

Coccinia (Cucurbitaceae) gains two new species from East Africa, three new synonyms, and one new combination

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Summary. We describe and illustrate *Coccinia pwaniensis* Holstein from eastern Tanzania and southeast Kenya, and *C. samburuensis* Holstein from the Samburu area in Kenya. The new species were already recognised by Charles Jeffrey in 1967 and are now known from eight and four collections, respectively. Ongoing monographic work also revealed three new synonyms and the need for a new combination, *Coccinia heterophylla* (Hook. f.) Holstein.

Key Words. Coastal forests, *Coccinia pwaniensis*, *Coccinia samburuensis*, Kenya, Tanzania.

The Cucurbitaceae genus *Coccinia* comprises some 28 species (N. Holstein, in prep.) that mostly occur in sub-Saharan Africa. *Coccinia grandis* (L.) Voigt, however, ranges from tropical Africa to subtropical and tropical Asia and has now become an invasive weed throughout the tropics. *Coccinia* species are adapted to a wide range of habitats from semi-arid bush lands to cloud forests; no species occur in afro-alpine habitats or the Cape floristic region. In the course of revising the genus, the first author surveyed specimens from 25 herbaria (B, BM, BR, COI, DSM, E, EA, FT, GAT, GOET, H, HBG, HEID, K, M, MO, NHT, P, S, UBT, W, WAG, and partly C, LISC and LISU), which brought to light fertile material of two species that had already been recognised as new by Charles Jeffrey during his work for the *Flora of Tropical East Africa* (Jeffrey 1967). Here we formally describe these species.

All specimens cited have been seen by the first author, except where otherwise marked.

***Coccinia pwaniensis* Holstein sp. nov.** differt ab omnibus speciebus generis foliis palmato-3 – (5)-lobatis, lobis apicibus acutis. Flores masculi bracteati. Pedunculus longus, basi interdum floribus 1 – (2) instructus, racemis (oligofloris usque) multifloris. Calycis dentibus subulatis, erectis. Typus: Kenya, Coast Province, Kwale Distr., Buda Mafisini forest, [8 miles] 12.9 km WSW of Gazi, 80 m, ♂ fl., 22 Aug. 1953, R. B. Drummond & J. H. Hemsley 3953 (holotypus K, 3 sheets; isotypus EA).

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Plants dioecious, creeping or climbing, up to 3 m long. Fresh branches green, lignifying to a greyish brown to purplish brown bark. Leaves somewhat

coriaceous, shallowly to profoundly 3 – (5) lobate, 2 – 10.4 × 2.7 – 11.4 cm, lobes broadly triangulate to elliptic, tips acute, margin minutely dentate, upper lamina fresh green, tiny pustulate, nerves sometimes with tiny hairs, lower lamina glabrous, rarely with blackish glands at base, nerves prominent and towards the base with stiff erect hairs that can be quite reduced, then appearing wart-like or subglabrous. Petiole 0.6 – 4.1 cm long, adaxial side glabrous or with short bristly hairs, abaxial side with indumentum as on the nerves. Tendrils simple. Probracts lanceolate, 0.2 – 0.3 cm long. Male flowers in racemes, sometimes accompanied by 1 – 2 solitary flowers, the peduncle 3.2 – 7.7 cm long and glabrous, pedicels of flowers in racemes 0.2 – 0.95 cm, pedicels of solitary flowers up to 3.8 cm long, bracts 0.1 – 0.15 cm long, receptacle tube obconical, green, glabrous, calyx teeth 0.25 – 0.35 cm long, subulate and erect, corolla pale yellow to pale orange-yellow, 1.7 – 2.6 cm long, lobes triangulate-elliptical, outside with few-celled hairs, inside with multicellular hairs, filaments 3, connected to a glabrous central column, anthers sinuate, forming a globose head, orange. Pollen prolate. Female flower unknown. Fruit solitary, petioles at maturity 2 – 3.3 cm long, fruit shape oblong-fusiform, 6.2 – 8 cm long, 1.8 – 2.3 cm in diam., rarely (?) with an up to 5.5 cm long sterile apical tip, immature green with pale longitudinal mottling, at maturity becoming orange-red to scarlet-red with pale mottling. Seeds grey beige, 6.5 – 7 × 4 – 4.5 × 1.5 mm (L/W/H), more or less symmetrical, broad ovate in outline, and lenticular. Fig. 1.

