

Canavalia kauensis (Leguminosae),
a New Species from the Island of Hawaii
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THE FOLLOWING new species, *Canavalia kauensis* (Leguminosae), sprung up in the Kau Desert on a small spot recently protected by a goat-proof fence.

Canavalia kauensis sp. nov. (subgen. *Maunaloa*)

Figs. 1 and 2

DIAGNOSIS HOLOTYPE: Liana elongata repens est, caulibus 2–4 mm diametro teretibus rectis vel volubilis viridibus et crebre pilosulis albis retrorsis, stipulis 1.5–2 mm longis lanceolatis pilosulis, petiolis 4–10.5 cm longis teretibus dense albi-pilosulis, stipelis inferis nullis, rhachidibus 20–33 mm longis albi-pilosulis, stipelis apicalibus 2–3 mm longis acicularibus adpresse pilosulis, foliolis lateralibus cum petiolulis 6–8 mm longis crassis pilosulis et laminis 6–11.5 cm longis 4–8.5 cm latis chartaceis suboblique ovatis basi rotundata apice subacuminato nervulis lateralibus in dimidio quoque 6–8 adscendentibus tum sursum curvatis et interconnectis pagina supra obscure viridibus et adpresse albi-pilosulis pagina infera cum pilis simulantibus sed nervis dense pilosulis midnervo et nervulis elevatis rotundatis, foliola terminali cum petiolulo 6–7 mm longo lamina 8.5–13 cm longa 5.5–10.5 cm lata late ovata apice subacuminato et simulanti, pedunculis in flore 5–9 cm longis curvatis dense albi-pilosulis, rhachidi 1–4 cm longo, 2–4 brachyblastis 2.5–3 mm diametro subglobosis glabris omnibus cum 2–3 floribus, bracteolis 2–2.5 mm longis ovatis concavis caducis adpresse albi-pilosulis, pedicelis in flore 2–3 mm longis minute pilosulis, calycibus in flore 23–25 mm longis tubo 12–13 mm longis 8–9 mm latis 6–6.5 mm crassis campanulatis inconcinnis viridibus et magenta-striatis et adpresse albi-pilo-

sulis adscendentibus, lobis superis binis 12–14 mm longis excepta in 3–4 mm ultimis connatis semiorbicularibus, labia infera trilobata lobis lateralibus binis 5–6 mm longis oblique deltoidei-ovatis in basi imbricatis, loba infera 4–5 mm longa ovati-deltoidea, lobis omnibus crebre magenta-striatis et adpresse adscendente albi-pilosulis, vexillo 35 mm longo limbo 29 mm longo 18 mm lato late obovato intra obscure purpureo (Ridgway, 1912, pl. XXVI) sed cum striis pallidis pagina exteriori pallidiori apice retuso 2 mm profundo basi oblonga 6 mm lata et cum auriculis rotundatis erectis ungui 7.5 mm longo, alis 32–35 mm longis limbo anguste spatulato ad basim margine proximali cum loba arcuata lanceolata recurvata glabra ungui 9 mm longo ligulato, carina 41 mm longa dimidiis 8 mm latis limbo anguste lunati-elliptico ad apicem per 3 mm libera tum per 18 mm in margine distali connato et ad basim margine distali cum loba 4 mm longa lanceolata reflexa, ungui 11 mm longo ligulato, androecio 48 mm longo albo curvato, apicibus filamentis liberis plerumque 9–12 mm longis, antheris 2.5 mm longis ellipticis subviridi-luteis, ovario 53 mm longo lineari arcuati adpresse adscendente albi-pilosulo, stipti in fructu 10–13 mm longo dense adpresse adscendente albi-piloso, legumeni 15–22.5 cm longo 2.9–3.4 cm lato 9–10 mm supra semines crasso 4–6 mm supra intervalles costis lateralibus in plano unico et 1–1.5 mm ex costa centrali separatis, seminibus 17–20 mm longis 11–13 mm latis 6–7 mm crassis elliptici-obovatis valde compressis laevibus lucidis pallide brunneis, hilo 9–11 mm longo 2 mm lato pallide brunneo cum centro 8 mm ex apice micropylari et 12 mm ex altero.

