	1963	Suswa volcanic caves	Not common		Found
S. polhillii	*P. E. Glover 3854*	1963	Suswa volcanic caves	Growing between lava boulders on the caldera edge		Found
S. polhillii	*P. E. Glover 3605*	1963	Suswa volcanic caves	On edge of hole but all over not specific to holes, common	Yes, species occurs only at edges of holes where goats cannot reach	Found
S. polhillii	*G. W. Ivens 2463*	1969	Suswa volcanic caves	*Tarchonanthus* grassland on lava, occasional	Yes, no *Tarchonanthus* except underneath shrubs; all grazed	Found
S. polhillii	*P. Parsons & J. Lambert 3*	1985	Suswa volcanic caves	Edge of a drophole open soil		Found
S. polhillii	*Anomymous 158*	1937	Top of Ngong escarpment			Found
S. polhillii	*P. R. O. Bally 5745*	1947	Top of Ngong escarpment			Found
S. polhillii	*E. R. Napier 1339*	1931	Western slopes of Ngong Hills	Amongst bushes in rocky grassland at the top of the escarpment		Not Found
S. polhillii	*E. R. Napier 6723*	1934	Western slopes of Ngong Hills	On the side of a bouldered hill. Growing at the foot of a huge rock		Not Found
S. polhillii	*E. R. Napier 3594*	1934	Western slopes of Ngong Hills			Not Found
S. polhillii	*P. R. O. Bally 2333*	1940	Western slopes of Ngong Hills	In scrub in rocky country		Not Found
S. polhillii	*P. R. O. Bally 4745*	1947	Western slopes of Ngong Hills			Not Found
S. polhillii	*A. Bogdan 1474*	1947	Western slopes of Ngong Hills			Not Found
S. polhillii	*P. G. Archer 76*	1960	Western slopes of Ngong Hills	Growing in cleft in rock face		Not Found

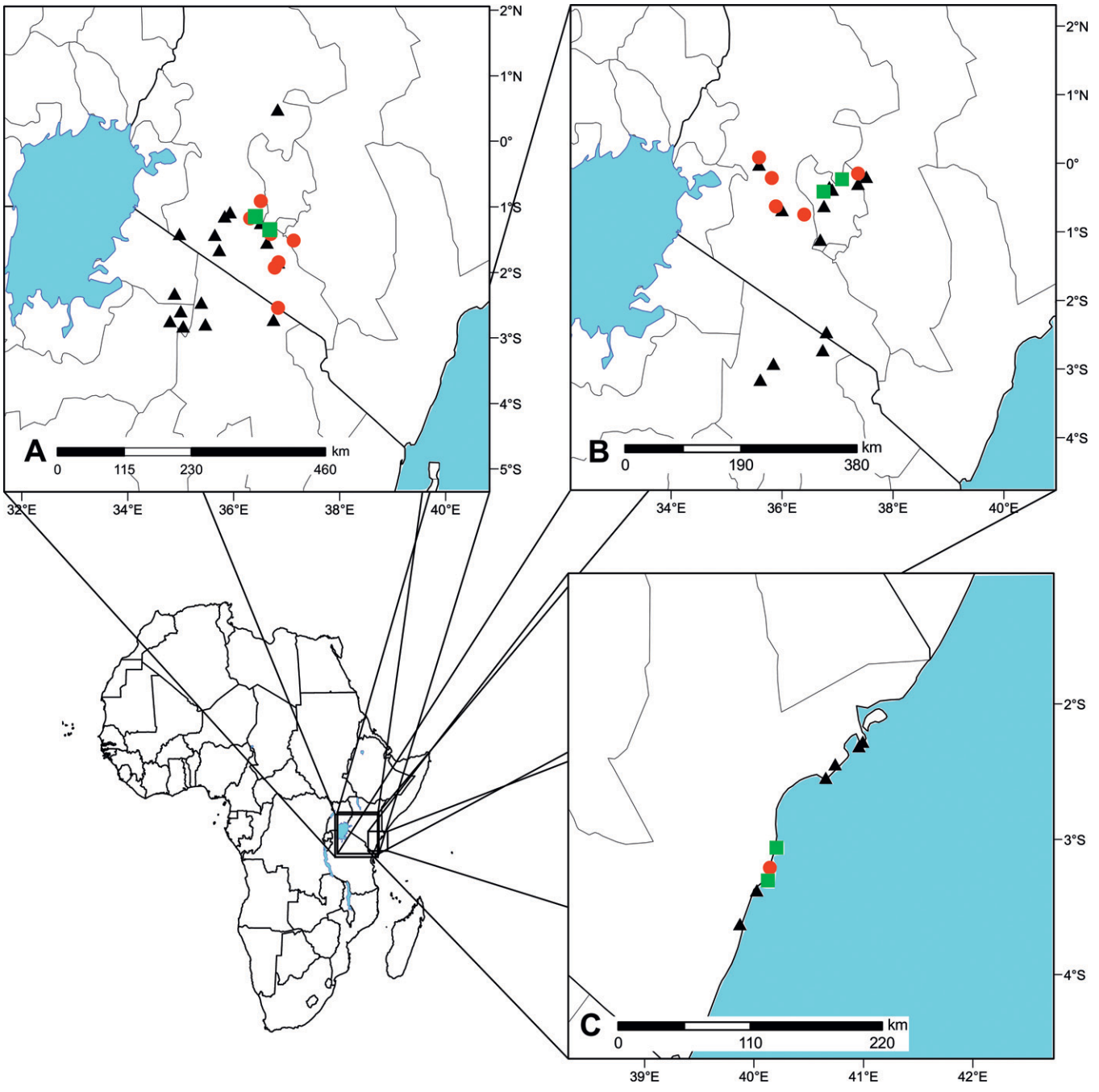

FIG. 1. Distribution of the three new species in Kenya and Tanzania. A. *Solanum polhillii* Voronts. sp. nov. B. *Solanum phoxocarpum* Voronts. sp. nov. C. *Solanum malindiense* Voronts. sp. nov. Collecting localities not visited are marked as black triangles. Collecting localities visited where the plants were not found are marked as red circles. Collecting localities visited where the plants were found are marked as green squares. Drawn by Paweł Ficinski.

volcanic holes. Another collection from the same area made in 1969 cites "*Tarchonanthus* grassland on lava;" we observed bare ground with only occasional patches of *Tarchonanthus* sheltered underneath shrubs (Fig. 5A). Populations of goats were seen eating dry twigs and attempting climb up *Acacia* trees to reach the green shoots.

The Kenyan Highlands receive more rainfall than the savanna and are home to much of the country's population. Densely populated and fertile with tea plantations, the highlands constitute one of the most successful agricultural production areas of Africa. *Solanum phoxocarpum* is restricted to open canopy forests, growing in open woodland and forest edges, often in the *Podocarpus* zone (Figs. 1B, 5E). The vegetation is protected by a network of National Parks administered by the Kenya Wildlife Service. Illegal logging, charcoal production, water extraction for irrigation, fires, and illegal cultivation are increasing (Lambrechts et al. 2003), and agricultural expansion is responsible for the decline in wildlife populations in some National Parks (Western et al. 2009). We visited seven localities from nine collections made in between 1922–1978. *Solanum phoxocarpum* was found at only two of these: within Aberdare National Park and Mount Kenya National Park. At the other five sites the woodland has been replaced by settlements and plantations (Table 2; Fig. 1B).

