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TWO NEW SPECIES OF *ACYTHOPEUS* PASCOE (COLEOPTERA: CURCULIONIDAE: BARIDINAE) FROM *COCCINIA GRANDIS* (L.) VOIGHT (CUCURBITACEAE) IN KENYA

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Abstract.—Two new species of *Acythopeus* Pascoe, ***A. burkhartorum*** and ***A. cocciniae,*** from Kenya are described. These weevils are stem gall makers and leaf miners, respectively. They are considered as potential biological control agents of *Coccinia grandis* (Cucurbitaceae) in Hawaii. These species are described and relevant morphological structures are illustrated. Thirty-two African and Madagascan species, previously placed in *Baris* and *Amictides,* are transferred to *Acythopeus.* AFRICA: *Baris aeniipennis* Hustache, *B. amaniensis* Hustache, *B. behanzii* Hustache, *B. bigibbosa* Hustache, *B. brevisetis* Hustache, *B. conicollis* Marshall, *B. helleri* Hartmann, *B. impolita* Boheman, *B. indigna* Boheman, *B. massaicus* Hustache, *B. naivashensis* Hustache, *B. nodipennis* Hustache, *B. opacus* Boheman, *B. riftensis* Hustache, *B. sculpturata* Hustache, *B. vadonis* Hustache. MADAGASCAR: *Baris allaudi* Hustache, *B. amborobense* Hustache, *B. callosa* Hustache, *B. decorsei* Hustache, *B. distigma* R. Richard, *B. glyptobaroides* Hustache, *B. hovanus* Hustache, *B. laevirostris* Hustache, *B. parvula* R. Richard, *B. perrieri* Fairmaire, *B. pilitarsis* Hustache, *B. rufoapicalis* Hustache, *B. sculpturata* Hustache, *B. vadonis* Hustache; *Amictides similaris* Hustache, and *A. similis* Hustache [**new combinations**].

Key Words: weevils, taxonomy, biological control, ivy gourd, Hawaii

The two species of weevils treated herein are being considered as potential biological control agents against Ivy gourd, *Coccinia grandis,* (L.) Voigt (Cucurbitaceae), an Old World plant native to Africa and the Indo-Malayan region of Asia. The plant was introduced intentionally into Hawaii by immigrants and is widespread on Oahu and on the Kona coast of Hawaii. Previously it was found on Kauai and Maui but has been eradicated there.

The two species of weevils were collected in Africa during extensive foreign exploration for potential biological control agents of *Coccinia.* Subsequently they were studied in strict quarantine in Hawaii to determine their efficacy as biological control agents and to determine potential host acceptance of other species of native or introduced Cucurbitaceae in Hawaii. Host specificity has been confirmed by feeding and rearing tests demonstrating their suitability as potential biological control agents against this important weed. Publications on the evaluation of two species are in preparation and awaiting the names proposed herein. Species epithets are required for any organisms released for biological control purposes, so the use of these weevils in Hawaii against *C. grandis* also is

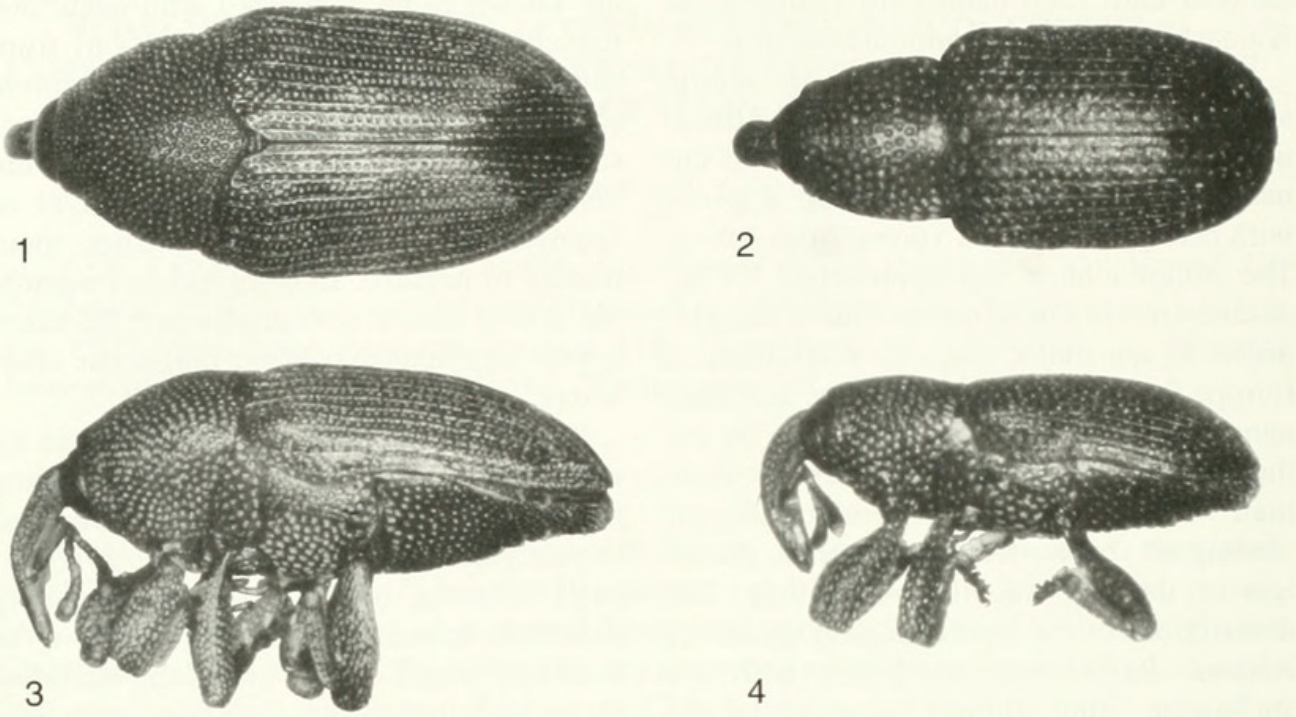
delayed until such names are available (B. Kumashiro, personal communication.).

