



Revision of black fungus gnat species (Diptera, Sciaridae) described from the Hawaiian Islands by D.E. Hardy and W.A. Steffan, and a contribution to the knowledge of the sciarid fauna of the Galápagos Islands

WERNER MOHRIG¹, ELLEN KAUSCHKE² & ADAM BROADLEY^{3,4}

¹Werner Mohrig, Puddemin 6, 18574 Poseritz/Rügen, Germany. E-mail: wmohrig@hotmail.com

²Ellen Kauschke, Justus Liebig University Giessen, Institute of Zoology, Stephanstrasse 24, 35390 Giessen, Germany.
E-mail: Ellen.Kauschke@allzool.bio.uni-giessen.de

³Adam Broadley, Department of Agriculture and Water Resources, PO Box 1006, Tullamarine, VIC 3043, Australia.
E-mail: adam.broadley@agriculture.gov.au

⁴Corresponding author

Abstract

On the Hawaiian Islands 22 sciarid species were detected, belonging to the following ten genera: *Austrosciara* Schmitz & Mjöberg, *Bradysia* Winnertz, *Corynoptera* Winnertz, *Cratyna* Winnertz, *Epidapus* Haliday, *Hyperlasion* Schmitz, *Lycoriella* Frey, *Phytosciara* Frey, *Pseudolykoriella* Menzel & Mohrig and *Scatopsciara* Edwards. The revision resulted in new combinations for the following five species: *Austrosciara hawaiiensis* (Hardy) **comb. n.**, *Corynoptera prominens* (Hardy) **comb. n.**, *Cratyna adrostylata* (Hardy) **comb. n.**, *Cr. longicosta* (Hardy) **comb. n.**, and *Scatopsciara hoyti* (Hardy) **comb. n.** Eight species were declared as new synonyms: *Bradysia bishopi* Steffan, 1973 = *B. centidens* Vilkamaa, Hippa & Mohrig, 2012 **syn. n.**; *B. crassicornis* (Skuse, 1890) = *B. molokaiensis* (Grimshaw, 1901) **syn. n.** and = *B. aspercera* Mohrig, 2016 **syn. n.**; *B. radicum* (Brunetti, 1912) = *B. spatitergum* (Hardy, 1956) **syn. n.**; *Corynoptera prominens* (Hardy, 1956) = *C. gladiota* Mohrig, 2004 **syn. n.**; *Cosmosciara hartii* (Johannsen, 1912) = *Plastosciara* (*Plastosciara*) *latipons* Hardy, 1956 **syn. n.**; *Hyperlasion wasmanni* (Schmitz, 1918) = *Scythropochroa magnisensoria* Hardy, 1956 **syn. n.**; and *Scatopsciara hoyti* (Hardy, 1956) = *Sc. spiculata* Vilkamaa, Hippa & Mohrig, 2012 **syn. n.** These four species are new reports for Hawai'i, three of them are new to science: *Epidapus pallidus* (Séguy), *Pseudolykoriella nigrofemoralis* Mohrig, Kauschke & Broadley **sp. n.**, *Scatopsciara hardyi* Mohrig, Kauschke & Broadley **sp. n.** and *Sc. steffani* Mohrig, Kauschke & Broadley **sp. n.** A lectotype was designated for *Bradysia radicum* (Brunetti) in order to fix the name. All new and revised species are figured.

The species *Bradysia bishopi* Steffan, 1973, *B. ocellaris* (Comstock, 1882), *B. radicum* (Brunetti, 1912), *Cosmosciara hartii* (Johannsen, 1912), *Pseudolykoriella planiforceps* (Steffan, 1971) and *Scatopsciara steffani* Mohrig, Kauschke & Broadley **sp. n.** are reported from the Galápagos Islands.

Key words: Australia, *Austrosciara*, *Bradysia*, *Corynoptera*, *Cosmosciara*, *Cratyna*, *Epidapus*, Fiji, *Hyperlasion*, India, *Lycoriella*, New Caledonia, new combinations, new species, new synonyms, Papua New Guinea, *Phytosciara*, *Pseudolykoriella*, Samoa, *Scatopsciara*, Seychelles, taxonomy, zoogeography

Introduction

The Hawaiian Islands are a 2400 km-long volcanic archipelago in the North Pacific Ocean, consisting of eight major islands (Kaua'i, Ni'ihau, Moloka'i, Lāna'i, Kaho'olawe, Maui, O'ahu and Hawai'i), as well as numerous atolls, reefs and smaller islets. The islands originated from a volcanic hotspot that has been active under the Pacific Plate for at least 85 million years. The diverse topography and microclimates of the Hawaiian Islands support an extremely diverse assemblage of plants and animals (Eldredge & Evenhuis 2003) and the highest diversity of endemic Diptera per land unit of any area in the world (Evenhuis 2009).

The first sciarids, known commonly as black fungus gnats, described from Hawai'i were assigned to the catch-all genus *Sciara* by Grimshaw (1901), who described *Sciara molokaiensis* Grimshaw, 1901 on the basis of a single

female collected from the Moloka'i Mountains in 1893, and Shaw (1952), who described five species: *Sciara hardyi* Shaw, 1952 [= *Bradysia impatiens* (Johannsen, 1912)], *Sciara garretti* Shaw, 1952, *Sciara johannseni* Shaw, 1952 and *Sciara laffooni* Shaw, 1952 [all = *Bradysia ocellaris* (Comstock, 1882)], *Sciara stonei* Shaw, 1952 [= *Bradysia molokaiensis* (Grimshaw, 1901)]. However, most of the taxonomic knowledge regarding Hawaiian sciarids is the result of the work of D. Elmo Hardy and Wallace Steffan, published between the 1950s and 1970s. Their work culminated in the Sciaridae chapter in the *Catalog of the Diptera of the Australasian and Oceanian Regions*, but many of the species listed in the catalog require revision and placement in the correct genera (Steffan 1989).