DISTRIBUTION. *Coccinia pwaniensis* occurs in the Coast Province of Kenya and the Pwani region of Tanzania (Map 1). It is expected near Tanga and Dar es Salaam.

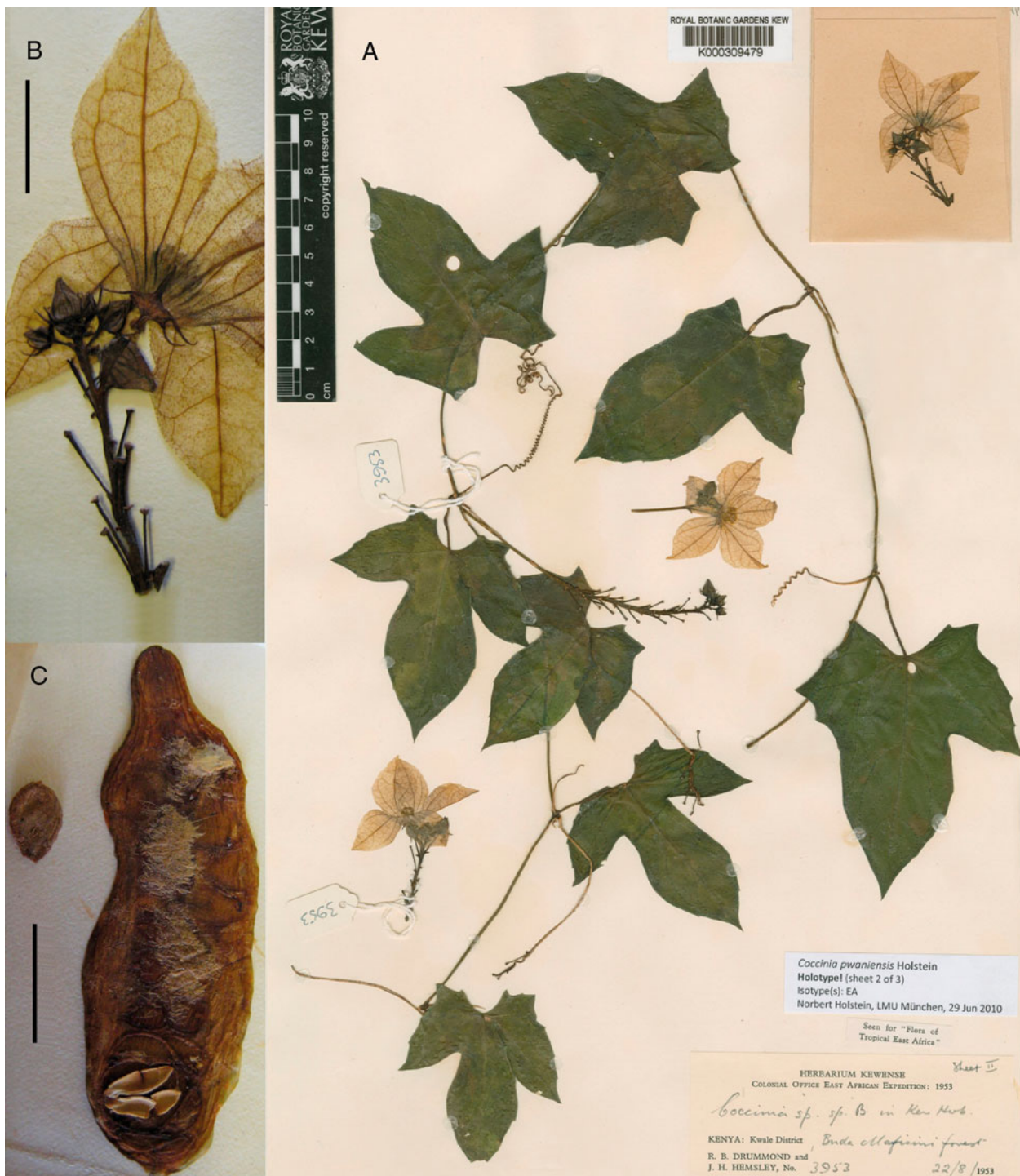
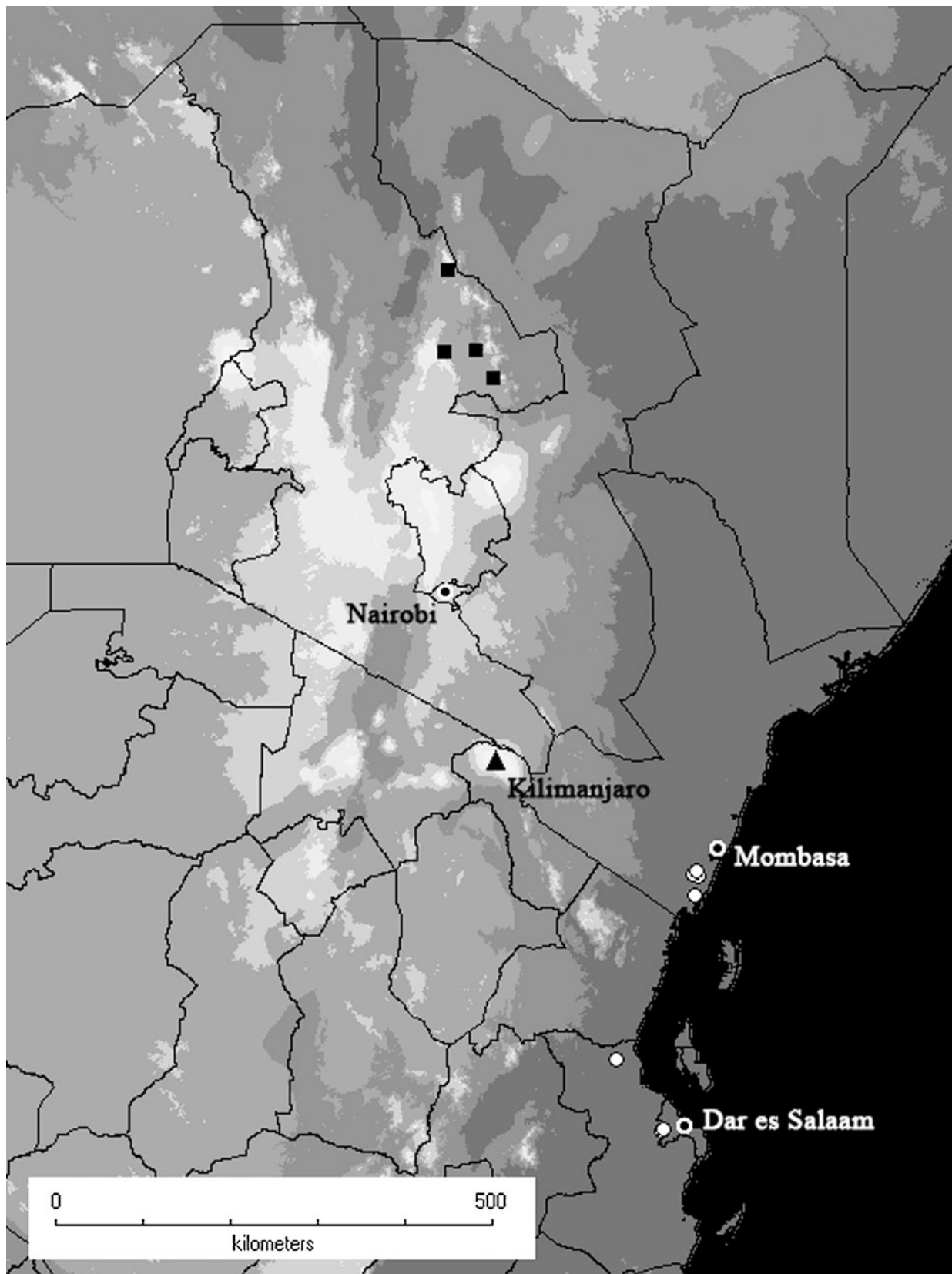