The two species of weevils were sent to specialists in three countries for identification, and in each case were identified as unnamed species of *Baris* Germar, a genus with nearly 100 species known from Africa. The senior author was approached for assistance in obtaining names and took specimens to ten major research collections in Europe for comparison with types and other named specimens. Type specimens or authoritatively identified examples of more than 90 species of *Baris* were studied, including all species from East Africa, the origin of the two weevils under study. The descriptions of the few remaining species of African *Baris* were compared with the specimens being studied. None of the descriptions, the types, nor identified species matched the weevils in question. In addition, careful study of the external and internal morphology clearly showed that these two new species belong to the genus *Acythopeus* Pascoe, not *Baris*. Hence, all described African species and 20 of the 25 described Asian species of the genus *Acythopeus* were carefully compared with the two species included herein. Since no match was found, the two species are described herein as new species of the genus *Acythopeus*.

Because *C. grandis* is a member of the family Cucurbitaceae, a plant family with many economically important species, the weevils were tested extensively to determine if they develop and/or feed on a wide spectrum of both cultivated and wild native species of cucurbits. Placement of the two new species in *Acythopeus*, subgenus *Carpobaris*, indicates that they are closely related to the melon weevil, *Acythopeus (Carpobaris) curvirostris* Boheman, an important pest of cultivated melons in Africa, across the Sudan Belt, in the Middle East, Iran and southern India. The taxonomy of the subspecies of this important pest was covered in detail by Thompson (1973). Two other species of *Acythopeus (Carpobaris)* are known to be associated with cucurbits, namely *A. (C.) alcyoneus* (Erichson) from southern Africa, and *A. (C.) cucurbitae* (Marshall) from Kenya, as cited in Thompson (1973). Thompson (1973) describes the distinctive male genitalia of this group of species, which alone distinguishes them readily from *Baris*. In independent research, the senior author also discovered the taxonomic significance of these diagnostic characters.

The two genera can be distinguished by the following characters: *Baris*—rostrum not normally incrassate basally, cylindrical to subcylindrical, not attenuate apically beyond antennal insertion, at most apically flattened; antennal club with article 1 at least half length of club and glabrous; tarsal claws widely separate and free; male median lobe with apodemes directly connected by thick, strongly, scleorotized cuticle; apodemes at most 2× as long as median lobe; flagellum, when present, shorter than or slightly longer than median lobe; *Acythopeus*—rostrum always moderately to strongly incrassate basally, gradually to strongly attenuate beyond antennal insertion; antennal club with article 1 less than half length of club and tomentose to subglabrous; tarsal claws approximate, basally connate; male median lobe with apodemes connected by weakly sclerotized, hyaline connection; apodemes 2.5 to 6.0× as long as median lobe; flagellum *ca* 1.5 to 4.5× as long as median lobe.

The following African and Madagascan species are transferred herein from *Baris* and *Amictides* to *Acythopeus* based on studies by the senior author, mentioned above. AFRICA: *Baris aeniipennis* Hustache, *B. amaniensis* Hustache, *B. behanzii* Hustache, *B. bigibbosa* Hustache, *B. brevisetis* Hustache, *B. conicollis* Marshall, *B. helleri* Hartmann, *B. impolita* Boheman, *B. indigna* Boheman, *B. massaicus* Hustache, *B. naivashensis* Hustache, *B. nodipennis* Hustache, *B. opacus* Boheman, *B. riftensis* Hustache, *B. sculpturata* Hustache, *B. vadonis* Hustache. MADAGASCAR: *Baris allaudi*



Figs. 1–4. *Acythopeus* spp. 1, 3, *A. burkhartorum*. 2, 4, *A. cocciniae*. 1, 2, Habitus, dorsal. 3, 4, Habitus, lateral.

Hustache, *B. amborobense* Hustache, *B. callosa* Hustache, *B. decorsei* Hustache, *B. distigma* R. Richard, *B. glyptobaroides* Hustache, *B. hovanus* Hustache, *B. laevirostris* Hustache, *B. parvula* R. Richard, *B. perrieri* Fairmaire, *B. pilitarsis* Hustache, *B. rufoapicalis* Hustache, *B. sculpturata* Hustache, *B. vadonis* Hustache; *Amictides similaris* Hustache, and *A. similis* Hustache **[new combinations]**.

Acythopeus Pascoe
(Figs. 1–12)

Acythopeus Pascoe 1874, p. 61. Type species, *Acythopeus tristis* Pascoe by subsequent designation Heller (1940: 106).