DIAGNOSIS OF HOLOTYPE: Elongate trailing vine; stems 2–4 mm in diameter, terete, straight or spiralling, green, and densely retrorse white pilosulous; stipules 1.5–2 mm long, lanceolate, pilosulous; petioles 4–10.5 cm long, terete,

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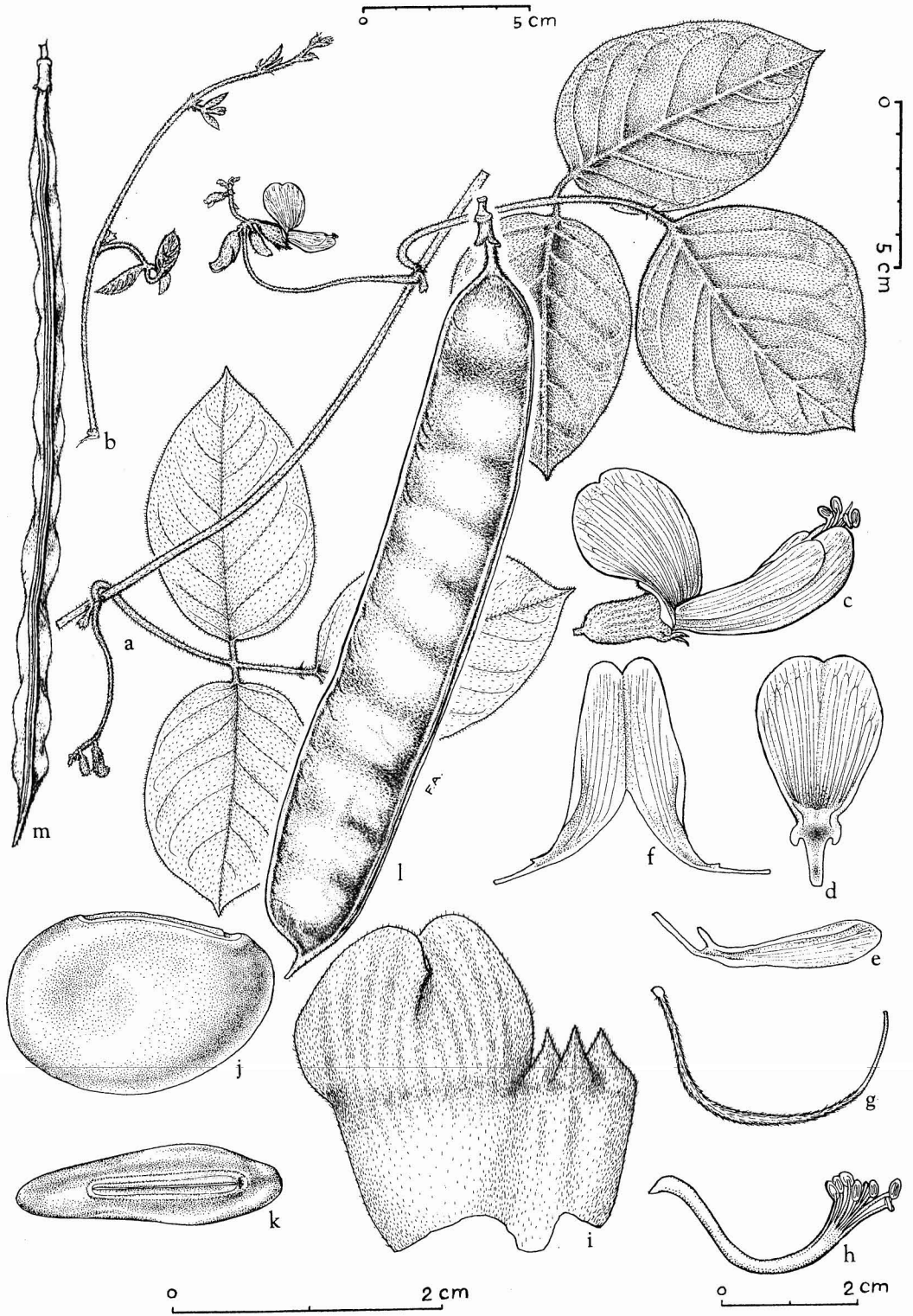




FIG. 2. Close up of *Canavalia kauensis* at Kukalauula, Hawaii. Photo by D. Reeser, 1971.