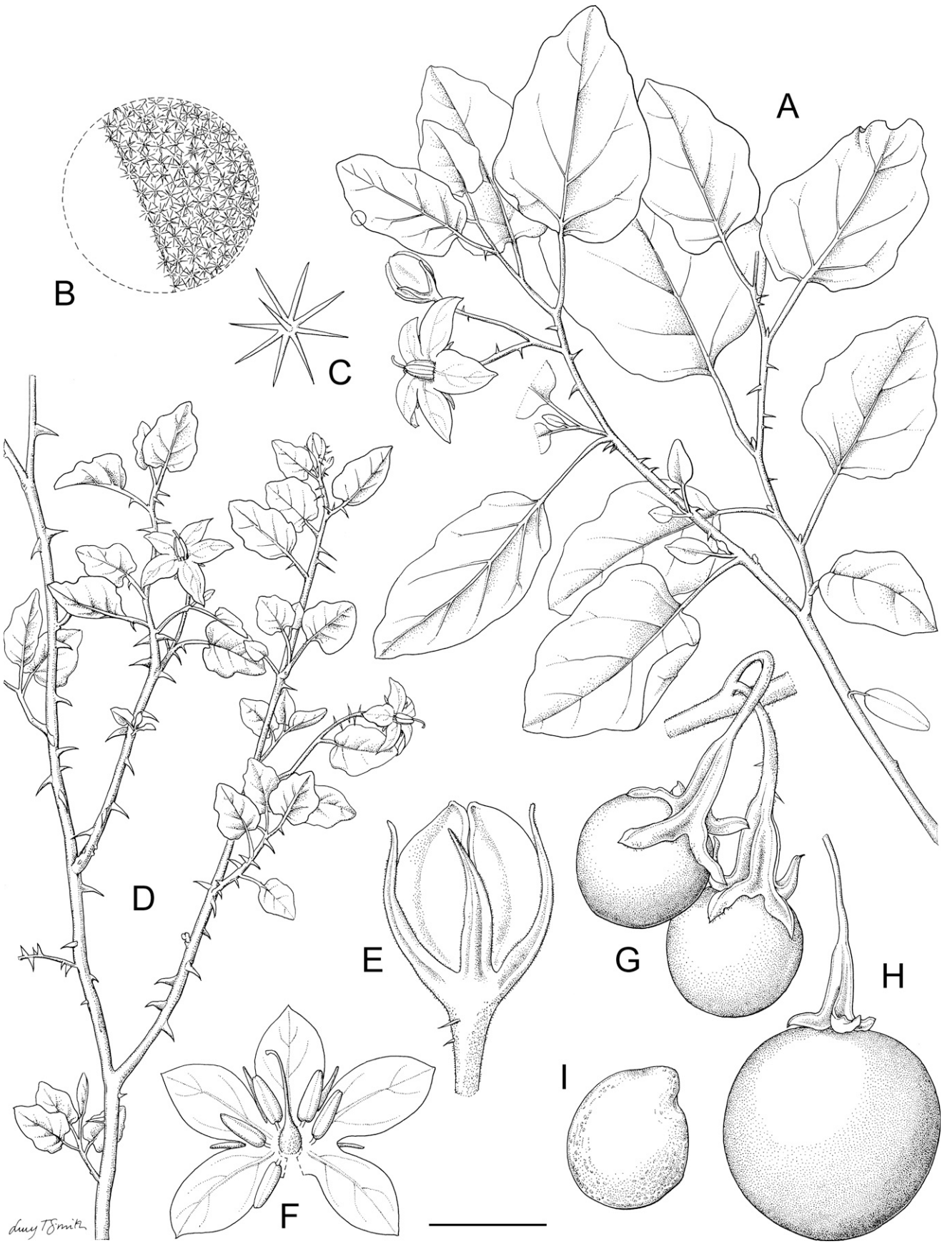

FIG. 2. *Solanum polhillii* Voronts. sp. nov. A. Habit in sheltered habitat. B. Underside of leaf showing stellate trichomes. C. Stellate trichome. D. Habit in exposed habitat. E. Bud. F. Flower. G. Immature fruit. H. Mature fruit. I. Seed. Drawn from herbarium specimens. A, B, C, E, F from *Verdcourt 3838*. D drawn from *Greenway 9086*. G and H from *Verdcourt et al. 2672*. I from *Greenway 10671*. Scale bar: A, D = 2.5 cm; B, I = 2.5 mm; C = 0.5 mm; E, G, H = 1 cm; F = 2 cm. Drawn by Lucy T. Smith.