Redescription.—*Rostrum* long, arcuate, with strong transverse impression at base, base moderately to strongly incrassate, apically gradually to strongly attenuate beyond antennal insertion; scrobe lateroventral, deeply grooved; eyes lateroventral. *Antenna* with scape moderately to strongly clavate, short, not quite reaching eye, funicle long, much longer than scape; club small, rounded to oval, subtruncate to acute, article 1 less than half length of club and tomentose to subglabrous. *Prothorax* transverse; apex tubulate, only somewhat produced; base strongly bisinuate. *Scutellum* small, round to oval. *Elytra* slightly to much wider than prothorax, apices apically narrowed to strongly emarginate. *Prosternum* medially, longitudinally, distinctly to moderately sulcate; forecoxae well-separated, by distance *ca* equal to their diameter. *Abdominal sterna* 1 and 2 connate. *Pygidium* exposed. *Legs* with femora unarmed, internally subcanaliculate; tibiae distinctly mucronate; tarsal claws small, approximate, basally connate.

Genitalia and associated structures.—*Median lobe* short to moderate in length, moderately to weakly curved in lateral view; with well-developed flagellum *ca* 1.5 to 4.5× as long as median lobe; apodemes connected to median lobe by weakly sclerotized unpigmented hyaline connection, *ca* 2.5 to 6× as long as median lobe. *Tegmen* (Fig. 7) fused with long "parameres"; with long apodeme. *Spiculum gastrale* (Fig. 8)

short, stout, moderately curved and distinctly forked at apex.

Acythopeus burkhartorum O'Brien, new species

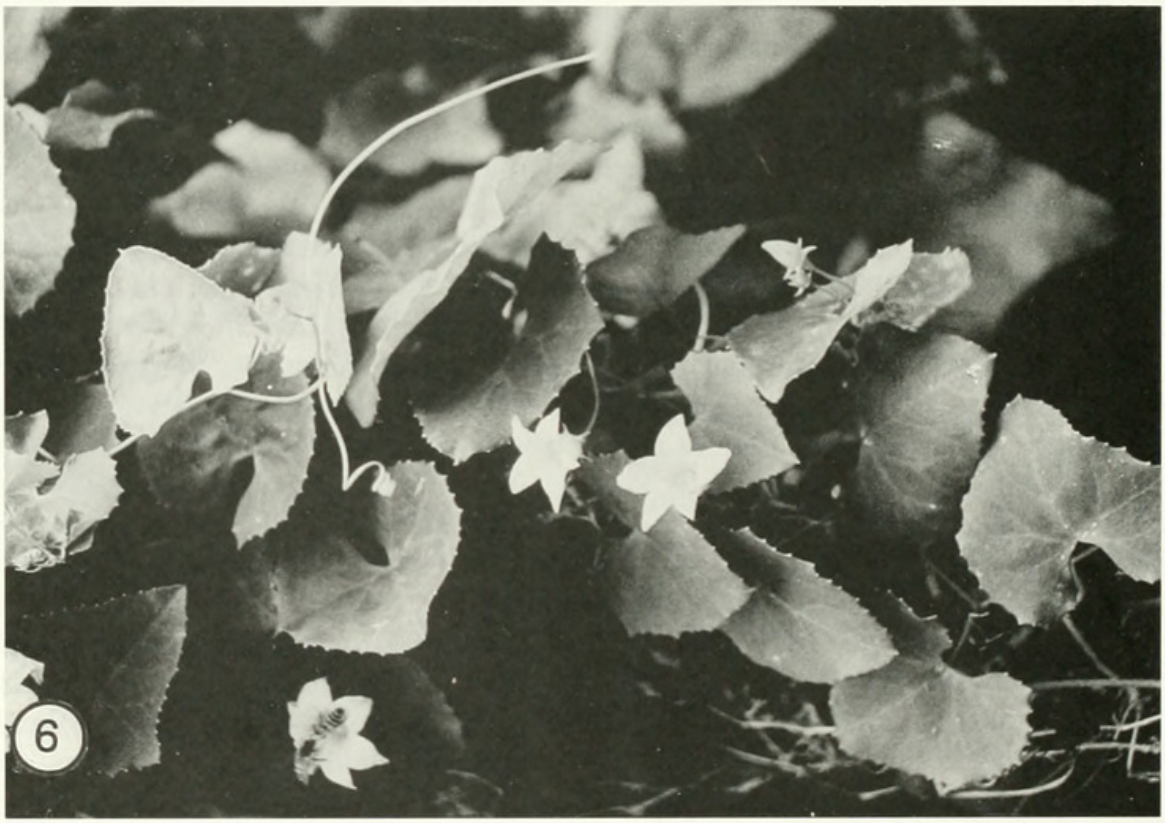
(Figs. 1, 3, 7–10)

Description.—Body medium-sized (3.80–4.30 mm); moderately broad-oval; subparallel behind humeri to declivity, there broadly rounded to strongly emarginate apices; cuticle piceous to black, finely to coarsely alutaceous, moderately shining; coarsely strongly punctate, with obvious white straplike setae to oval scales in each puncture, setae or scales all well-separated.