densely white pilosulous; lower stipels wanting; rhachis 20–33 mm long, similarly pilosulous, the apical stipels 2–3 mm long, acicular, appressed pilosulous; lateral leaflets with petiolules 6–8 mm long, stout, pilosulous; lateral leaflet blades 6–11.5 cm long, 4–8.5 cm wide, chartaceous, slightly obliquely ovate, the base rounded, the apex subacuminate, the lateral veins 6–8 on each side, ascending, then upcurved and interconnected, upper surface dark green and appressed white pilosulous, the lower surface similarly white pilosulous and the veins shaggily so, midrib and secondary veins rounded and elevated; terminal leaflet with petiolule 6–7 mm long, the blade 8.5–13 cm long, 5.5–10.5 cm wide, broadly ovate, the apex subacuminate, with similar coloration and pubescence; peduncles in flower 5–9 cm long, curving, densely white pilo-

sulous; rhachis 1–4 cm long, the 2–4 nodal short shoots 2.5–3 mm in diameter, subglobose, glabrous, bearing 2–3 flowers each; bracteoles 2–2.5 mm long, ovate, concave, appressed white pilosulous, caducous; pedicels in flower 2–3 mm long, finely pilosulous; calyx 23–25 mm long (when fresh), the tube 12–13 mm long, 8–9 mm wide, 6–6.5 mm thick, asymmetric campanulate, green, and magenta streaked, and white appressed ascending pilosulous, the 2 upper lobes 12–14 mm long, united except for the last 3–4 mm, semiorbicular, lower lip 3-lobed, the 2 lateral lobes 5–6 mm long, obliquely deltoid-ovate, the base overlapping, the lower lobe 4–5 mm long, ovate-deltoid, the lobes all heavily streaked with magenta, and appressed ascending white pilosulous; standard 35 mm long, the limb 29 mm long, 18 mm wide, broadly obovate,

FIG. 1. *Canavalia kauensis* St. John, from holotype. *a*, habit, $\times \frac{1}{2}$; *b*, young shoot, $\times \frac{1}{2}$; *c*, flower, $\times 1$; *d*, standard, $\times 1$; *e*, wing, $\times 1$; *f*, keel, $\times 1$; *g*, pistil, $\times 1$; *h*, androecium, $\times 1$; *i*, calyx, $\times 2$; *j*, seed, lateral view, $\times 2$; *k*, seed and hilum, $\times 2$; *l*, pod, lateral view, $\times \frac{1}{2}$; *m*, pod, proximal view, $\times \frac{1}{2}$.

the inner surface dull dark purple (Ridgway, 1912, pl. XXVI), with paler streaks, and paler on the outer surface, retuse, the notch 2 mm deep, the oblong base 6 mm wide, with rounded erect auricles, the claw 7.5 mm long; the wings 32–35 mm long, the limb narrowly spatulate, the proximal margin bearing at its base an arcuate lanceolate recurved glabrous lobe, the claw 9 mm long, ligulate; keel 41 mm long, the halves 8 mm wide, the limb narrowly lunate elliptic, beginning 3 mm from the apex their distal margins connate for 18 mm, and with a 4 mm lanceolate reflexed lobe at the base of the proximal margin, the claw 11 mm long, ligulate; androecium 48 mm long, white, curved; free filament tips mostly 9–12 mm long; anthers 2.5 mm long, elliptic, greenish yellow; ovary 53 mm long, arcuate linear, appressed ascending white pilosulous; stipe in fruit 10–13 mm long, densely appressed white ascending pilose; pods 15–22.5 cm long, 2.9–3.4 cm wide, 9–10 mm thick over the seeds, 4–6 mm thick over the intervals, lateral ribs in the same plane and 1–1.5 mm distant from the central rib; seeds 17–20 mm long, 11–13 mm wide, 6–7 mm thick, elliptic-obovate, much compressed, smooth, shining, light brown; hilum 9–11 mm long, 2 mm wide, pale brown, centering 8 mm from the micropylar end and 12 mm from the other end.

HOLOTYPE: Hawaiian Islands, Hawaii Island, Hawaii Volcanoes National Park, Kukulauula antigoat enclosure, Kau Desert, 800 ft alt, 11 March 1971, *Donald W. Reeser* (BISH).