In recent years a number of taxonomic studies of the sciarid fauna in the wider region were completed to try to address this problem: for Australia, Broadley *et al.* (2016) reviewed the male sciarid types described by F.A.A. Skuse (Skuse 1888; 1890), described some species from Norfolk Island and eastern Australia (Mohrig *et al.* 2016; 2017a; 2017b; 2018), and reviewed plant and mushroom pest species (Broadley *et al.* 2018). Mohrig and Jaschhof (1999) and Köhler & Mohrig (2016) reported on the sciarids of New Zealand, Vilkamaa, *et al.* (2011; 2012a; 2012b; 2012c; 2012d; 2014; 2015) studied those of New Caledonia, and sciarids of Papua New Guinea were described by Mohrig (1999; 2004; 2013; 2016). Mohrig *et al.* (2013) reviewed the sciarids of North America.

D. Elmo Hardy (Figure 1), described as “one of the last polymaths in Diptera systematics”, studied Biology at Brigham Young University in Utah before undertaking his PhD at the University of Kansas (Evenhuis 2004). During World War II he received a commission to join the U.S. Army Sanitary Corps as a medical entomologist and then transferred to the U.S. Air Force, where he reached the rank of major. In 1948 he was offered the position of Assistant Professor at the University of Hawai'i, where he started work on the five Diptera volumes of the *Insects of Hawaii* series. When Hardy arrived in Hawai'i only 197 species of Diptera were known but following publication of the five volumes this increased to 1209 species. Over nearly 70 years Hardy described 1,867 species in 34 different families of Diptera (Evenhuis 2004). Hardy noted that some sciarid species are of economic importance, damaging the roots of pineapples and hampering efforts to set up commercial mushroom farms in Hawai'i.

For the most part Hardy, like Shaw (1953) before him, followed the taxonomic concepts of Frey (1942; 1948). During his tenure as Professor at the University of Hawai'i Agricultural Experiment Station Hardy produced two important taxonomic works on the sciarids of Hawaii (Hardy 1956; 1960) but he also recognized that his concepts would need to be modified to fit the more up-to-date generic classification of Tuomikoski (1960).

Wallace A. Steffan, an entomologist based at the Bernice P. Bishop Museum, worked almost exclusively on black fungus gnats. Steffan described two genera and 21 species of Sciaridae from Australasia and Oceania. His publications include revisions of some of Hardy's Hawaiian types (Steffan 1968; 1973a), descriptions of new species from Micronesia (Steffan 1969) and some subantarctic islands (Steffan 1964; 1970; 1972a) and a generic revision of the Sciaridae of North America (Steffan 1966). His work culminated in the publication of a catalogue which is still being used today (Steffan 1989).

Here, we revise the sciarid species described by Hardy and Steffan from Hawai'i. We also contribute knowledge regarding the sciarid fauna of the Galápagos Islands.

Materials and methods

The material that we examined for this study consisted mainly of a collection of Hardy's types and other specimens on slides, obtained on loan from the Bernice P. Bishop Museum, Honolulu. The type specimens were mounted in Canada balsam and generally well preserved, despite deformations of the thorax due to dissections of the head and wings.

We also obtained a number of dried specimens on loan: four homotypes of *Bradysia molokaiensis* (Grimshaw) glued on card points [*homotype* = a specimen that has been directly compared with the holotype and determined to be conspecific with it, and done so by someone other than the author of the type with which it is being compared (Evenhuis 2008)], from the University of Hawai'i at Mānoa, and eight micropinned *Bradysia radicum* (Brunetti) syntypes, from the British Museum of Natural History, London, United Kingdom. These dried specimens were treated as follows: the labels were removed from the pins, then the specimens, still attached to their card points/micro-pins, were immersed overnight in a small dish of distilled water containing a few drops of detergent. The micro-pinned specimens were still attached to the pins after soaking so they were further treated by immersion in a