Fig. 1. *Coccinia pwaniensis*. A holotype (sheet 2 of 3), reproduced with permission from the Royal Botanic Gardens, Kew; B male flower in raceme, detail of the holotype; C fruit and seed, detail from R. B. Drummond & J. H. Hemsley 1078 (K). Scalebars = 1 cm.

SPECIMENS EXAMINED. KENYA. Coast Province, Kilifi Distr.: Mangea Hill, 39°42'E 03°16'S, 450 m, dry bushland with *Cynometra* sp., *Brachylaena* sp., *Manilkara* sp., *Brachystegia* sp., *Julbernardia* sp., *Diospyros* sp., *Xylopia* sp., *Inhambanella* sp., ♀ fr., 28 Dec. 1988,

W. R. Q. Luke 1601 (EA); Kwale Distr.: Buda Mafisini forest, [8 miles] 12.9 km WSW of Gazi, 80 m, ♂ fl., 22 Aug. 1953, R. B. Drummond & J. H. Hemsley 3953 (holotype K, 3 sheets; isotype EA); Cha Simba forest, 300 m, ♀ fl., fr., 1 Feb. 1953, R. B. Drummond & J. H.



Map 1. Distribution map showing the locations of the four collections of *Coccinia samburuensis* (black squares) and of the eight of *C. pwaniensis* (white circles with narrow black margin) collections. Major cities are indicated by a white circle with a black centre.

Hemsley 1078 (K); Shimba Hills, Giriama Point area, 381 m, forest edge, ♂ fl., 17 March 1968, *F. Magogo* & *P. Glover* 315 (EA, K); Shimba Hills, Pengo Hill area, 457 m, forest, ♂ fl., 27 March 1968, *F. Magogo* & *P. Glover* 493 (EA, K); Shimba Hills, Longomagandi, 350 m, high lowland rainforest, 25 June 1988, *R. Schmidt* 1203 (EA); Kwale Distr., no detailed location given, ♂ fl., 15 June 1957, *Saunders* 11241 (EA).

TANZANIA. Pwani region, Bagamoyo Distr.: Zaraninge Forest in Kiono Plateau, 38°36'E 6°09'S, 305 m, dry evergreen coastal forest, on sand, ♂ fl., 14 March 1990, *Frontier-Tanzania Coastal Forest Research Programme* 1041 (K); Kirasawe Distr.: Pugu Hills Forest Reserve on Dar es Salaam–Kisarawe road. Roadside in forest, 100 – 270 m, ♂ fl., 12 May 1970, *K. H. Macauley* CVL 102 (DSM, EA); Pugu Hills, ♂ fl., 19 March 1939, *J. H. Vaughan* 2774 (EA). Pugu Hills Forest Reserve, road W from road-tunnel, 100 m, in bushes by car-track through forest, ♀ fr., 23 July 1972, *R. Wingfield* 2056 (DSM, EA).

HABITAT. Open, disturbed places in East African coastal forests and dry woodlands (*Brachystegia* sp., *Julbernardia* sp., *Diospyros* sp.); on sandy soil at 80 – 460 m altitude.