SPECIMENS EXAMINED: Hawaii Island, all from type locality, Jan. 7, 1971, *Reeser*; also May 6, 1971, and July 6, 1971 (BISH); June 23, 1971, *H. St. John* 26,775 (BISH). Another locality is: Hawaii Island, Kamakalepo, Ahupua'a of Kawela, Ka'u Dist., Kaaualu-Waiohinu Road, 5.2 miles s. of its junction with Hawaii Belt Road, scrambling over open, lichen-covered a'a flow, 400 ft. alt., April 9, 1972, *C. H. Lamoureux, J. Jacobi, & L. Matsunami* 4,532 (BISH).

DISCUSSION: At the time of publication of the author's revision of the Hawaiian species of *Canavalia* (St. John, 1970) only one species of this genus was known on the island of Hawaii. It, *C. hawaiiensis*, occurs at numerous localities

from Puuwaawaa, south to Kapua, all in a forest belt at from 1,200 to 1,900 feet altitude on the western or leeward side of the island.

The discovery of a new species is always a significant event, but the occurrence of *S. kauensis* has a special interest. It is found at Kukulauula in the border of the Kau Desert, Hawaii Volcanoes National Park. The spot is at 800 feet altitude on a dry, treeless slope, well below the lowest dry forest. Though on the eastern side of the island, it is actually on the leeward slope of Kilauea, and this 3,974-foot volcano intercepts most of the rain clouds. Consequently, this newly discovered locality for *Canavalia* is in a dry, leeward region, quite comparable to the habitats of most of the other Hawaiian species.

The type collection of *C. kauensis* was made by Park Ranger Donald W. Reeser, Management Biologist of Hawaii Volcanoes National Park. This and other collections were made in connection with a conservation experiment that he conducted. Feral wild goats abound on the island of Hawaii, and it is estimated that 14,000 of them inhabit the National Park. They have eaten up most of the good herbage, cropping it to the ground, and devouring all tree seedlings and all soft herbage in the areas distant from human control. An experiment was made at Kukulauula at 800 feet altitude in the Kau Desert. An area 300 by 30 feet was enclosed in August 1969, by a strong and goat-proof wire fence. The soil was of volcanic gravel and silt between basalt ledges. So heavily was the area overgrazed that few indeed were the plant shoots visible above the bare rocks and mineral soil.

Within a year there was a good plant cover in the enclosure, and by 2 years the fenced patch had a nearly continuous plant cover that from even a mile away was a conspicuous green, oblong spot on a light colored, bare landscape (see Figs. 3 and 4). The new plant cover was undisturbed within, except next to the fence where goats, by reaching their heads and necks through the barrier, had destroyed a 2-ft-wide band of the vegetation. Reeser took the writer to examine the plot in June 1971. The wild goats were lined up at the fence, like cattle at a feed rack, stretching to reach a bit of an edible plant. They retreated only when we approached within a few yards.



FIG. 3. Antigoat enclosure at Kukalauula, Hawaii. The dark central mass is a mat of *Canavalia kauensis*. Photo by D. Reeser, 8 March 1971.

Records on the plant succession on the plot were kept, and the writer is grateful to D. Reeser and to Dr. Guenter Spatz for data on this. Exotic weeds appeared early in the succession. The most abundant of these were *Cynodon Dactylon* and *Eragrostis tenella*, then a much smaller proportion of *Desmodium triflorum* and

Waltheria americana. By December 1971, of the adventive species, only *Cynodon* was still a sizable element, but *Cassia Leschenaultiana*, *Desmodium triflorum*, and *Indigofera suffruticosa* were still present, and *Rhynchelytrum repens* was a newcomer. There were also several native plants, *Digitaria pruriens*, *Portulaca cya-*