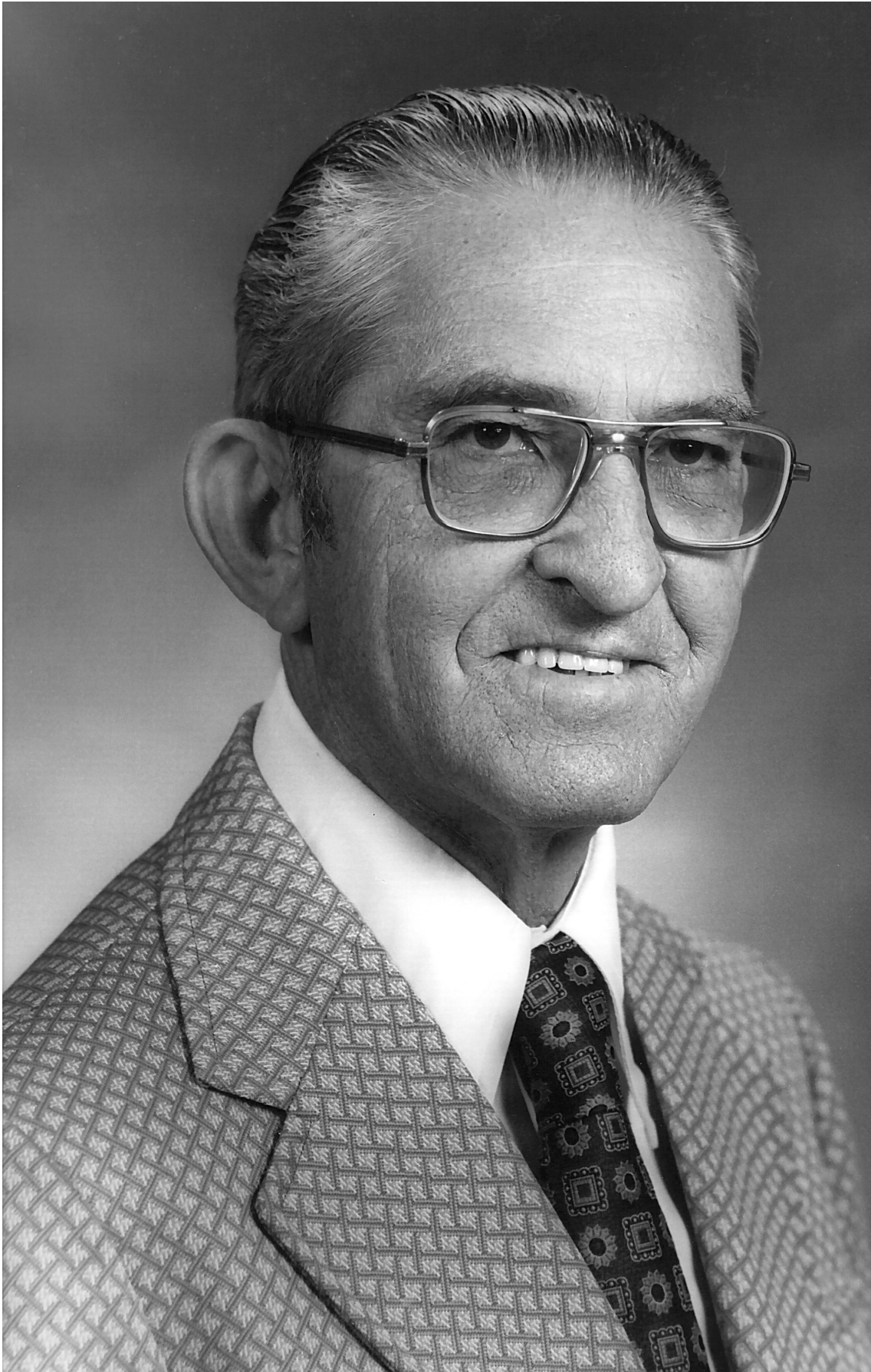


FIGURE 1. Elmo Hardy in 1978. Photo courtesy of Neal Evenhuis.

5% solution of Decon 90™ and gently warmed in an incubator at 50° C for 15 min. The specimens then floated off the micro-pins. The detached specimens were washed in a bath of distilled water, then put through baths of increasing concentrations of ethanol (50%, 70%, and 96%) for a minimum of 30 min each time, cleared in beech wood creosote for a minimum of 30 min, and finally slide mounted in Canada balsam as described in Broadley *et al.* (2016). Additional material was collected by the first author by net and yellow pan traps and by Dr C. Gillett with a UV light trap. Material that was freshly collected was stored in 70% ethanol and embedded in Canada balsam after dehydration in 96% ethanol (10 min.) and creosote (at least 30 min.) as described in Broadley *et al.* (2018). Illustrations were obtained on the basis of multilayer digital images using a Keyence VHX-2000 digital microscope and respective software, including size measurements. Photographs obtained were modified using Adobe Photoshop software. Prints were improved in details by hand drawing and simultaneous microscopic control (Olympus microscope). After final scanning and last corrections using Photoshop software they were finalized for publication.

The terminology used herein follows Mohrig *et al.* (2013) and Broadley *et al.* (2016).

Abbreviations: l/w-index = length/width of the basal node of the 4th flagellomere; c/w = ratio of C and w within the space between R₄₊₅ and M₁; x/y = ratio of wing vein bM and wing vein r-m.

Museums and collections

ANIC = Australian National Insect Collection, CSIRO, Canberra, Australia.

BMNH = British Museum of Natural History, London, United Kingdom.

BPBM = Bernice P. Bishop Museum, Honolulu, Hawai‘i, USA.

PABM = Private Collection of Adam Broadley, Melbourne, Australia.

PWMP = Private Collection of Werner Mohrig, Puddemin/Rügen, Germany.

UHIM = University of Hawai‘i Insect Museum, University of Hawai‘i at Mānoa, Honolulu, Hawai‘i, USA.

Descriptions of species

Austrosciara Schmitz & Mjöberg, 1924

Type species: *Austrosciara termitophila* Schmitz & Mjöberg (1924) [Schmitz & Mjöberg (1924): 1–3, fig. 1].

Common synonym: *Ctenosciara* Tuomikoski, 1960.

Literature: Tuomikoski (1960): 110; Mohrig *et al.* (1992): 20–21; Mohrig & Jaschhof (1999): 14–26; Menzel & Mohrig (2000): 293–299; Vilkamaa *et al.* (2012a): 37–51; Mohrig (2013): 123–136 (all as *Ctenosciara*); Mohrig *et al.* (2017b): 357–366.

Austrosciara hawaiiensis (Hardy, 1956) comb. n.

(Fig. 2 A–D)

Sciara (*Leptosciara*) *hawaiiensis* Hardy, 1956 [Hardy (1956): 78–80, fig. 5 a–c].

Selected literature: Hardy (1960): 218–219, fig. 69 a–d; Steffan (1973a): 357 (as *Ctenosciara*).

Material studied: Holotype male, November 1953, O‘ahu, Mt. Tantalus, ex rotten wood, BPBM No. 2491, leg. D.E. Hardy (labelled “*Sciara* (*Leptosciara*) *aliena* Hardy”).

Conservation status: Embedded in Canada balsam. Body and head separated, most details in good condition, hypopygium somewhat swollen and inclined.

Further material: 1 male (4000 ft.), 1 female (6700 ft.), 30.viii.1971, Hawai‘i Islands, Mauna Loa East Slope, pitfall trap, leg. J. Jacobi; 1 male, 5.xi.1968, O‘ahu, Wai‘anae [as “Waiange”] Range, 1st gully W of Peacock Flat, 1500 ft., reared ex rotting logs, leg. W. Gagné (PWMP). The specimens are identical to the holotype and fit Hardy’s description and figures.

Conservation status: Embedded in Euparal. Body and head separated. All details in good condition.

Comments. The species is characterized by rather long flagellomeres (l/w index of 2.4), a long palpus, lack of

macrotrichia on CuA_2 , a broad tibial comb, toothless claws, slender gonostylus with a short apical tooth and 3 equal spines at the base of the tooth, a small and rounded tegmen, and a long aedeagus.