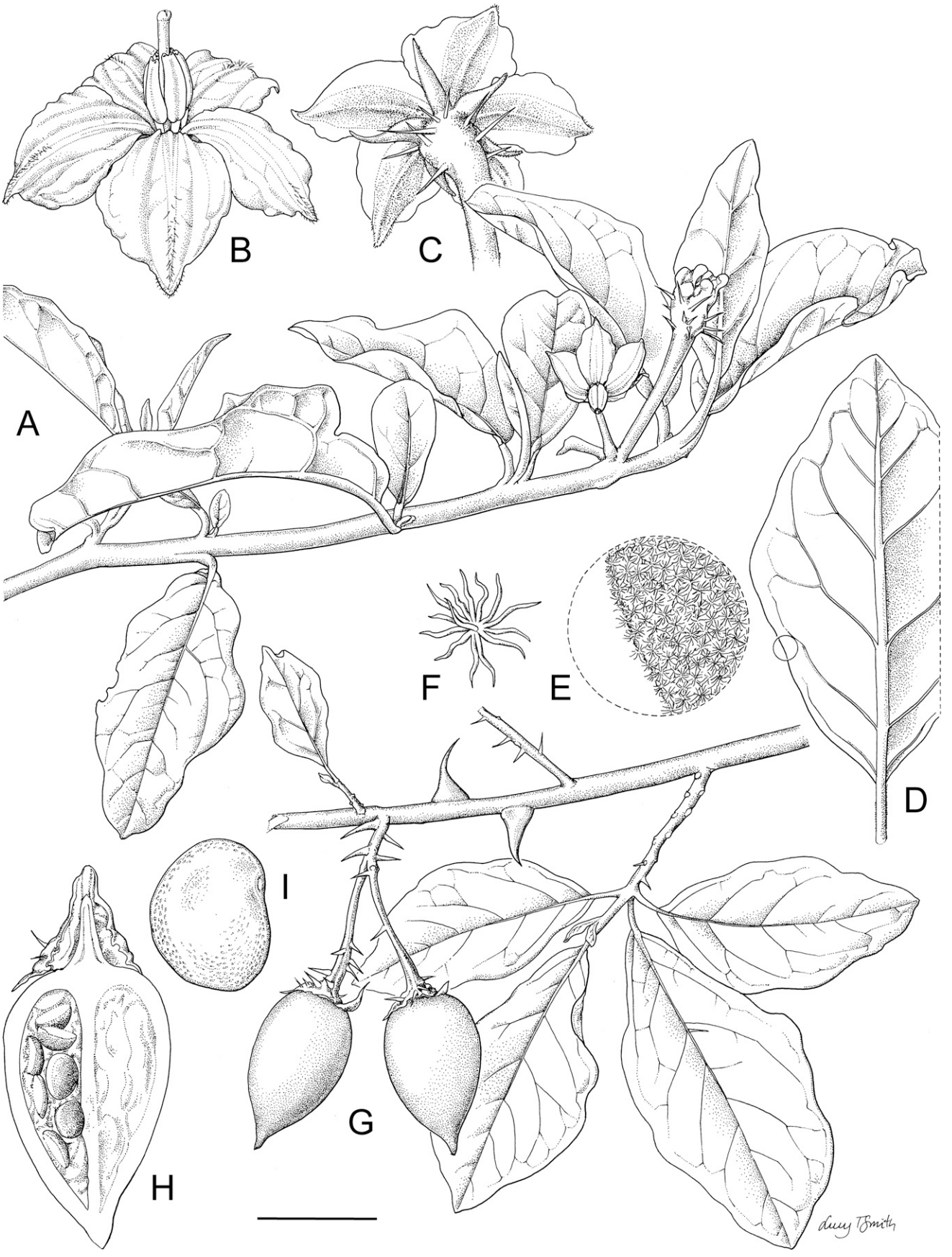

FIG. 3. *Solanum phoxocarpum* Voronts. sp. nov. A. Habit in flower. B. Flower. C. Flower and calyx. D. Underside of the leaf. E. Underside of leaf showing stellate trichomes. F. Stellate trichome. G. Habit in fruit. H. Fruit, longitudinal cross section. I. Seed. A, B, C, H drawn from field photographs of *Vorontsova et al. 29*. D, E, F, G drawn from herbarium specimen *Verdcourt 3725*. I drawn from herbarium specimen *Frame 229*. Scale bar: A = 2 cm; B, C, D, H = 3 cm; E, I = 2.5 mm; F = 0.5 mm; G = 2.5 cm. Drawn by Lucy T. Smith.

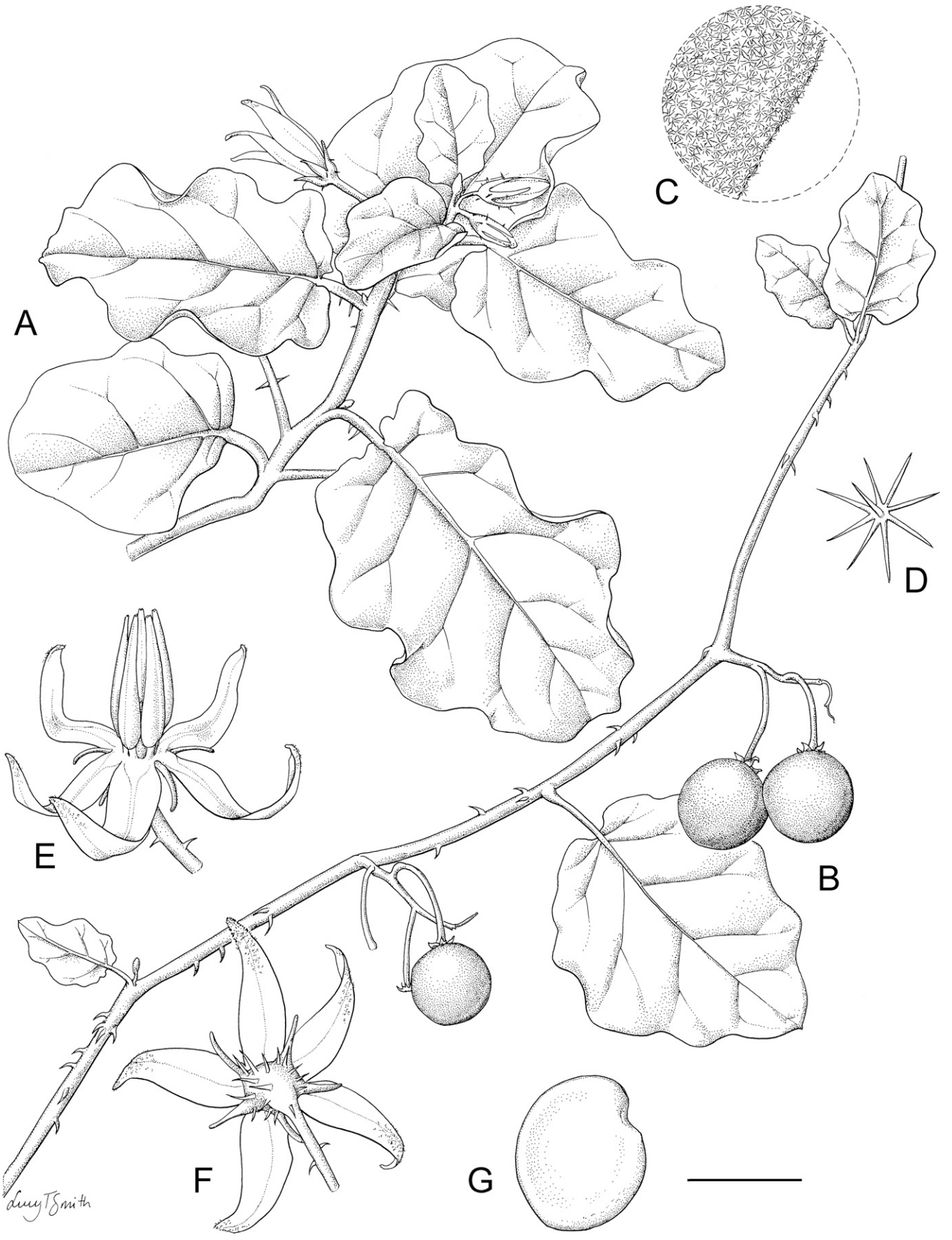

FIG. 4. *Solanum malindiense* Voronts. sp. nov. A. Habit in flower. B. Habit in fruit. C. Underside of leaf showing stellate trichomes. D. Stellate trichome. E. Flower. F. Flower and calyx. G. Seed. A, E, F drawn from field photographs, B, C, D, G drawn from herbarium specimens. A from *Vorontsova et al. 115*. B, C, D from *Luke 10326K*. E, F from *Vorontsova et al. 112*. G from *Jeffery K415*. Scale bar: A = 1.5 cm; B = 2 cm; C, G = 2.5 mm; D = 0.5 mm; E, F = 1 cm. Drawn by Lucy T. Smith.