Holotype male.—*Rostrum* 0.81× as long as pronotum; dorsally very strongly, unevenly curved; ventrally weakly, unevenly curved; *ca* basal ⅔ very strongly swollen, with very dense contiguous to cribrate deep punctures; *ca* apical ⅓ moderately attenuate, with basal moderately coarse and moderately dense punctures, becoming finer and sparser apically; with evident ventrally and laterally produced margin at antennal insertion. *Head* smooth, strongly shining, scarcely alutaceous; with fine, shallow, moderately dense punctures; frons moderately strongly transversely impressed, with small deep median fovea; frons 0.44× as wide as head across eyes. *Antennae* inserted just behind apical ⅓ of rostrum (0.35); scape moderately clavate; funicle *ca* 1.14× as long as scape; club *ca* 0.40× as long as scape, weakly oval and subacute; segment 1 of club with sides nearly subparallel, much more than one half length of club, shining and tomentose. *Pronotum* 0.94× as long as broad; sides subparallel in basal ⅓, then unevenly gradually narrowed to weakly tubulate apical 1/12; disc moderately convex, rather evenly covered with dense subcontiguous coarse deep punctures, each with evident recumbent grayish white scale. *Elytra* with angulate, weakly developed, rounded humeri; 1.18× as wide as pronotum; intervals subequal in width, slightly widened basally, only sutural interval narrower, latter scarcely punctate, remainder with coarse subcontiguous moderately shallow punctures; each puncture with recumbent straplike seta or rounded scale; intervals 1–8 flat, intervals 9 and 10 carinately convex producing distinctly margined sides; fused apices of intervals 3–9 forming weak but evident subapical callous; sides subparallel to declivity, there gradually narrowed to broadly rounded, broadly emarginate apices. *Prosternum* distinctly broadly longitudinally sulcate in front of procoxae, side margins of sulcus with evident fine carina from apex to procoxa; longitudinal sulcus deep narrow and transverse at area of subtubulate apex, with deep lateral foveae. *Thoracic sterna* rather evenly densely coarsely punctate, each puncture with recumbent round scale or straplike seta. *Abdominal sterna* more finely and sparsely punctate, slightly coarser and denser laterally, each puncture with recumbent round scale or coarse straplike seta; sternum 1 flattened, very weakly medially longitudinally impressed, with scarcely evident impression extended on sternum 2; sternum 5 with dense coarse setae near apical margin; sternum 5 with median apical narrow quadrate projection. *Pygidium* weakly convex; completely, coarsely, densely punctate. *Legs* densely coarsely punctate, each puncture with recumbent oval to straplike scale or seta; femora unevenly swollen, not distinctly clavate; tibiae with minute apical mucro. *Length,* pronotum and elytron: 3.80 mm.

Genitalia and associated structures.—*Median lobe* (Figs. 9, 10) moderate in length; orificial opening triangular-oval, completely visible in dorsal view; moderately slender and weakly curved in lateral view; hyaline connection of apodemes *ca* 0.57× as long as median lobe; apodemes including hyaline connection more than 2× as long as median lobe; flagellum *ca* 1.5× as long as median lobe.

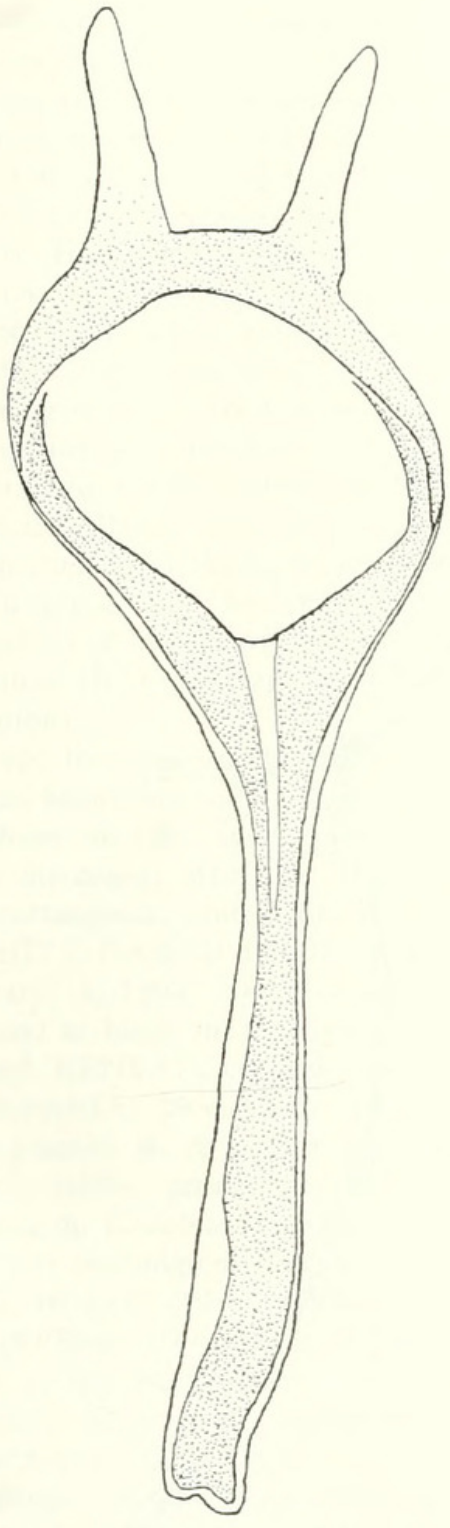
Allotype female.—Same as male except: *Rostrum* longer, 0.91× as long as pronotum; *ca* apical ⅖ strongly attenuate with