The slide of *Sciara aliena* Hardy is the holotype for *Austrosciara hawaiiensis* (Hardy). It seems that Hardy initially decided on the name *aliena* but subsequently published the name *hawaiiensis*, and neglected to change the label on the slide. The slide (No. 2491) corresponds to the same in the description on page 80 of Hardy (1956) and in the catalog by Steffan (1976).

Distribution. Common on all Hawaiian Islands.

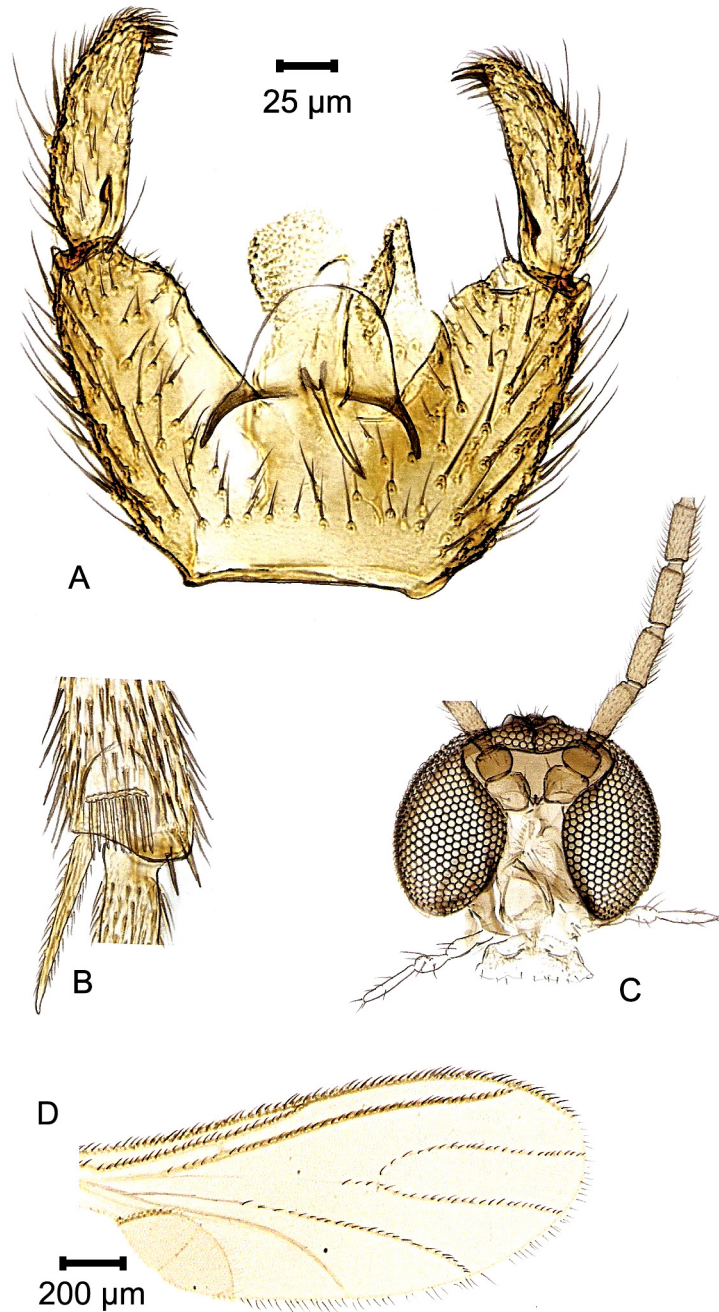


FIGURE 2 A–D. *Austrosciara hawaiiensis* (Hardy, 1956). Specimen from Mauna Loa East Slope. A. Hypopygium; B. Apex of fore tibia; C. Head with palpus and basal flagellomeres; D. Wing.

Bradysia Winnertz, 1867

Type species: *Bradysia angustipennis* Winnertz, 1867 [Winnertz (1867): 180–181, plate, fig. 6 a].

Literature: Tuomikoski (1960): 116–149; Menzel & Mohrig (2000): 98–185.

***Bradysia bishopi* Steffan, 1973**

(Fig. 3 A–D)

Bradysia bishopi Steffan, 1973 [Steffan (1973a): 353–355, fig. 1 a–f].

Selected literature: Hardy (1960): 227–228, fig. 75 c–e [as *Sciara (Lycoriella) radicum* Brunetti, misinterpretation]; Steffan (1969): 719–722, fig. 20 a–g [as *Bradysia radicum* (Brunetti), misinterpretation]; Menzel & Smith (2009): 24–26, figs 4–6; Köhler & Menzel (2013): 68; Mohrig (2016): 12–13, fig 12 a–c (as *Bradysia mutuata*); Mohrig *et al.* (2018): 212–213, fig 7 A–C (as *Bradysia centidens*).

Material studied: Holotype: Male, Hawai‘i, O‘ahu I., HW 162, F₉, leg. unknown (BPBM No. 9943). 3 males, Hawai‘i, O‘ahu, Kailua, 11.xi.1968, blacklight, leg. W.A. Steffan (1 in PWMP).

Conservation status: Embedded in Euparal. Body and head separated, all details in good condition.

=*Bradysia centidens* Vilkamaa, Hippa & Mohrig, 2012, syn. n.

Bradysia centidens Vilkamaa, Hippa & Mohrig, 2012 [Vilkamaa *et al.* (2012c): 28, fig. 2 A–D].

= *Bradysia mutuata* Mohrig, 2016 (syn. to *B. centidens* Vilkamaa, Hippa & Mohrig, 2012).

Literature: Mohrig *et al.* (2018): 212–213, fig.7 A–C.

Comments. Two specimens from the Hawaiian Islands, O‘ahu, Kailua, 6.xi.1968, 157, blacklight, leg. W.A. Steffan and one specimen from O‘ahu, Kailua, 2.xi.1968, HW 162, F₉, leg. W.A. Steffan, were misinterpreted by Steffan as *B. radicum*. The illustration of the hypopygium of *B. radicum* (Figure 20) in Steffan (1969) is very similar to the illustration of *B. bishopi* Steffan (Figure 1d) in Steffan (1973a) and Figure 4 in Menzel & Smith (2009).