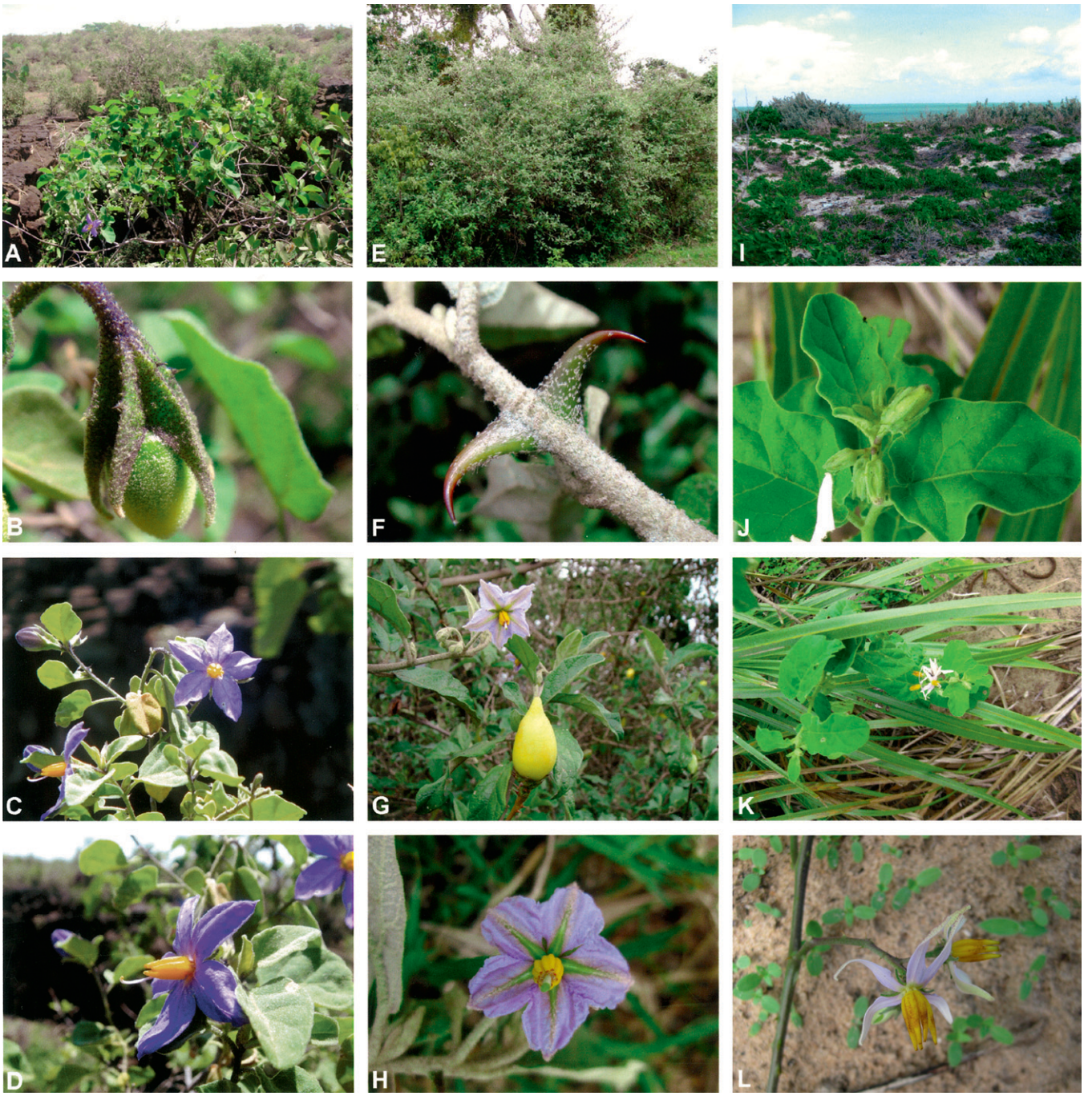

FIG. 5. Three new species and their habitats in Kenya. A – D. *Solanum polhillii* Voronts. sp. nov. on Mount Suswa. E – H. *Solanum phoxocarpum* Voronts. sp. nov. in the Aberdare National Park. I – L. *Solanum malindiense* sp. nov. at the Mayungu beach. Photographs A – H by Maarten Christenhusz. Photographs I – L by Maria Vorontsova.

The narrow strip of Indian ocean coastline in the south east of Kenya is home to coastal coral forest and scrub. With rainfall estimated at between 1,000–1,200 mm per year (Robertson and Luke 1993), this is a biodiverse as well as economically important region with small land area and commercial value for the tourist industry. *Solanum malindiense* occurs in salt tolerant beach vegetation up to 500 m away from the shore, making it particularly vulnerable to hotel expansion. Hotel building continues to affect coastal vegetation around Malindi (Robertson and Luke 1993; A. Roberston pers. comm. May 2009). Habitat at the Tana River Delta is threatened by a proposed agricultural expansion (Askari 2009; Munguti 2009). Other threats include salt mining, white silica sand extraction, tidal erosion, and beach degradation due to intense tourism activities. The 1961 collection made four miles north of Malindi cites "sandy soil, coastal bush with *Adansonia*, *Hyphaene*, and others." The land has now been cleared and cultivated and *Solanum malindiense* was not found (Table 2; Fig. 1C).

Old habitat records are often unreliable due to variable definitions of vegetation terminology, inaccurate locality recording, problems with georeferencing, and other issues. New habitat records can depend on short term conditions such as drought. Failure to find a certain species is not necessarily meaningful; it is difficult to prove absence as this is dependent

Table 3. Diagnostic characters of *Solanum polhillii* Voronts., sp. nov.

Solanum polhillii sp. nov.	all other *Solanum* species in East Africa
Buds inflated	Buds not inflated
Sepals keeled	Sepals not keeled
Solanum polhillii sp. nov.	*Solanum richardii*
Leaves 2–6 cm long	Leaves 7–22 cm long
Anthers 4.5–8 mm long	Anthers 8.5–11.5 mm long

Table 5. Diagnostic characters of *Solanum malindiense* Voronts., sp. nov.

Solanum malindiense sp. nov.	*Solanum usaramense*
Leaves lobed	Leaves subentire
Leaves 1.5–2 times longer than wide	Leaves 2–3 times longer than wide
Berries yellow	Berries orange to red
Berries at least 15 mm wide	Berries 8–11 mm wide
Trichomes with stalk up to 0.1 mm long	Trichomes with stalk up to 0.1–0.4 mm long

on how much effort is spent searching, and presence of recognisable flowers and fruits may be dependent on varying rainfall and time of year. The data presented here are insufficient for broad generalizations but we hope that this example will encourage similar studies with larger datasets. Herbarium specimen collections and the data they contain are useful for historic vegetation reconstruction when used in combination with broader vegetation and environmental surveys.

Taxonomic Treatment

Solanum polhillii Voronts., sp. nov.—TYPE: KENYA. Masai Province: Narok District, Ewaso Ngiro - Loliondo Road where it crosses the Masan River, 13 Dec 1963, *B. Verdcourt 3838* (holotype: EA!; isotypes: K000441234!, K000441243!).

Ab aliis speciebus africanis *Solani* gemmis inflatis et sepalis carinatis differt. A *Solano richardii* Lam. foliis 2–6 cm tantum (nec 7–22 cm) longis, antheris 4.5–8 mm tantum (nec 8.5–11.5 mm) longis differt.