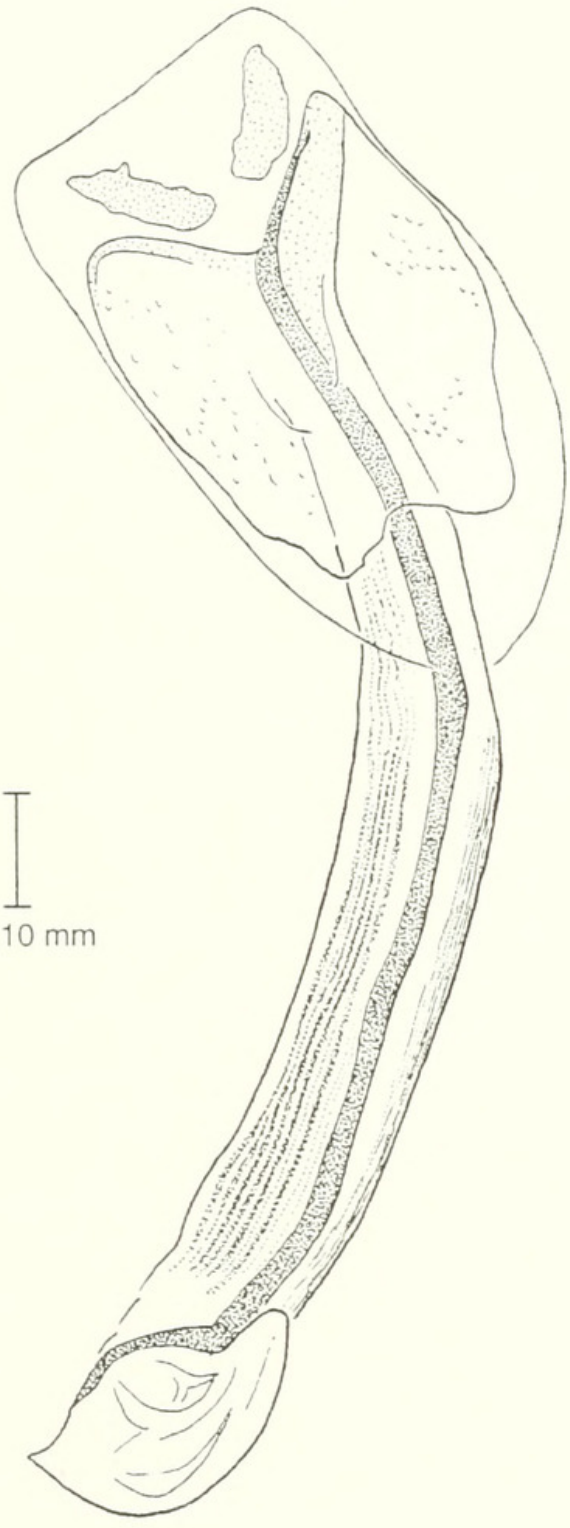


Figs. 5–6. 5, *Coccinia grandis* habitat in Hawaii. 6, *C. grandis* habitus.

very fine, sparser punctures. *Antennae* inserted at middle of rostrum (0.51). *Abdominal sterna* with sternum 1 weakly convex medially, with sternum 2 flattened medially, not at all impressed. *Length,* pronotum and elytron: 4.30 mm.

Intraspecific variation.—Although the cuticle is usually black, the elytra, antennae





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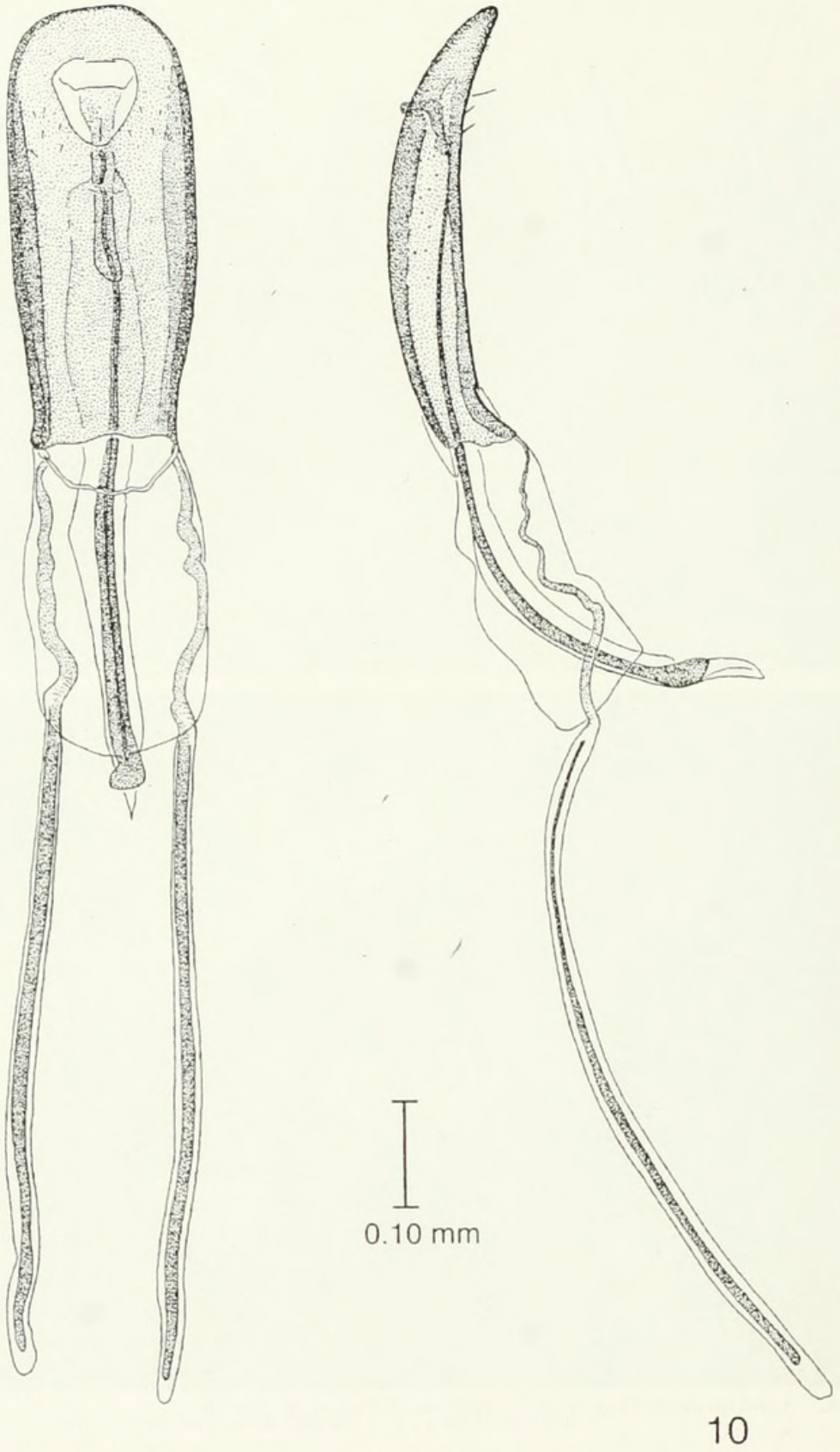
Figs. 7–8. *Acythopeus burkhartorum*. 7, Tegmen. 8, Spiculum gastrale.