The species is characterized by 2 dorsally inserted spines distinctly separated from the 4–5 apical spines of the gonostylus. A comparison with the paratype of *Bradysia centidens* Vilkamaa, Hippa & Mohrig, 2012 from New Caledonia showed that *B. bishopi*, *B. centidens* and *B. mutuata* are conspecific.

The slide labelled holotype bears the number BPBM 9943 which differs from the number listed in Steffan’s original description and in his types catalog (BPBM 9942) (Steffan 1973a, Steffan 1976). Steffan (1973a) reported that the types were generation F₉, reared from a single female captured on the 11.xi.1968.

The distribution of *B. bishopi* was reported by Menzel & Smith (2009) and Köhler & Menzel (2013) to include French Polynesia (Tahiti, Marquesas Islands), American Samoa (Tutuila), Samoa (Upolu, Savaii), and Fiji (Vanua Levu); however these were based on erroneous records by Edwards (see comments for *B. radicum*). The presence of *B. bishopi* on these islands requires confirmation.

Distribution. Widespread in the Southern Hemisphere. Hawai‘i; Australia; New Caledonia; Thailand (Bangkok); Seychelles Islands; Galápagos Islands.

***Bradysia crassicornis* (Skuse, 1890)**

(Fig. 4 A–C)

Sciara crassicornis Skuse, 1890 [Skuse (1890): 407].

Literature: Broadley *et al.* (2016): 419–421, fig. 11 A–C.

= *Bradysia aspercera* Mohrig, 2016 syn. n.

Bradysia aspercera Mohrig, 2016 [Mohrig (2016): 5, fig. 2 a–d].

= *Bradysia molokaiensis* (Grimshaw, 1901) *sensu* Hardy, syn. n.

Sciara molokaiensis Grimshaw, 1901 [Grimshaw (1901): 2, Plate 1, fig 1].

Literature: Shaw (1952): 491, 493 (as *Sciara molokaiensis*); Shaw (1952): 495, fig. 5 (as *Sciara (Lycoriella) stonei*); Hardy (1960): 226–227, fig. 74 a–c (as *Sciara (Lycoriella) molokaiensis*); Steffan (1973a): 355–356.

Material studied: 1 female, “homotype”, vii.1952, Pu‘u Kolekole Moloka‘i, leg. M. Tamashiro (BPBM); 1 female, “homotype”, vii.1952, Pu‘u Kolekole Moloka‘i, “♀ head on slide”, leg. M. Tamashiro (UHIM2016.14958) (UHIM); 1 male, “homotype”, vi.1952, Pu‘u Kolekole Moloka‘i, “♂ genitalia on slide” [this genitalia slide is missing], leg. M. Tamashiro (UHIM2016.14959) (UHIM); 2 males, 1 female, vii.1953, Pu‘u Kolekole Moloka‘i, leg. D.E. Hardy; 2 females, “homotypes”, vii.1952, Manawainui, Valley, Moloka‘i, leg. D.E. Hardy (UHIM2016.14956/14957) (UHIM); 1 male, 1 female, x.1952, Hawai‘i, Keanakolu 5200 ft., leg. D.E. Hardy; 2 males, 2 females, ii.1954, O‘ahu, Barbers Point, leg. D.E. Hardy (1 male, 1 female in PWMP); 2 males, 2 females, ii.1954, Honolulu, U.H. Campus, on windows, leg. D.E. Hardy; 3 males, 20.iii.1962, O‘ahu, Leeward, at light, leg. D. Wilton.