Erect woody shrub, 1–2 m, armed, moderately branched; young stems stout, straight, erect, sparsely to densely stellate-pubescent; trichomes porrect, translucent, stalked, the stalks up to 0.2 mm, the rays 7–9, 0.1–0.2 mm, the midpoints same length as the rays or shorter, often reduced to globular unicellular glands; prickles 2–3(–6) mm long, 0.5–1.5 mm wide at widest point, straight to slightly curved, perpendicular to the stem or somewhat reflexed, orange-brown to yellow; main branches 1–2 cm in diam at base, glabrescent; bark smooth, grey or brown. Sympodial units difoliate, not geminate. Leaves simple, the blades 2–6 × 1–4 cm, 1.5–2 times longer than wide, ovate, chartaceous, drying discolorous, yellow-green, densely stellate-pubescent on both sides; trichomes porrect, translucent, stalked, the stalks up to 0.2 mm, the rays ca. 8, 0.1–0.3 mm, the midpoints same length as the rays or shorter, adaxially with reduced rays pointed upwards; the blades unarmed; midvein raised abaxially, flat or sunk adaxially, the primary veins 3–4 pairs, spreading at 30–60° to the midvein, the tertiary venation usually not visible to the naked eye; base cordate, rarely rounded or cuneate, often oblique; margin entire to weakly lobed, the lobes, if present, 1–2 on each side, up to 3 mm long, extending up to 1/4 of the distance to the midvein, broadly rounded; apex rounded or obtuse; petiole 0.3–2.5 cm, 1/3 of the leaf length to as long as the leaf, unusually variable, rarely with 1–2 prickles. Inflorescences usually terminal, sometimes apparently lateral, 2–4.5 cm long, not branched, 1–4-flowered, with 1(–2) flowers open at a time, stellate-pubescent like the young stem, unarmed or with 1–3 small prickles; peduncle 0–5 mm long; rachis 0–2 cm long; pedicels 10–15 mm long, slender at base, inflated towards the sepals, articulated less than 0.5 mm from base, unarmed or with a few prickles; pedicel scars inconspicuous stumps. Buds broad-ovoid or almost globose, conspicuously inflated in living material. Plants andromonoecious, with 1(–2) long-styled flowers at the base of the inflorescence, the flowers 5-merous. Calyx 8–16 mm long, obconical, divided for 3/4–5/6 of its length, the lobes 4.5–12 mm long, 1–1.5 mm wide at base, equal, long-deltoid to thin-oblong, apically long-acuminate, with pronounced keels visible on fresh material, with no venation visible or a raised midvein, densely stellate-pubescent like the young stem, unarmed or more rarely with up to 10 filiform prickles to 1.5 mm long. Corolla 2–4.2 cm in diam, deep purple, drying orange-brown or somewhat pink, stellate, tearing unevenly at anthesis, opening fully or slightly reflexed, lobed for 2/3–3/4 of its length, the lobes 7–15 × 4.5–10 mm, broad-deltoid to ovate, apically cuspidate, with a clearly visible network of brown veins, densely stellate-pubescent abaxially, the trichomes porrect, orange-translucent, subsessile, the stalks up to 0.1 mm, the rays ca. 8, 0.1–0.25 mm, the midpoints same length as the rays or shorter, slightly longer than rays towards corolla lobe apices, mostly glabrous adaxially, the trichomes variously reduced and irregular. Stamens with the filament tube 2–2.5 mm; free portion of the filaments 1.7–2 mm; anthers 4.5–8 mm long, 1–2 mm wide, free, equal, tapering, poricidal at the tips, the pores lengthening into longitudinal slits with age, the anther surface drying papillose, yellow-orange to dark red-brown, often sparsely stellate-pubescent on the dorsal surface. Ovary ca. 2.5 mm diam ovoid-globose, upper part of the ovary usually visible in fully open long-styled flowers, densely stellate-pubescent over its entire surface; style 0.8–1.2 cm long on long-styled flowers, slender, curved, exserted 3–5 mm beyond the anthers, stellate-pubescent in the lower 1/4; stigma clavate, papillose. Fruit a globose berry, 1(–2) per infructescence, 13–20 mm in diam, ovoid or spherical during development, becoming spherical at maturity, the pericarp thin, smooth, shiny, the whole surface visibly stellate-pubescent during development, becoming glabrous at maturity, marbled green and white when young, yellow to orange at maturity, drying yellow to orange-brown; fruiting pedicels 0.8–4 cm long, 0.6–1 mm wide at base, becoming woody, pendulous, unarmed or with up to 15 small prickles, the apical 5–10 mm inflated; calyx slightly accrescent, covering 1/3 to all of the mature fruit, usually unarmed, rarely with up to 10 prickles. Seeds ca. 30–100 per berry, 2.8–3 × 2–2.5 × ca. 0.3 mm,

Table 4. Diagnostic characters of *Solanum phoxocarpum* Voronts., sp. nov. Leaf characters refer to the leaves on fertile branches.

Solanum phoxocarpum sp. nov.	*Solanum aculeastrum*
Leaves subentire	Leaves lobed
Leaves 6–8 cm long	Leaves 8–15 cm long
Leaves 2.5 times longer than wide	Leaves 1.5–2 times longer than wide
Flowers lilac	Flowers usually white
Fruit cone shaped	Fruit usually globose or ellipsoid

flattened-reniform, often somewhat irregular in outline, pale yellow to orange-brown, the surface smooth or with raised outlines of cells or small pits. Figures 2, 5A-D. Table 3.

Distribution and Habitat—Kenya and Tanzania. Savanna, rocky hillsides, bushland and scrub, on granite, volcanic rocks or red sandy soil, sometimes locally common, 1,800–2,200 m elevation. Figures 1A, 5A.

Common Names—The Masai names include "Endulelei," "Oliasuria," and "Entenelua-Narok."

Uses—Decoction of the roots used as cure for anthrax by rubbing into the abscesses; the Masai attribute strong medicinal powers to the "Endulelei".

Etymology—The epithet honours Roger Polhill's contribution to East African botanical taxonomy as a whole and *Solanum* in particular.

Specimens Examined—KENYA. Central Province: Lukenya rocks by Nairobi-Mombasa Road., 2 Jun 1980, *Gilbert 5961* (EA, K); Ilpartimaro, 26 Nov 1977, *Kuchar & Msafiri 8013* (EA). Masai Province: Ngong Hills, Oct 1937, *Anonymous 158* (EA); Ngong Hills, 12 May 1960, *Archer 76* (EA); Suswa lava flow, near Narok Road, Jun 1960, *Archer 117* (EA, K); 22 miles on Kajiado - Namanga Road., 29 Nov 1960, *Archer 208* (EA, K); Namanga Hill river valley, 8 Mar 1964, *Archer 434* (EA, K); Ngong Escarpment, Jun 1940, *Bally 2333* (EA, K); Suswa, 31 Oct 1943, *Bally 2922* (EA); Ngong Escarpment, 21 Dec 1947, *Bally 4745* (EA, K); Suswa crater near rim, 23 Mar 1963, *Bally 12657* (K); Western slopes of Ngong Hills, 12 Dec 1947, *Bogdan 1474* (K); near Kenya Marble co, quarry SW of Kajiado, 27 Nov 1977, *Gilbert 4933* (EA, K); Makueni: Tsavo West National Park, 13 Aug 1965, *Gillett 16842* (EA); Suswa volcanic cave area, 6 Apr 1963, *Glover 3605* (EA, K); Mount Suswa, 4 Aug 1963, *Glover 3854* (EA); Mount Suswa, 5 Aug 1964, *Glover 4570* (EA); Mount Suswa, 14 Feb 1964, *Glover & Oledonet 4133* (EA); Mount Suswa, 13 Mar 1964, *Glover & Oledonet 4446* (EA); Mount Suswa, 15 Mar 1964, *Glover & Oledonet 4500* (EA); Lower NW slopes of Suswa near the Narok-Kijabe road, 20 Apr 1962, *Glover & Samuel 2736* (EA, K); Olenyamu, about 38 miles from Magadi on the road to Nairobi, 30 Jun 1962, *Glover & Samuel 2908* (EA, K); Loita, 25 Dec 1984, *Hohl 348* (EA); Mount Suswa, 1 Jun 1969, *Ivens 2463* (EA); Masai Mara Game Reserve, 24 Sep 1978, *Kuchar 9911* (EA); Ilgeri, 26 Feb 1979, *Kuchar 10669* (EA); Ewaso Nyiro, 1875, 11 Jan 1981, *Kuchar 13858* (EA); Ewaso Nyiro, 11 Jan 1981, *Kuchar 13917* (EA); Narok, 1850, 10 Aug 1977, *Kuchar & Msafiri 6901* (EA); Ollaro Camp, 11 Feb 2001, *Luke & Luke 7317* (EA, K); Ngong escarpment, 9 Jun 1931, *Napier, E.R. 1339* (EA, K); Ngong Hills, Dec 1934, *Napier 3594* (EA); Rift Valley W of Ngong Hills., 13 Dec 1934, *Napier 6723* (K); Ngong Escarpment, Dec 1934, *Napier 6724* (K); Mount Suswa, 15 Jul 1985, *Parsons & Lambert 3* (EA); 37 miles from Nairobi on Magadi road, 12 Apr 1960, *Polhill et al. 2672* (EA, K). Rift Valley Province: Kedong Valley, 1 May 1960, *Archer s. n.* (EA); Ol Longonot, 10 May 1960, *Kerfoot 1860* (EA, K); Ol Longonot Estate, 29 Dec 1961, *Kerfoot 3393* (EA, K); Ol Longonot Estate, 28 Jan 1962, *Kerfoot 3597* (EA); Ol Longonot Estate, 31 Jul 1962, *Kerfoot 4001* (EA, K); Uaso Narok River on Kisima Farm, 40 km N of Rumuruti, 13 Nov 1977, *Stannard & Carter 333* (EA, K).