CONSERVATION STATUS. The species appears confined to coastal forests, which are declining due to deforestation although they are legally protected (Burgess *et al.* 1998). However, low botanical collecting activity does not allow the assessment of the conservation status of this species. Therefore we treat it here as Data Deficient (DD).

VERNACULAR NAMES (all Kidigo). Mnokonyoka (*F. Magogo* & *P. Glover* 493), Mtambaa (*F. Magogo* & *P. Glover* 315).

NOTES. *Coccinia pwaniensis* was first collected in 1939 and described as *Coccinia* sp. B in the *Flora of Tropical East Africa* (Jeffrey 1967: 64). The diagnostic characters mentioned by Jeffrey were the numerous male flowers in a long raceme on a rather long peduncle and the species' occurrence in coastal forests. In addition, the leaves are often 3-lobate with acutely lobed tips, the male flowers are usually bracteate, and the calyx teeth are erect and subulate.

The epithet *pwaniensis* comes from the Kiswahili word “pwani” for “coast” and points to the habitat and distribution of the species. The label of *F. Magogo* & *P. Glover* 493 states that the Digo tribe believe the fruits to be poisonous and eaten by snakes. The DSM duplicate of *R. Wingfield* 2056 has a fruit with an exceptionally long apical tip without seeds.

Coccinia pwaniensis apparently hybridises with *C. grandis*. This is suggested by a population discovered by the first author in the Pugu Hills, UTM 37 M 0507657 9237464, 194 m, ♂ fl., 25 July 2009, *N. Holstein*, *F. M. Mbago* & *D. Shikelango* 102 (DSM, M), 103 (M), 104 (M), 105 (DSM, M). Comparison of chloroplast and nuclear DNA sequences of plants from this population with those of *C. grandis* and other species suggests that *C. grandis* is the female parent. *C. pwaniensis* differs from *C. grandis* in the male

flowers being borne in racemes, instead of solitarily. The hybrid plants were in full bloom, but none of their pollen sacs were opened, indicating that the plants may be sterile. Non-dehiscence of the anthers was also observed in an artificial hybrid between *C. grandis* and *C. hirtella* Cogn. created in a greenhouse in Munich (*N. Holstein* 108 (M)).

***Coccinia samburuensis* Holstein sp. nov.** differt ab omnibus speciebus generis foliis palmato-(5 –) 7-lobatis, lobis marginibus crenatis vel lobulis parvis vel partim longis instructis, glanduloso-dentatis. Cirrhi simplices. Calycis dentibus linearibus. Fructus cylindricus. Typus: Kenya, Rift Valley Province. Samburu Distr., on Wamba – Isiolo road, 0.7 km S of turnoff to Maralal, c. 1300 m, ♀ fl., fr., 4 July 1974, *R. B. Faden* & *A. J. Faden* 74/948 (holotypus MO; isotypus WAG).

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Perennial dioecious climber up to 5 m long. Stem subglabrous except for tiny, few-celled hairs visible under 5 – 10× magnification, when older white-speckled. Leaves coriaceous, 6 – 14 × 10 – 13 (– 17) cm, (5 –) 7-lobate, the lobe apices subacute to apiculate, margins serrate (to lobulate), teeth (lobule tips) with yellowish glands, upper lamina glabrous, clear or white pustulate, lower lamina glabrous, often with small blackish glands between the vein bases, nerves white-speckled, petioles glabrous and sometimes with white speckles along the base. Tendrils simple. Probracts up to 0.4 cm long, ovoid, acute, glandular on both sides, underneath with few-cellular hairs at 5 – 10× magnification. Male flowers 1 – 2 solitary, pedicel up to 5 cm long, glabrous, receptacle tube glabrous, calyx teeth 0.65 cm long, linear, the corolla 3.7 cm long and brownish yellow, the lobes obovate, the tips acute-mucronate. Female flowers solitary, pedicel 0.4 – 0.5 cm long, glabrous, the ovary narrow cylindrical, glabrous, receptacle tube c. 0.3 cm long, glabrous, calyx teeth 3 mm long, linear, the corolla 3.2 – 4 cm long and yellow-orange, the lobes 2.5 cm long, obovate, the tips acute-mucronate, the lobes abaxially with several long multi-cellular hairs. Fruits c. 14 cm long and 1.5 – 2 cm in diam., sausage-shaped, unripe green with lighter spots, the pulp orange. Seeds 6.5 – 7 × 3.5 – 4.5 mm (L/W), symmetrical, ovate in outline, and flat lenticular. Fig. 2.