and legs show variable amounts of piceous coloration. The amount of piceous cuticle is increased greatly in teneral specimens, and may be present throughout the body and appendages in occasional specimens.

Etymological note.—This species is named in honor of the collectors, Dr. Robert Burkhart and his wife Lystra, who underwent considerable hardship and struggle to collect the parent population of this and nu-



Figs. 9–10. *Acythopeus burkhartorum*. 9, Median lobe, dorsal. 10, Median lobe, lateral.

merous other species during their years of foreign exploration.

Remarks and comparative notes.—This distinctive species is not likely to be confused with any other species from Africa. It superficially resembles *Acythopeus amaniensis* (Hustache) and *Acythopeus massaicus* (Aurivillius), both of which have much coarser and denser punctation. It also resembles the widespread species, *Acythopeus atrocoerulea* (Boheman), but the latter is metallic blue in color.

Biological notes.—This species develops in stem galls on *Coccinia grandis*. A thorough study of its biology and development is in preparation for publication by researchers of the Hawaii Department of Agriculture (B. Kumashiro, personal communication).

Type locality.—Africa, Kenya, coast between Mombasa and Tanzania.

Notes on type specimen.—Holotype ♂ (not dissected), with the following labels: 1) [rectangular; white; printed in black ink] OAHU I, HAWAII HDOA Quarantine Insectary, xi.1994. 2) [rectangular; white; printed in black ink]. Original colony collected: KENYA: coast btwn. Mombasa and TANZANIA, 29.vi-12.vii.1992, ex *Coccinia grandis,* R. & L. Burkhart. 3) [rectangular; white; printed in black ink. Lab reared on *Coccinia grandis*. M. Chun/94-651. 4) [rectangular; red; printed in black ink]. HOLOTYPE/*Acythopeus/burkhartorum*/O'Brien 1998. Point mounted. Deposited in the National Museum of Natural History, Smithsonian Institution (USNM), Washington, D.C., USA.

Range.—Known only from the type locality. To be introduced in Hawaii, as a potential biological control agent of Ivy gourd, *Coccinia grandis*.

Material examined.—Holotype, allotype and 293 paratypes. HAWAII: OAHU I, HDOA [Hawaii Department of Agriculture] Quarantine Insectary, xi. 1994 Original colony collected KENYA: coast btwn Mombasa & TANZANIA, 29.vi.12.vii.1992, ex *Coccinia grandis,* R.&L. Burkhart Lab reared on *Coccinia grandis* M. Chun 194-651 (holotype, allotype, 13 paratypes); HDQA Quarantine Insectary Lab colony, 3-i-1996 T. Culliney/96-003 Reared ex stems of *Coccinia grandis*. Original collection: KENYA, coast btwn. Mombasa & TANZANIA, 6-7-1992 ex *C. grandis,* R.&L. Burkhart (9, paratypes); same except vi-x-1996, M. Chun/96-470 (270, paratypes). KENYA: Coast btwn. Mombasa & TANZANIA, 29.vi.12.vii.92 ex *Coccinia grandis* stem galls R.&L. Burkhart coll's 94-435/RB. 92.04 (7) (1, paratype)