TANZANIA. Lake Province: Moru Kopjes, Serengeti Plains, 31 Dec 1971, *Greenway & Turner 14,952* (K); Serengeti Central Plains, 2 miles W of the Eastern Boundary, 30 May 1962, *Greenway & Watson 10677* (EA, K); Seronera, Seronera Rest Camp, 25 Apr 1958, *Paulo 377* (EA, K). Northern Province: Longido Mt., 1676, 24 May 1967, *Carmichael 1404* (EA); Soitayai, 29 Nov 1956, *Greenway 9086* (EA, K); Serengeti National Park, 29 Nov 1969, *Herlocker 610* (EA); Oldiang'aranger, E. Serengeti, 19 Nov 1962, *Newbould 6267* (EA, K); Oldiang'arangar, E. Serengeti, Nov 1962, *Oteke 228* (EA, K); Serengeti National Park, Dec 1963, *Turner 12900* (EA).

Notes—*Solanum polhillii* is an attractive erect pubescent shrub with noticeable mauve flowers, broad pubescent leaves and apically inflated pedicels. The wide stamens and broad corollas are similar to those of *S. richardii*, while the vegetative morphology is reminiscent of *S. taitense* Vatke and *S. setaceum* Dammer. Morphology varies with environmental conditions such as aridity, nutrient availability, and herbivory, including leaf size, petiole length and prickliness. Particularly remarkable is the variation in flower size, with the corolla 2–4.2 cm wide and the anthers 4.5–8 mm long, smaller than the more southern *S. richardii* but larger than most other species in the region.

Solanum polhillii is the species designated as *Solanum* sp. nov. *2* by Polhill (in mss.) and *Solanum* sp. G sensu Agnew and Agnew (1994) and Beentje (1994). It does not fit comfortably into any sections accepted by Bitter (1913, 1917, 1921, 1923) or Jaeger (1985), many of which are not monophyletic (Levin et al. 2006; S. Stern, unpubl. data). Polhill (in mss.) placed it in Bitter's section *Ischyracanthum*, an unlikely placement as *S. polhillii* lacks overall similarity to its members and also lacks the curved stem prickles that define that section. In spite of vegetative similarity to members of Bitter's section *Oliganthes*, its fruits are yellow rather than orange to red and its flowers are too large to fit comfortably into that group. Perhaps the position of *S. polhillii* will become clearer with further molecular phylogenetic studies.

Solanum phoxocarpum Voronts., sp. nov.—TYPE: KENYA. Masai Province: Narok District, Lake Naivasha to the Enesambulai Valley, on the crest of the Western Rift Wall, 2 Nov 1969, *P. G. Greenway & Kanuri 13869* (holotype: EA!; isotype: K000441270!).

Species *Solano aculeastri* Dunal similis sed foliis caulium fertilium subintegris (nec lobatis), 6–8 cm tantum (nec 8–15 cm) longis et 2.5plo (nec 1.5–2plo) longioribus quam latioribus, floribus lilaciniis (nec plerumque albidiis), baccis conicis (nec plerumque globosis neque ellipsoideis) et duplo (nec minus quam duplo) longioribus quam latioribus differt.

Erect shrub to small tree, 1–3(–6) m, armed, much branched at base; young stems long and slender, densely stellate-pubescent; trichomes multangulate, white-translucent, irregular and densely matted, sessile, the rays 11–16, 0.1–0.2 mm, the midpoints same length as the rays or up to 0.8 mm long; prickles 6–15 mm long, 2–7 mm wide at the widest point, straight or curved, rounded to flattened, orange-brown; main branches up to 20 cm in diam at base, glabrous to glabrescent in patches; bark smooth red-brown to almost white. Sympodial units appearing plurifoliate, not geminate. Leaves simple, the blades on fertile branches 6–8 × 2.5–4 cm (larger on vegetative branches), ca. 2.5 times longer than wide, elliptic, chartaceous, drying strongly discolorous, reddish-green above, white-grey underneath, densely stellate-pubescent abaxially; trichomes porrect to multangulate, white-translucent, a mixture of sessile and stalked, the stalks ca. 0.1(–0.2) mm, the rays 11–16, 0.15–0.3 mm, the midpoints same length as the rays or up to 0.8 mm long, adaxially almost glabrous; the blades unarmed, sometimes with 1–2 straight prickles up to 5 mm long; midvein raised abaxially, sunk adaxially, the primary veins (4–)5–6 pairs, spreading at 30–45° to the midvein, the tertiary venation visible on both sides of the leaf; base cuneate, usually equal; margin subentire to weekly lobed, the lobes 1–2(–3) on each side, up to 0.5(–1.5) cm long, extending up to 1/3 of the distance to the midvein (larger on vegetative branches), broadly rounded; apex acute; petiole 0.5–0.9 cm, ca. 1/6 or less of the leaf length, unarmed. Inflorescences apparently terminal or lateral, 3–5.5 cm long, not branched, 1–7-flowered, with 1 flower open at a time, densely stellate-pubescent, the trichomes often with elongated midpoints, unarmed; peduncle 0–0.6 cm long; rachis 0–0.3 cm long; pedicels 1.8–3 cm on long-styled flowers, 0.8–1.2 cm on short-styled flowers, slender, articulated less than 0.5 mm from base, stellate-pubescent in patches, the trichomes often with elongated midpoints, sometimes with 1–2 prickles on long-styled flower pedicels; pedicel scars broad dark stumps, spaced 1–2 mm apart. Buds ovoid to ellipsoid. Plants andromonoecious,