DISTRIBUTION. *Coccinia samburuensis* is only known from the Samburu District in the Rift Valley Province in Kenya (Map 1).

SPECIMENS EXAMINED. KENYA. Rift Valley Province. Samburu Distr.: on Wamba – Isiolo road, 0.7 km S of turnoff to Maralal, c. 1300 m, ♀ fl., fr., 4 July 1974, *R. B. Faden* & *A. J. Faden* 74/948 (holotype MO; isotype



Fig. 2. *Coccinia samburuensis*. A holotype; B fruit; C female flower bud without ovary; D seed. B – D from R. B. & A. J. Faden 74/948 (WAG). Scalebars = 1 cm.

WAG); Mt Nyiru, southern slopes, near a river, 2°03'N 36°51'E, 1600 m, ♀ fr., 1 April 1995, *B. Bytebier et al.* 355 (EA, 2 sheets); Operoi, 1°12'N 36°49'E, 1350 m, rocky outcrop in *Acacia* woodland, ♀ fr., 23 Dec. 2004, *W. R. Q. & P. A. Luke* 10787 (EA, K); near Maralal, Lowaweregoi [Lowua Werekoi Mt] c. 1220 m [4000 ft], rocks in bushland, ♂ fl., 15 Dec. 1958, *J. G. B. Newbould* 3233 (K) **HABITAT.** *Coccinia samburuensis* grows on rocky outcrops, near rivers or seepage lines, in *Acacia-Commiphora* deciduous bushland; 1200 – 1600 m.

CONSERVATION STATUS. The species is only known from four collections, and we therefore cannot assess

its conservation status. It is treated here as Data Deficient (DD).

VERNACULAR NAMES. None are known.

NOTES. *Coccinia samburuensis* was first collected in 1958 and mentioned as *Coccinia* sp. A in the *Flora of Tropical East Africa* (Jeffrey 1967: 63), with the characters mentioned being the (5 –) 7-lobate leaves with sinuate-lobulate and glandular-toothed margins and the relatively large flowers. In addition, the species has distinct cylindrical fruits, lineal calyx teeth, and simple tendrils. Jeffrey knew only a male specimen, but female individuals have since become available, and

at least five duplicates exist of the type collection (*R. B. Faden & A. J. Faden* 74/948; R. B. Faden, pers. comm., 7 April 2010). Unfortunately, the whereabouts of three of them remain unclear.

***Coccinia heterophylla* (Hook. f.) Holstein comb. nov.**

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Physedra heterophylla Hook. f. in Oliv., *Fl. Trop. Afr.* 2: 553 (Oliver 1871). Type: Angola [Cuanza Norte province], Golungo Alto, along the banks of the stream Casaballa, at the base of the mountains in Sobato de Bumba, male, fl., Oct. 1855, *F. M. J. Welwitsch* 791 (lectotype BM no. 000948006, selected here); Golungo Alto, along the banks of the stream Casaballa, at the base of the mountains in Sobato de Bumba, ♂ and ♀ fl., Oct. 1855, *F. M. J. Welwitsch* 791 (isolectotype p.p.¹ LISU no. 214547, n.v., digital image [JSTOR Plant Science]).