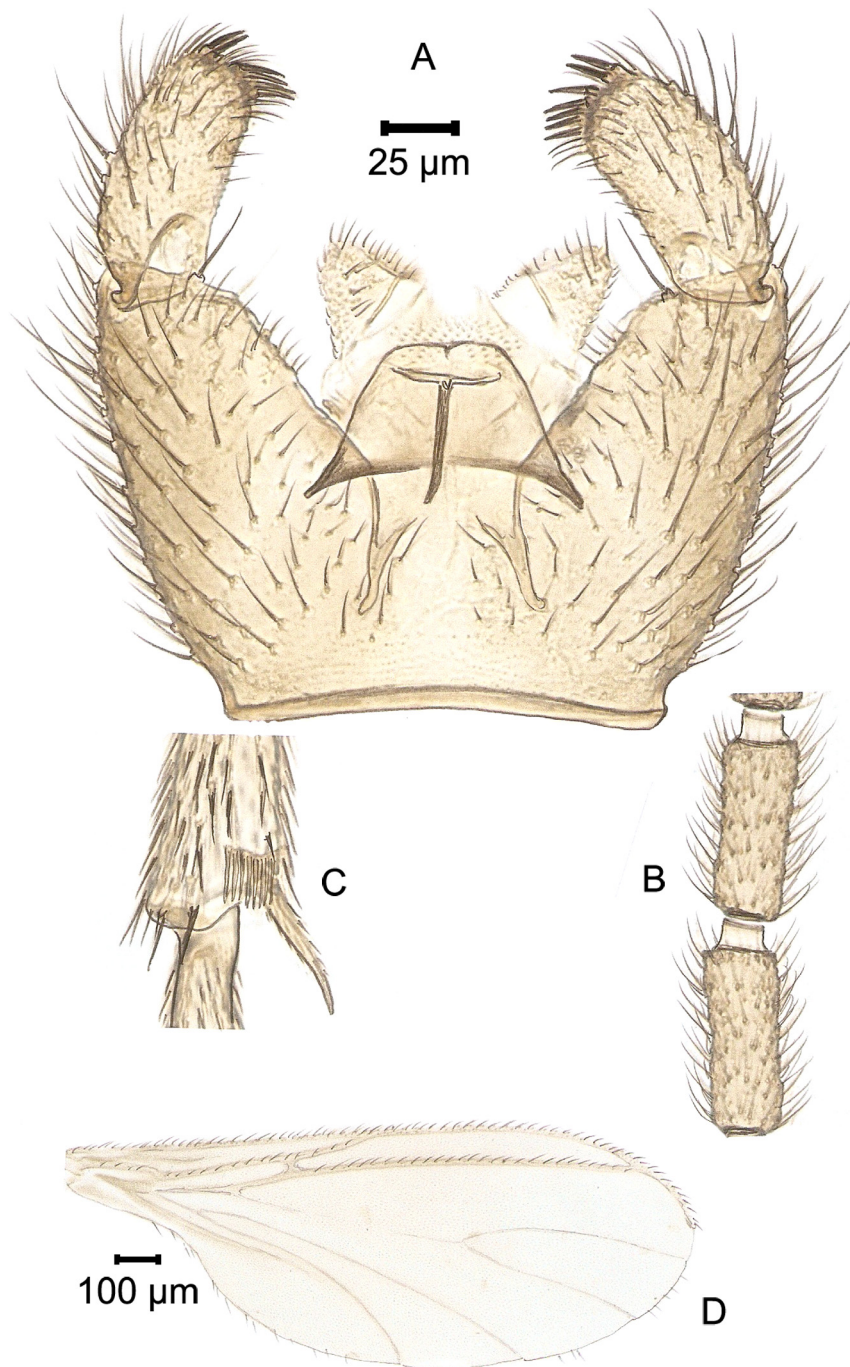


FIGURE 3 A–D. *Bradysia bishopi* Steffan, 1973. Holotype. A. Hypopygium; B. Flagellomeres 4–5; C. Tibial organ of fore tibia; D. Wing.

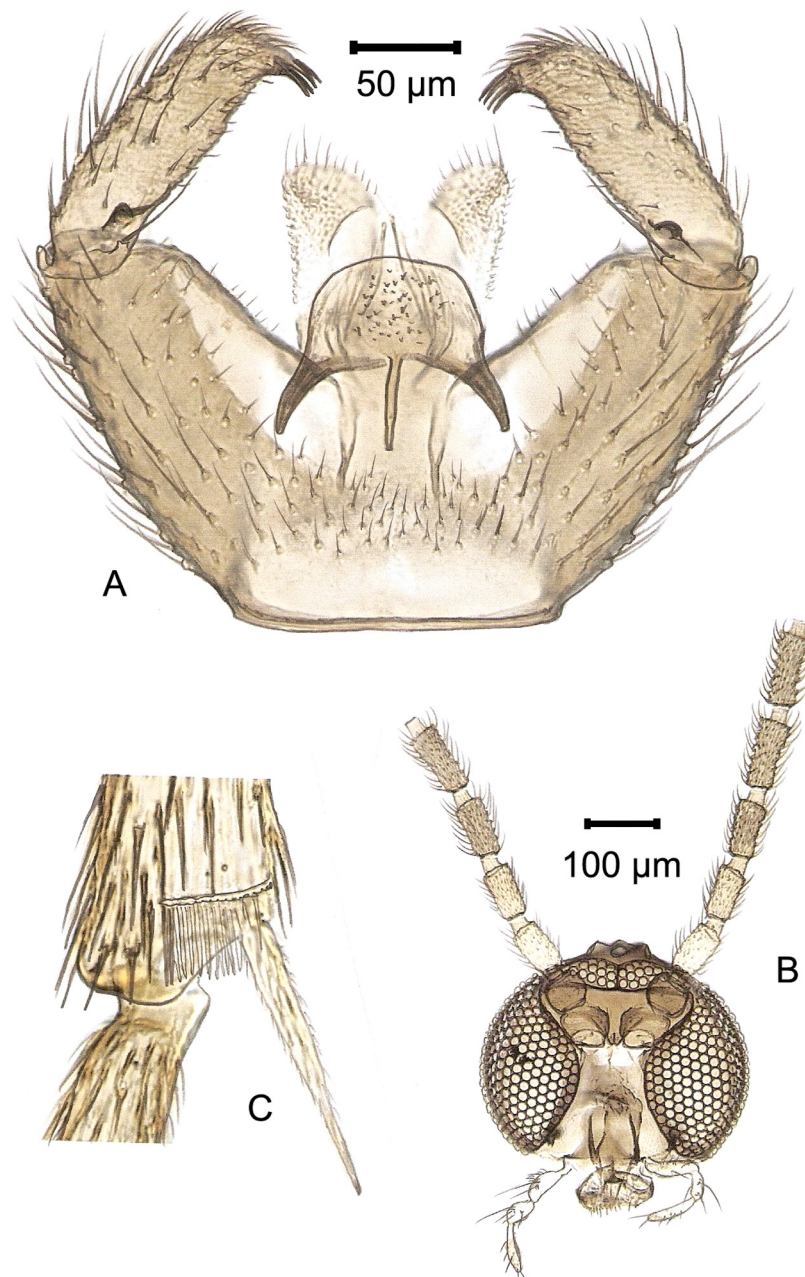


FIGURE 4 A–C. *Bradysia crassicornis* (Skuse, 1890). Specimen from Barbers Point, O’ahu. A. Hypopygium; B. Head with basal segments of flagellomeres; C. Tibial organ of fore tibia.

Conservation status. Embedded in Canada balsam. Head, palpus, antennae and wings mostly separated, morphological structures in good condition.

Comments. *Sciara molokaiensis* Grimshaw (1901) was inadequately described on the basis of a single female collected by R.C.L. Perkins in the Moloka’i Mountains in September 1893. The female holotype, which we have not studied, is deposited in the BMNH. The re-identification of *B. molokaiensis* (Grimshaw) is discussed by Steffan (1973a: 355). We follow the opinion of Hardy and Steffan that *Bradysia molokaiensis* (Grimshaw) *sensu* Hardy belongs to the genus *Bradysia* near to *B. scabricornis* Tuomikoski, 1960. It is characterized by rough flagellomeres with the scape, pedicel and the first flagellomere pale yellowish; hypopygium short haired and with a closed base, an elongate slender gonostylus with 4 (sometimes 5) apical spines, a somewhat wider than long tegmen with a large area of fine teeth, a rather long aedeagus and distinctly toothed claws. The Hawaiian specimens were compared

with the holotype of *Bradysia aspercera* Mohrig, 2016 from Papua New Guinea and they are identical. The specimens of *B. molokaiensis* (Grimshaw) from Hawai'i are also conspecific with *Bradysia crassicornis* (Skuse, 1890), described from New South Wales, Australia, therefore *B. aspercera* Mohrig and *B. molokaiensis* (Grimshaw, 1901) are junior synonyms of it.