with 1(–3) long-styled flowers at the base of the inflorescence, the flowers 5(–6)-merous. Calyx ca. 15 mm long on long-styled flowers, ca. 7 mm long on short-styled flowers, long-cupular, divided for ca. 2/3 of its length on long-styled flowers, for ca. 1/2 of its length on short-styled flowers, the lobes 7–10 × 2–3 mm in long-styled flowers, ca. 4 × 2 mm in short-styled flowers, mostly equal, sometimes with one lobe much longer than the others, long-deltoid, apically acute to apiculate, with no venation visible or a faint raised midvein, densely stellate-pubescent, unarmed or with up to 15 prickles to 5 mm long in long-styled flowers, unarmed in short-styled flowers. Corolla ca. 3 cm diam in long-styled flowers, ca. 1.7 cm diam in short-styled flowers, blue-mauve, drying orange-brown, slightly reflexed, stellate, lobed for 1/2–2/3 of its length, the lobes 10–15 × 4–5 mm in long-styled flowers, 6 × 3–4 mm in short-styled flowers, deltoid, with a dark midvein, densely stellate-pubescent abaxially, the trichomes porrect, irregular, orange-translucent, sessile, the rays 8–15, 0.1–0.3 mm, undulate, the midpoints shorter than the rays, lengthening towards corolla lobe apices, mostly glabrous adaxially, the trichomes variously reduced and irregular. Stamens with the filament tube ca. 2 mm; free portion of the filaments ca. 1.2 mm; anthers 3.5–4 mm, free, equal, tapering, poricidal at the tips, the pores lengthening into longitudinal slits with age, the anther surface drying orange to red-brown. Ovary ca. 2.5 mm in diam, broad-ovoid, densely stellate-pubescent in the upper 1/5; style ca. 7 mm long on long-styled flowers, thick, dark brown, straight or almost straight, stellate-pubescent in the lower 1/3, exserted 3–4 mm beyond the anthers; stigma clavate, papillose. Fruit a conical berry, 1(–3) per infructescence, 2.8–3.7 × 1.8–2.2 cm, ca. two times longer than wide, apically pointed, retaining the same elongated pointed shape throughout development, the pericarp thin, usually smooth, sometimes warty, shiny, glabrous, with a few stellate trichomes near the apex on immature fruit, evenly green when young, yellow at maturity, drying almost black when young and drying orange-brown at maturity; fruiting pedicels 2.5–4 cm long, 1.2–1.8 mm wide at base, woody, held erect becoming pendulous as the pedicel dries, usually with 2–10 prickles up to 7 mm long in the apical part; calyx sometimes accrescent to 2.5 cm long, covering 1/6–1/4(–1/2) of the mature fruit, not reflexed, with 0–10 prickles ca. 5 mm long. Seeds ca. 30 per berry, 4–4.5 × 3–4 × ca. 0.3 mm, flattened-reniform, almost round, often somewhat irregular in outline, brown to almost black, the surface smooth or with raised outlines of cells or small pits. Figures 3, 5E-H. Table 4.

Distribution and Habitat—Endemic to the East African Rift Valley, including the Rift Valley Province, Central Province, and Masai Province in Kenya and Northern Province in Tanzania. Damp forest understorey or secondary scrub at 2,100–3,000 m altitude. Figures 1B, 5E.

Common Names—Masai vernacular names are "Osigawai" and "Sigawet."

Uses—The plants are used for hedges and the fruit is eaten. Roots are boiled in water and the liquid is then mixed with broth and taken as a remedy for gonorrhoea. The ripe dry fruits are roasted and then ground to powder and mixed with butter to give to babies.

Etymology—*Solanum phoxocarpum* means "pointy-fruited solanum", derived from the Greek "phoxos" meaning pointed or peaked and "karpos" meaning fruit.

Specimens Examined—KENYA. Central Province: Mount Kenya, 10 Sep 1970, *Archer 639* (EA); Limoru, 30 Aug 1939, *Bally 7438* (EA, K); Aberdare National Park, 23 Jun 1978, *Campbell s. n.* (EA); Mount Kenya, 22 Oct 1981, *Cheseny 61* (EA); Aberdare National Park, 1 Jan 1922, *Fries 632* (EA); Aberdare National Park, 7 Apr 1975, *Hepper & Field 4910* (K); Mount Kenya, 15 Sep 1970, *Kokwaro & Mathenge 2340* (EA); Chogoria, 26 Oct 1987, *Luke 681* (EA); Aberdare National Park, 4 km from Muringa to bridge towards the mooreland, 13 Mar 2007, *Mbale et al. NMK844* (K); Limoru, 4 Jul 1909, *Scheffler 306* (K); Mount Kenya, Naro Moru Track, *Verdcourt, B. 3725* (EA, K); Mount Kenya, mountain lodge near Nyeri, 6 Dec 1974, *Williams 63* (EA, K). Masai Province: Oldonyo Orok, 6 Dec 1944, *Bally 4141* (EA, K); Molo, 22 Feb 1951, *Gillett 43,551* (EA); Olokurto, Mau Area, 13 May 1961, *Glover et al. 935* (EA, K). Rift Valley Province: Timbora, 25 Jul 1938, *Evans & Erens 1468* (K); Kinangop, 11 Jul 1965, *Gillett 16,766* (EA, K); Mau Narok, 5 Jul 1976, *Gitonga 61* (EA); near Timboroa, 2 km S of equator, 27 Dec 1986, *Robertson 4404* (K); Timboroa, by Londiani turning, Apr 1972, *Tweedie 4315* (K).

TANZANIA. Northern Province: Ngorongoro Crater, 2,100 m, 16 Aug 1973, *Frame 229* (EA, K); Ngorongoro Crater, 21 Jul 1968, *Gilbert 2994* (EA); Ngorongoro Crater, 28 Jan 1965, *Herlocker 12* (EA); Longido Mt, 2530 m, 8 Jul 1976, *Paterson 146* (EA); Embagai, 5 Feb 1932, *Saint Claire Thompson 1255* (K). Tanga Province: Gologolo, 9 Jun 1958, *Mgaza 172* (EA).

Notes—*Solanum phoxocarpum* is a high-altitude species with unusual long and pointed fruit, subentire leaves, and mauve flowers. It is closely related to the widespread *S. aculeastrum* but lacks its strongly lobed leaves on fertile branches, the corolla is mauve, and less dissected. Both species are found in the habitat mosaics characteristic of the Kenyan Rift Valley and are found growing together in woodland above 2,100 m. Some populations of *S. aculeastrum* in Uganda and the Democratic Republic of the Congo have long pointed fruit like that of *S. phoxocarpum* as well as leaves that are less lobed than average, but these leaves are not as long and thin as those of *S. phoxocarpum* and these plants have denser and longer indumentum. Morphology of *S. aculeastrum* is reminiscent of typical juvenile *Solanum* morphology with more leaf lobing and abundant prickles (Roe 1966), while the morphology of *S. phoxocarpum* is more similar to the typical mature *Solanum* morphology with more entire leaves and fewer prickles.

Solanum phoxocarpum is the species designated as *Solanum aculeastrum* Dunal var. 1 by Polhill (in mss.), *Solanum aculeastrum* Dunal subsp. 1 by Jaeger (1985), and *Solanum* sp. K sensu Agnew and Agnew (1994). Udo Dammer has also recognised the distinctness of these plants and annotated the sheet *Scheffler 306* (K) as "*Solanum sepiaceum* Dammer var. *fructile verrucans* spec. nov." in Dammer's handwriting, with a printed label "Brit. Uganda. Station Lamuru. Buschiges Hochland. b. c. 3,000 m". This name does not seem to have been published and the specimen is not cited in the protologue of *S. sepiaceum* Dammer (Dammer 1905). "Station Lamuru" most likely refers to Limuru in Kenya, Central Province (Polhill 1988).

Solanum malindiense Voronts., sp. nov.—TYPE: KENYA. Tana River District: Nairobi Ranch, Ras Wanawali Sabaa, 02°33′ S, 40°37′ E, 5m, 13 July 2006, *L. Festo & Q. Luke 2337* (holotype: EA!; isotypes: MO, NHT).