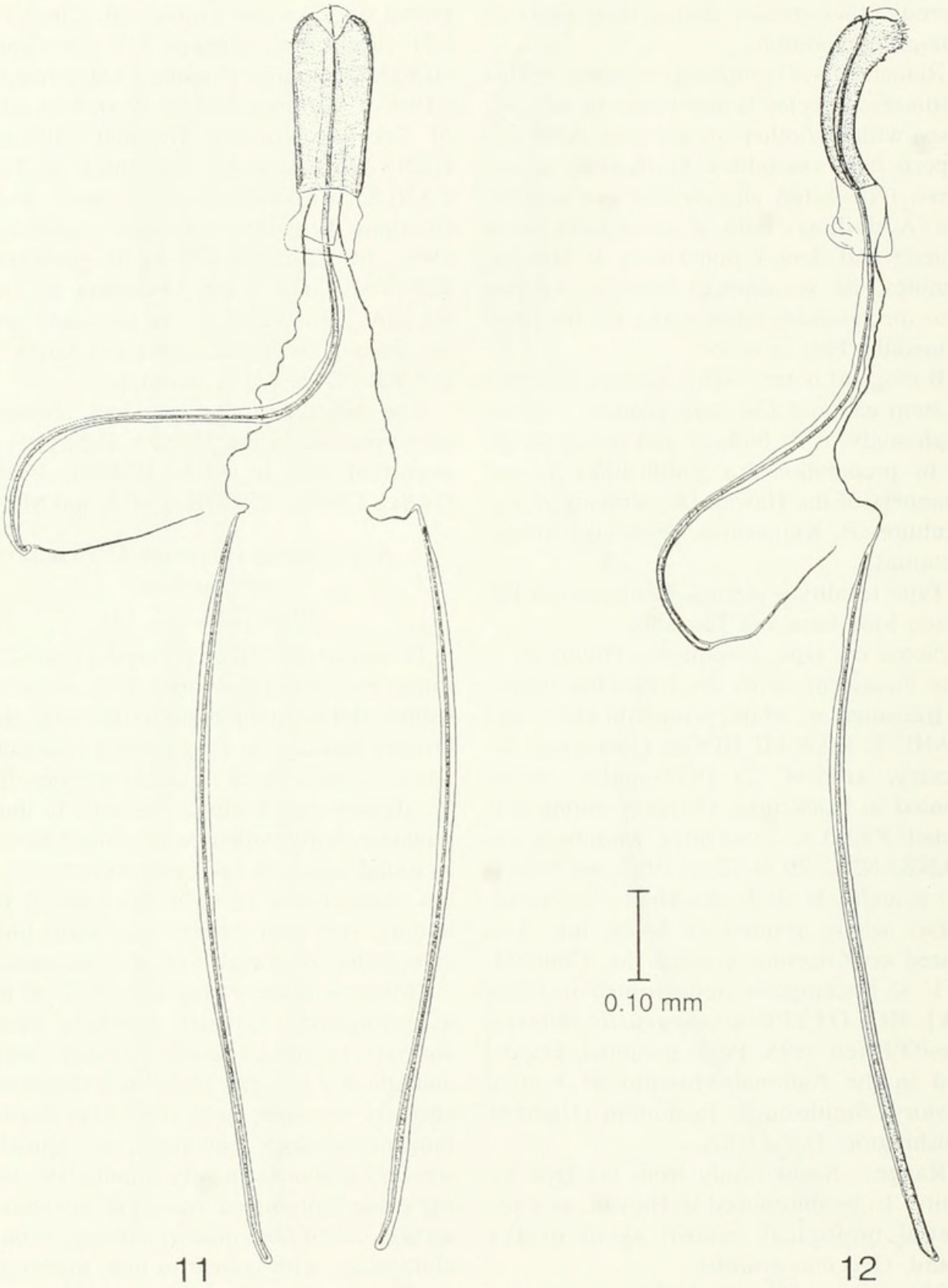
The holotype, allotype, and numerous paratypes are in the USNM. Paratypes are deposited also in ARC, BMNH, BPBM, CASC, CMNC, CWOB, FSCA and MNHP.

Acythopeus cocciniae O'Brien, new species

(Figs. 2, 4, 11, 12)

Description.—Body small (1.40–2.20 mm); moderately slender-oval; sinuately subparallel behind humeri to declivity, there broadly rounded to very weakly emarginate apices; cuticle black or rarely piceous, finely alutaceous, shining; coarsely to finely punctate, with evident white straplike setae to round scales in each puncture, scales often concentrated medially on base of pronotum; and with pearlescent white imbricate scales on dorsal ⅓ of mesepimeron.

Holotype male.—*Rostrum* 0.87× as long as pronotum; dorsally strongly evenly curved; ventrally basally weakly curved and apically straight; *ca* basal ¾ moderately strongly swollen, with dense contiguous moderately deep punctures; *ca* apical ¼ scarcely attenuate, nearly impunctate; lacking evident produced margin at antennal insertion. *Head* not smooth, shining, strongly alutaceous; with coarse to fine, moderately shallow, moderately dense punctures; frons moderately strongly transversely impressed, with large coarse moderately deep median fovea; 0.33× as wide as head across eyes. *Antennae* inserted just in front of middle (0.46); scape clavate; funicle *ca* 1.40× as long as scape; club 0.50× as long as scape;



Figs. 11–12. *Acythopeus cocciniae*. 11, Median lobe, dorsal. 12, Median lobe, lateral.

moderately oval and acute, segment 1 with sides rounded, *ca* ½ length of club, shining and tomentose. *Pronotum* 0.94× as long as broad; sides moderately rounded from base to distinctly tubulate apical 1/6; disc moderately convex, unevenly covered with dense subcontiguous coarse moderately deep punctures, each with evident recum-