Distribution. Australia; Hawai'i; Papua New Guinea.

***Bradysia impatiens* (Johannsen, 1912)**

Sciara impatiens Johannsen, 1912 [Johannsen (1912): 136, figs 137, 252].

Common synonyms: *Bradysia agrestis* Sasakawa; *B. difformis* Frey; *B. paupera* Tuomikoski; *Sciara hardyi* Shaw.

Selected literature: Menzel & Mohrig (2000): 146–147, figs 129–131 (as *Bradysia agrestis*); Mohrig *et al.* (2013): 162–163; Broadley *et al.* (2018): 205–209, figs 1 A–E, 2 A–C.

Not studied. Reported from the Hawaiian Islands by Shaw (1952): 493–494, fig. 2 (as *Sciara hardyi*); Hardy (1960): 223–224, fig. 71 a–e (as *Sciara (Lycoriella) hardyi*); Steffan (1973a): 355; Steffan (1974a): 43–44.

Distribution. Cosmopolitan.

***Bradysia ocellaris* (Comstock, 1882)**

Sciara ocellaris Comstock, 1882 [Comstock (1882): 202, figs 2–4].

Common synonym: *Bradysia tritici* (Coquillett).

Selected literature: Shaw (1952): 494, fig. 3 (as *Sciara (Lycoriella) garretti*); Shaw (1952): 493, fig. 1 (as *Sciara (Lycoriella) johannseni*); Shaw (1952): 494–495 (as *Sciara (Lycoriella) laffooni*); Hardy (1960): 221–223, fig. 70 a–g (as *Sciara (Lycoriella) garretti*); Steffan (1969): 723, 725–727, fig. 22 a–i; Steffan (1973a): 356; Steffan (1974a): 45; Steffan (1974b): 467–472, fig. 1 a–h (all as *Bradysia tritici*); Steffan (1974b): 472–473, fig. 2 a–h (as *Bradysia reynoldsi*); Menzel & Mohrig (2000): 155–156; Mohrig *et al.* (2013): 166–168, fig. 16 a–c; Broadley *et al.* (2018): 210–213, fig. 3 A–E.

Material studied: 9 males, 31.xii.2000, Maui, Kihei, house garden in suburban area, yellow trap, leg. W. Mohrig (PWMP).

Comments. The nomenclature and the synonymy of the species was discussed by Menzel & Mohrig (2000).

Distribution. Cosmopolitan.

***Bradysia radicum* (Brunetti, 1912)**

(Fig. 5)

Sciara radicum Brunetti, 1912 [Brunetti (1912): 139–140].

Literature: Steffan (1972b): 593–594, fig 2 a–b.

Material studied: Lectotype (here designated): Male. BMNH(E)#249717, NHMUK 012812245. Mounted in Canada balsam August 2018. Body, two wings and hypopygium (Fig. 5) under separate coverslips on same slide. Slide bears original label data verbatim 'Ind. Mus./Calcutta/24.ii.10', 'Bred from rotten/bulb of Lily./Museum garden', '*Sc. radicum*/♂♀', 'Revd. In Exch./from Ind. Mus./Nov. 1912', 'Pres. by/E. Brunetti/ B.M.1927-184'.

Paralectotypes. 3 males, same data. BMNH(E)#249716, NHMUK 012812244/BMNH(E)#249718, NHMUK 012812246/BMNH(E)#249719, NHMUK 012812247; 2 males, same data. BMNH(E)#249720, NHMUK 012812248 & BMNH(E)#249721, NHMUK 012812249; 2 males, BMNH(E)#249714, NHMUK 012812250 & BMNH(E)#249715, NHMUK 012812251, 'India:/Calcutta./Bred. Lily bulbs/i-ii.1910./C. Paiva.', '*Sciara radicum* Brun/Paratypes.', '*Bradysia/radicum*/(Brunetti)/det. W. Steffan 1971'; 1 male, BMNH(E)#249722, NHMUK 012812253, 'Calcutta/21.I.10', 'Swarming on/flower pots/containing/imported bulbs/early morning', 'Brunetti Coll./B.M. 1927-184', '*Sciara/radicum* ♀'. **Other material.** 1 male, NHMUK 010398016, '*Bradysia/radicum*/Head + ♂ genit./of Spec. D.'