Physedra heterophylla var. *hookeri* Hook. f. in Oliv. (Oliver 1871: 553). Type: Angola [Cuanza Norte province], Golungo Alto, near Ponte de Felix Simões, ♀ fl., Dec. 1855, *F. M. J. Welwitsch* 792 (holotype BM).

ADDITIONAL SYNTYPES EXAMINED. ANGOLA. No detailed location, ♀ fr., Jan. 1856, *F. M. J. Welwitsch* 791 (BM no. 000948008); in rugged places at Delamboia R., with *Coffea melanocarpa*, *F. M. J. Welwitsch* 791 (BM no. 000948007); no detailed location and date, *F. M. J. Welwitsch* 791 (COI); no detailed location, ♂ fl., *F. M. J. Welwitsch* 791 (K); no detailed location, ♀ fl., *F. M. J. Welwitsch* 791 (LISU no. 214548); no detailed location, ♀ fr., Jan. 1856, *F. M. J. Welwitsch* 791 (LISU no. 214549); no detailed location, ♂ fl., *F. M. J. Welwitsch* 791 (LISU no. 214550); in rugged places at Delamboia R., with *Coffea melanocarpa*, Sept. 1855, *F. M. J. Welwitsch* 791 (LISU no. 214551); at Delamboia R., *F. M. J. Welwitsch* 791 (LISU no. 214552); no detailed location, *F. M. J. Welwitsch* 791 (LISU no. 214553); no detailed location, *F. M. J. Welwitsch* 791 (P).

NOTES. Hooker's species is based on at least 13 sheets of *Welwitsch* 791, distributed after Hooker described the species (Phillips *et al.* 1992). The number "791" does not refer to a collection, but instead to a species (Albuquerque *et al.* 2009), as was common practice at the time. Some specimens are labelled with "fol." plus a number, but there is no indication of a series, and the label "fol. 2" occurs twice (BM000948006 and LISU 214548), precluding unambiguous assignments for

specimens without dates and localities. Collection dates and localities appear on some sheets, but are not consistent with the "fol." groups. Some of the specimens come from different localities and dates and thus cannot be considered duplicates (ICBN Art. 8.3), making them syntypes. Others, however, do seem to be duplicates (LISU no. 214547 and BM no. 000948006; BM no. 000948008 and LISU no. 214549). BR also holds a Welwitsch specimen without a "collection" number and date, but with its label stating *Physedra heterophylla* and Angola; a drawing is attached to the sheet.

In his treatment for the *Flora of Tropical East Africa* (1967: 61), Jeffrey indicated that a lectotype should be chosen from among the BM gatherings, but he did not carry out this planned lectotypification. We here follow Jeffrey's suggestion and chose a male BM specimen as lectotype.

Monique Kéraudren (1967) synonymised *Coccinia heterophylla* under *C. barteri*, but the two species can readily be distinguished based on the long subulate calyx teeth (> 2.5 mm) found only in *C. heterophylla*. Kéraudren appears to have seen only the BM specimens, and thus she remained unaware that the calyx teeth of *C. barteri* do not differ from her species *C. subhastata*, which we synonymise below.

***Coccinia barteri* (Hook. f.) Keay (1953: 82).** Type: Nigeria, Nupe [Niger State], exact locality not specified, ♂ fl., *C. Barter* 1525 (holotype K); *Staphylosyce barteri* Hook. f. in Oliv. (Oliver 1871: 554); *Physedra barteri* (Hook. f.) Cogn. (Cogniaux 1881: 525).

Coccinia subhastata Keraudren (1967: 131), **synon. nov.** Type: Cameroon, South Province, Bitey, ♂ fl., 1917, *G. L. Bates* 1469 (holotype BM).

***Coccinia mackenii* Naudin ex C. Huber (1865: 5)** [sphalm. Mac-Kennii, after M'Ken, ICBN 60 C.5]; *Cephalandra mackenii* (Naudin ex C. Huber) Naudin (1866: 17) [sphalm. mac kennii]. Type: cultivated in Paris Botanical Garden, original source: South Africa. KwaZulu-Natal, near Durban [Port Natal], ♀ fl., *C. Naudin* s.n. (lectotype P, selected here; isolectotype G-DC (G00211343)).