bent grayish white scale. *Elytra* with angulate, very weakly developed, weakly rounded humeri; 1.56× as wide as pronotum; all intervals subequal in width, not distinctly widened basally, with moderately coarse unevenly separated shallow punctures; each punture with relatively fine straplike recumbent seta; intervals flat, intervals 9 and 10 at most weakly convex, not subcarinate, laterally slightly margined only from declivity to apices; fused apices of intervals 3–9 not forming evident callous; sides somewhat sinuately subparallel behind humeri to declivity, there suddenly narrowed to broadly rounded, scarcely emarginate apices; sides below and behind humeri distinctly swollen. *Prosternum* weakly broadly longitudinally sulcate in front of procoxae, side margins of sulcus evident only in area of subtubulate apex, there deeply coarsely transversely sulcate with large deep lateral foveae. *Thoracic sterna* evenly densely coarsely punctate, each puncture with recumbent oval to round scale; *ca* dorsal ⅓ of mesepisternum concealed by coating of broad recumbent imbricate pearlescent white scales (visible laterally and from above). *Abdominal sterna* much more finely though densely punctate, slightly coarser and denser laterally, each puncture with recumbent round scale or straplike seta; sternum 1 broadly medially moderately impressed, with evident narrower impression extended on sternum 2; sternum 5 with dense coarse recumbent straplike setae on apical half; sternum 5 with median apical narrow subacute projection. *Pygidium* strongly convex; completely, coarsely, moderately densely punctate. *Legs* densely coarsely punctate, each puncture usually with pale straplike seta, rarely with few oval to round scales; femora evenly swollen, strongly clavate; tibiae with small apical mucro. *Length,* pronotum and elytron: 2.10 mm.

Genitalia and associated structures.—*Median lobe* (Figs. 11, 12) short; orificial opening broadly triangular-oval, only partially visible in dorsal view; slender and moderately curved in lateral view; hyaline connection of apodemes *ca* 2× as long as median lobe; apodemes including hyaline connection *ca* 4× as long as median lobe; flagellum *ca* 4.70× as long as median lobe.

Allotype female.—Same as male except: *Rostrum* more evenly curved, less coarsely punctate, apical ⅓ distinctly though weakly attenuate. *Antennae* inserted at middle of rostrum (0.51). *Abdominal sterna* 1 and 2 flattened, at most appearing very weakly convex. *Length,* pronotum and elytron: 2.05 mm.

Intraspecific variation.—The scales and straplike setae present in the punctures on the body are often grayish to grayish white and appear relatively nondescript. However there are many specimens on hand which possess very distinct white scales and setae. Frequently there is a distinct white macula at the medial basal margin of the prothorax, but denuded specimens are equally common. The swollen area of the elytral margin just behind and below the humeri is always present but varies greatly in size and convexity. Rarely specimens are piceous rather than black. The dorsal surface of some specimens is very smooth, but an undulate elytral disc is more common.

Etymological note.—This epithet is based on the name of the host plant genus, *Coccinia,* Cucurbitaceae.

Remarks and comparative notes.—This small species is not likely to be confused with any other species from Africa. It superficially resembles the slightly larger *Acythopeus conicollis* (Marshall), but the latter has a distinctive conical shaped pronotum, coarser and denser punctation, and lacks the distinctive pearlescent white patch of imbricate scales on the dorsal ⅓ of the mesepimeron.

Biological notes.—This species develops as a leaf miner in leaves of *Coccinia grandis.* A thorough study of its biology and development is in preparation for publication by researchers of the Hawaii Department of Agriculture (B. Kumashiro, pers. comm.).

Type locality.—Africa, Kenya, coast between Mombasa and Tanzania.

Notes on type specimen.—Holotype (by designation) ♂ (not dissected), with the following labels: 1) [rectangular; white; printed in black ink] KENYA: Coast btwn. Mombasa & TANZANIA, 29.vi-12.vii.92 2) [rectangular; white; printed in black ink] *Coccinia grandis* lvs. R. & L. Burkhart 92-471/RB.92.04(5). 3) [rectangular; red; printed in black ink] HOLOTYPE/*Acythopeus/cocciniae*/O'Brien 1998. Point mounted. Deposited in the National Museum of Natural History, Smithsonian Institution (USNM), Washington, D.C., USA.

Range.—Known only from the type locality. To be introduced in Hawaii, as a potential biological control agent of Ivy gourd, *Coccinia grandis*.

Material examined.—Holotype, allotype and 302 paratypes. [HAWAII:] OAHU I., HI: HDOA [Hawaii Department of Agriculture] Quarantine Insectary Lab colony, 3-i-1996 K.Murai/96-004 Reared ex leaves of *Coccinia grandis* (26, paratypes); same except, vi-x-1996, K Murai/96-470 (276, paratypes). KENYA: Coast btwn. Mombasa & TANZANIA, 29.vi.12.vii.92 *Coccinia grandis* lvs. R. & L. Burkhart coll's 92-471/RB 92.04 (5) (holotype, allotype). The holotype, allotype, and numerous paratypes are in the USNM. Paratypes are deposited also in ARC, BMNH, BPBM, CASC, CMNC, CWOB, FSCA and MNHP.

Acknowledgments

We thank Bernarr R. Kumashiro of the Hawaii Department of Agriculture who contacted us and presented us with the specimens of the new species described herein. His colleagues at the HDOA supplied us with the basic information on the weevils' biologies. We thank Peter W. Kovarik for his excellent line drawings of the male genitalia and Lisa Roberts for assistance with computer graphics.

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The following codens are used to indicate the collections in which specimens are deposited:

ARC	Alexander Riedel Collection, private, Friedberg, Germany.
BMNH	The Natural History Museum, London, England.
BPBM	Bernice Pauahi Bishop Museum, Honolulu, HI.
CASC	California Academy of Sciences, San Francisco, CA.
CMNC	Canadian Museum of Nature Collection, Ottawa, ON, Canada.
CWOB	Charles W. O'Brien Collection, private, Florida A&M University, Tallahassee, FL.
FSCA	Florida State Collection of Arthropods, Division of Plant Industry, Gainesville, FL.
MNHP	Muséum National d'Histoire Naturelle, Paris, France.
USNM	National Museum of Natural History, Smithsonian Institution, Washington, DC.

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