Species *Solano usaramense* Dammer similis sed foliis lobatis (nec subintegris) et 1.5–2plo (nec 2–3) longioribus quam latioribus, baccis flavis (nec aurantiis) et 15mm vel ultra latis (nec 8–9 mm latis), pilis stellatis sparsis (nec densis) cum stipe ad maximum 0.1 mm tantum longis (nec 0.2–0.4 mm longis) differt.

Scandent shrub to 2 m, armed, sparsely branched; young stems long, ascendant, densely stellate-pubescent; trichomes porrect, translucent, sessile or stalked, the stalks up to 0.1 mm, the rays 6–8, 0.1–0.2 mm, the midpoints same length as the rays or shorter, often reduced to globular glands; prickles 1–3 mm long, 1–1.5 mm wide at widest point, hooked, flattened at the base but conical at the apex, white-yellow to

orange-brown; main branches ca. 5 mm in diam at base, glabrescent; bark smooth, greyish. Sympodial units difoliate, not geminate. Leaves simple, the blades 3–6 × 2.5–4 cm, 1.5–2 times longer than wide, ovate, chartaceous, drying discolorous, yellow-green to yellow-orange or dark red-green, densely stellate-pubescent abaxially; trichomes porrect, translucent, subsessile, the stalks less than 0.1 mm, the rays ca. 8, 0.15–0.2 mm, the midpoints same length as the rays or shorter, adaxially glabrescent, with reduced rays and midpoints; the blades unarmed or with 1–5 prickles on the abaxial midvein and often 1 prickle on the adaxial midvein; midvein raised abaxially, flat adaxially, the primary veins 3–5 pairs, spreading at 45–60° to the midvein, the tertiary venation visible on both sides of the leaf; base cordate or sometimes rounded, often oblique; margin subentire to sinuate, the lobes 2–4 on each side, up to 5 mm long, extending up to 1/3 of the distance to the midvein, broadly rounded; apex rounded to obtuse; petiole 1–2 cm, 1/2–1/4 of the leaf length, slender, with 0–4 prickles. Inflorescences apparently terminal or lateral, 2–4 cm long, not branched, 3–10-flowered, with 1–4 flowers open at a time, stellate-pubescent like the young stem, unarmed or with a few small recurved prickles; peduncle 1–5 mm long; rachis 0.3–2 cm long; pedicels 5–10 mm long, slender, articulated less than 0.5 mm from base, stellate-pubescent like the young stem, unarmed or with 1–2 prickles; pedicel scars broad flat stumps, spaced 2–4 mm apart. Buds ovoid to ellipsoid. Plants andromonoecious, with 1(–2) long-styled flowers at the base of the inflorescence, the flowers 5-merous. Calyx 5–8 mm long, obconical, divided for 1/3–2/3 of its length, the lobes 3.5–5 mm long, ca. 1 mm wide at base, equal, long-deltoid, apically long-acuminate, with no venation visible or with a raised midvein, densely stellate-pubescent like the young stem, unarmed or with up to 20 thin straight prickles to 2.5 mm long. Corolla 2–3.7 cm in diam, white to pale mauve, drying orange-brown, stellate, tearing unevenly at anthesis, opening fully but not reflexed, lobed for ¾-4/5 of its length, the lobes 8–12 × 4–5 mm, long-deltoid, apically acute, with a dark midvein, stellate-pubescent abaxially, the trichomes porrect, orange-translucent, subsessile, the rays ca. 8, 0.15–0.25 mm, undulate, the midpoints shorter than the rays, lengthening towards corolla lobe apices, mostly glabrous adaxially, the trichomes variously reduced and irregular. Stamens with the filament tube 2–2.5 mm; free portion of the filaments ca. 1.5 mm; anthers 8–9.5 mm long, ca. 1.5 mm wide, free, equal, tapering, poricidal at the tips, the pores small, not lengthening into longitudinal slits with age, the anther surface drying smooth to papillose, dark red-brown to orange-brown. Ovary stellate-pubescent in the upper 1/2 only; style 1.3–1.5 cm long on long-styled flowers, curved, the upper 1/3 dark and thick, exserted 3–5 mm beyond the anthers, stellate-pubescent in the lower 2/3; stigma clavate, papillose. Fruit a globose berry, 1(–2) per infructescence, ca. 15 mm in diam, spherical throughout development, the pericarp thin, smooth, shiny, sparsely stellate-pubescent in the apical 1/2 during development, becoming glabrous at maturity, marbled green and white when young becoming yellow at maturity, drying orange-brown or dark brown; fruiting pedicels ca. 1.5 cm long, 0.8–1 mm wide at base, herbaceous becoming woody, pendulous, unarmed or with a few straight or curved prickles; calyx accrescent to ca. 10 mm long, covering ca. 1/3 of the mature fruit, with 10–30 straight or curved prickles. Seeds ca. 50–100 per berry, 2.5–3.5 × 2–2.5 × ca. 0.3 mm, flattened-reniform, often somewhat irregular in outline, brown, the surface smooth or with raised outlines of cells or small pits. Figures 4, 5I-L. Table 5.

Distribution and Habitat—Kenya, Coast province: coastal bush, dunes and sand, often on coral, at low altitudes. Figures 1C, 5I.

Etymology—*Solanum malindiense* is named after the town of Malindi near the site of its first discovery.

Representative Specimens Examined—KENYA. Coast Province: Watamu, Duchess of Gloucester Girls School, 23 Oct 1967, *Anonymous 14* (EA); Watamu, Duchess of Gloucester Girls School, 22 Oct 1967, *Anonymous 39* (EA); Manda Island, 5 Aug 1982, *Brathay Expedition 107* (EA); Kitwa Pembe Hill and vicinity, 15 Jul 1974, *Faden & Faden 74/1072* (EA, K); Kilifi, 28 Nov 1945, *Jeffery K415* (EA); Kilifi, 22 Oct 1948, *Jeffery K600* (EA); Nairobi Ranch, Ras Wanawali Sabaa, 18 Oct 2004, *Luke & Luke 10326K* (EA); 4 ml N of Malindi, 3 Nov 1961, *Polhill & Paulo 709* (K); Shela, 20 Oct 1984, *Robertson 3776* (EA).

Notes—*Solanum malindiense* has undulate leaves of consistent shape, long-acuminate calyx lobes, curved prickles covering the calyx from late bud onwards, and a pubescent ovary with stellate trichomes persisting until the developing fruit reaches 1 cm in diameter. *Solanum malindiense* is the northern continuation of *S. usaramense* populations in the coastal areas of Mozambique, Tanzania, and southern Kenya, with wider and more lobed leaves, larger yellow berries, and sparse indumentum. The name *Solanum monotanthum* Dammer has been erroneously applied to populations of *Solanum usaramense* in coastal Kenya and Tanzania. Type material of *S. monotanthum* found in Universität Göttingen suggests the name *S. monotanthum* is actually a synonym of *S. zanzibarense* Vatke and is not synonymous with either *S. usaramense* or *S. malindiense*. The habit and yellowish regularly undulate leaves of *S. malindiense* are reminiscent of two other species of East African coasts: the sympatric *S. zanzibarense* and *S. litoraneum* A. E. Gonç. from coastal Mozambique and Tanzania, although the corollas, anthers and fruit are larger than in either of these species.

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