Cephalandra palmata Sond. (Sonder 1862: 493). Type: South Africa, KwaZulu-Natal: near Port Natal [Durban], ♂ and ♀ fl., fr., April, *J. F. Drège* s.n. (lectotype S; isolectotype P); *Coccinia palmata* (Sond.) Cogn. (Cogniaux 1881: 540), **nom. illeg.** non Roemer (1846).

Coccinia dinteri André (1900: 276), **synon. nov.** Type: unnumbered plate in André (1900).

ADDITIONAL SYNTYPES EXAMINED. SOUTH AFRICA. Without location and date, ♂ fl., *J. F. Drège* s.n. (G, HBG, K 2 sheets, P 2 sheets); KwaZulu Natal: cultivated in Huber garden in Hyères [Olbia], original source near Durban [Port Natal], male and female, fl., 1864, *C.*

¹ The male specimen on the LISU no. 214547 sheet is an isolectotype, but additionally contains a female flower, which must come from another individual because *Coccinia* is strictly dioecious. This female flower could be considered a lectoparatype.

Naudin s.n. (G-DC (G00211344) 3 sheets, K 3 sheets, W); Umzimkulu [Omsamculo], between shrubs and thickets, near river mouth, female, fr., March, J. F. Drège 4637 (P).

NOTES. The protologue of *Cephalandra palmata* cites Drège s.n. collections in the herbaria of Hooker (now in K) and Sonder (now in S; Nordenstam 1980). The collections were originally identified as *Momordica palmata*, a combination never validly published (*Momordica palmata* E. Meyer ex Drège, *Zwei Pflanzengeogr. Doc.*: 156, 159, 202 (1843), nom. nud.), and Sonder then took up the epithet when he described the species in *Cephalandra*. When Cogniaux later transferred Sonder's species to *Coccinia* he overlooked M. J. Roemer's (1846) *Coccinia palmata* (L.) M. Roem., thus creating an illegitimate name (ICBN Art. 53.1).

Meeuse (1962) cites the holotype of *Coccinia palmata* as being in S, which is erroneous since this specimen is merely a lectotype (ICBN Art. 9.8). He also cites a Drège isotype from H, but no such specimen exists (L. Junikka, pers. comm., 14 April 2010).

The line drawing accompanying the protologue of *Coccinia dinteri* shows a bifid tendril, as is characteristic of most *C. mackenii* specimens (even though André regarded this as a difference between the species). All other characters of *C. dinteri* also match *C. mackenii*, and we are confident that both names refer to the same biological species.

Coccinia senensis (Klotzsch) Cogn. (Cogniaux 1881: 535); *Cephalandra senensis* Klotzsch (1862: 151). Type: Mozambique, [Zambésia Province], Rios de Sena [Province], without detailed locality, in grassland, W. C. H. Peters s.n. (holotype B, destroyed). Tanzania, Lindi Region, 40 km W of Lindi, Lake Lutamba, hill, woodland, climbing over bushes, c. 240 m, ♂ fl., 6 Sept. 1934, H. J. Schlieben 5259 (neotype M, selected here; isoneotypes BM, HBG, MO, P, S).

Coccinia fernandesiana C. Jeffrey (1975: 478). **synon. nov.** Type: Mozambique, de Lemos & Macudcua 29 (holotype COI; isotypes LISC, LMA, SRGH).

NOTES. The type of *Coccinia senensis* was destroyed during the bombing of the Berlin herbarium in 1943. The protologue, however, mentions key characters, such as stiff, erect, somewhat articulate hairs on the petioles and the lower leaf lamina, combined with softly pilose to glabrous receptacle tubes, which were the main traits distinguishing *C. fernandesiana*.

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