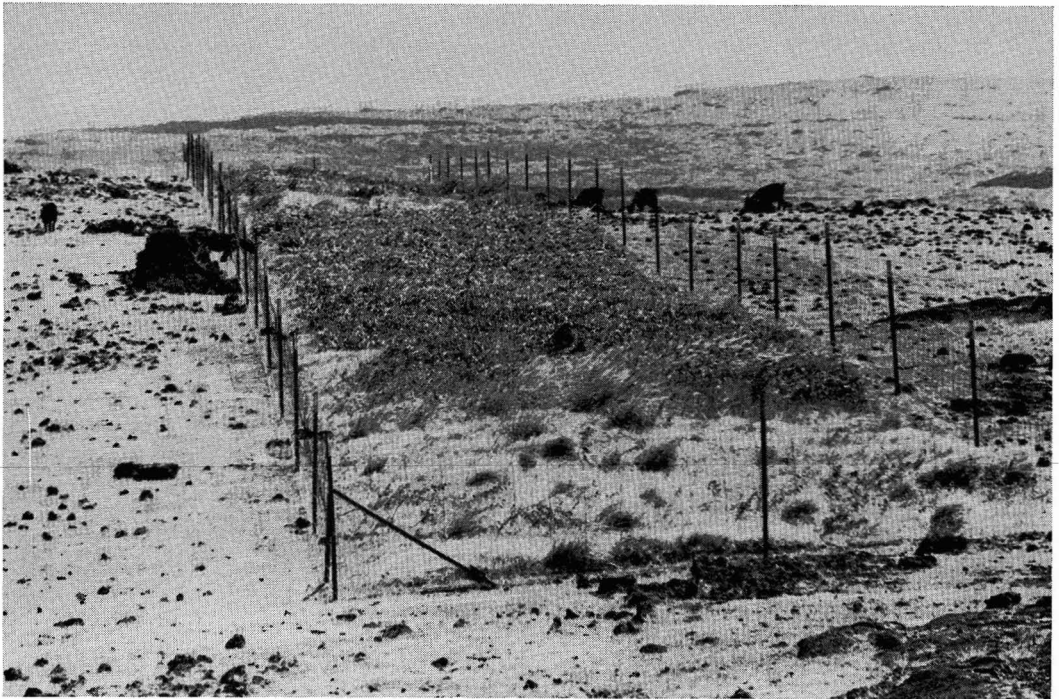


FIG. 4. Another view of the antgoat enclosure at Kukalauula, Hawaii. Photo by D. Reeser, 8 March 1971.

nosperma, *Sisyrinchium acre*, and *Heteropogon contortus*, all but the *Digitaria* in small amount, but the most abundant and most conspicuous plant was a species of *Canavalia*. It is a long vine, here running on the ground, because there is nothing to climb on, as the goats devour all shoots that come close to the fence. The vines cover more than half of the enclosure and wind back and forth, piling up on themselves to make a mat about 4 dm thick. These vines flower regularly, but have set very few seed, probably due to their remoteness from other nectar-bearing flowers and a scarcity of insect pollinators.

This *Canavalia* is quite different from the only other native species on the island of Hawaii, *C. hawaiiensis*, and actually is more closely related to *C. Rockii* of the island of Lanai.

The hard seeds of this new species, here named *C. kauensis*, evidently have long viability, and must have been lying in the soil for years. By chance one seed was in the small area fenced in 1969, and the shade and moisture caused by a protected vegetation allowed the seed to germinate. One wonders how many other unknown Hawaiian plants would spring up and recover if a large area were fenced and protected from the omnivorous goats.

C. kauensis is a member of the subgenus *Maunaloa*, as is its closest relative, *C. Rockii* St.

John, of Lanai Island, a species with the calyx tube 9–10 mm long, the lateral lobes 4.5–5 mm long; standard 31.5 × 25 mm, the limb broadly elliptic, the claw 4.5 mm long; keel halves 10–11 mm wide; petioles 3.2–4.5 cm long; terminal leaflet blade 7.1–8.6 cm long, 4.5–5.2 cm wide, elliptic or elliptic-ovate, upper surface glabrous, lower surface more pilose than the veins. *C. kauensis* has the calyx tube 12–13 mm long, the lateral lobes 5–6 mm long; standard 35 × 29 mm, the limb broadly obovate, the claw 7.5 mm long; keel halves 8 mm wide; petioles 4–10.5 cm long; terminal leaflet blade 8.5–13 cm long, 5.5–10.5 cm wide, broadly ovate, the upper surface appressed white pilosulous, the lower surface with the veins shaggily pilosulous, the surface less so.

The new epithet is formed from the name of the Kau Desert, and *-ensis*, the Latin adjectival locality suffix.

LITERATURE CITED

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