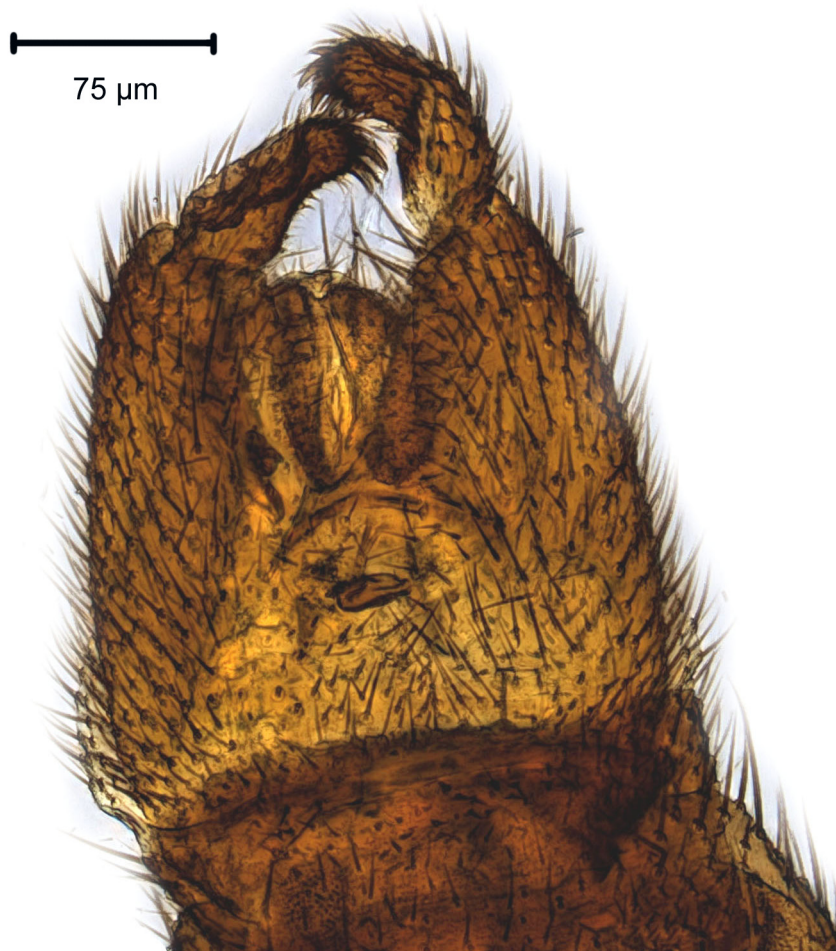


FIGURE 5. *Bradysia radicum* (Brunetti, 1912). Hypopygium of lectotype from Calcutta.

= *Bradysia spatitergum* (Hardy, 1956) **syn. n.**

Sciara (*Lycoriella*) *spatitergum* Hardy, 1956 [Hardy (1956): 85–86, fig. 10 a–c].

Selected literature: Hardy (1960): 229–230, fig. 77 a–c (as *Sciara* (*Lycoriella*) *spatitergum*); Steffan (1968): 515–519, figs 1 a–g, 2; Steffan (1973a): 356; Steffan (1974a): 45; Menzel & Smith (2009): 28–29, figs 1.11–13; Mohrig (2016): 24, fig. 28 a–e; Broadley *et al.* (2018): 234, fig. 14 A–C.

Comments. The confusion over the identity of “*Bradysia radicum* (Brunetti)” from the Pacific Islands started when Edwards (1928) misidentified specimens from Samoa as *Sciara radicum* Brunetti. Hardy (1960) compounded the error when he concluded that his specimens from O’ahu and Samoa were *S. radicum*, and described *S. spatitergum* Hardy as new. It appears that Hardy did not examine the *radicum* syntypes in the British Museum; consequently he could not have known that his *spatitergum* and Brunetti’s *radicum* were actually conspecific. Steffan perpetuated the error by misinterpreting *B. radicum* in Steffan (1969) [see comments for *B. bishopi*]. Steffan later compared Edwards’ Samoan specimens with Brunetti’s *radicum* syntypes from Calcutta and discovered that Edwards’ Samoan records were misidentifications (Steffan 1972b). Indeed, we have examined Edwards’ Samoan material held in the BMNH and there are two males, mounted on slides [Samoa Is., Tutuila, Pago Pago, 14.xii.1925, leg. P.A. Buxton & G.H. Hopkins, mounted in Euparal 1971 (presumably by Steffan), “*Sciara radicum* Brunetti”, det. F.W. Edwards, NHMUK012810482; Samoa, Savaii, Safune, V.4-24, leg. E.H. Bryan, Jr, Brit. Mus. 1947-32, NHMUK012812258], both of which belong to *Pseudolycoriella*. The remainder of the Edwards specimens from Samoa and Fiji are females which cannot be identified. The records of *Sciara*

radicum by Edwards (Edwards 1928, 1935a, 1935b) from French Polynesia (Tahiti, Marquesas Islands), American Samoa (Tutuila), Samoa (Upolu, Savaii), and Fiji (Vanua Levu) should therefore be regarded as doubtful until the species is collected and positively identified from these localities.

Steffan (1972b) redescribed *B. radicum* (Brunetti) and provided a good hypopygium drawing based on the syntype material in the BMNH, which we have examined. Steffan stated “the male terminalia are enlarged, the basimeres being large compared to the short distimeres. In this respect, *B. radicum* (Brunetti) is closely related to *B. spatitergum* (Hardy), from which it differs in the armature of the distimere and shape of tergum IX” (Steffan 1972b). In this respect Steffan was wrong, as his figures show as well as the descriptions of both species. It is likely that the differences that Steffan observed were due to the specimens being somewhat collapsed and distorted as they had been dried and mounted on pins.

Bradysia radicum is unique in respect to the very large gonocoxites and the large IX tergite (the shape of which can differ from sub-oval to somewhat trapezoidal) with short and uniform hairs. It belongs to the *B. hilaris* group in a wide sense and is related to two species from Papua New Guinea (Mohrig 2013). The larvae are often connected with rotting lily bulbs. The best figure is given in Broadley *et al.* (2018): 234, fig. 14 A–C.

Distribution. The species is common on all major Hawaiian Islands. It is widespread, with records from India, Zimbabwe, Madagascar, Central and South America, the Galápagos Islands, Seychelles Islands and Papua New Guinea.

***Corynoptera* Winnertz, 1867**

Type species: *Corynoptera perpusilla* Winnertz, 1867: 177; [preocc., nec *Corynoptera perpusilla* (Walker, 1848); = *Corynoptera fatigans* (Johannsen, 1912)].

Selected Literature: Tuomikoski (1960): 42–73; Mohrig & Jaschhof (1999): 44–87; Menzel & Mohrig (2000): 205–260; Hippa *et al.* (2010): 1–197.

***Corynoptera latistylata* (Hardy, 1956)**

(Figs 6 A–C, 7)

Sciara (*Lycoriella*) *latistylata* Hardy 1956 [Hardy (1956): 82–83, fig. 7 a–d].

Literature: Hardy (1960): 225–226, fig. 73 a–e; Steffan (1969): 699–701, fig. 12 a–h; Steffan (1973a): 357; Menzel & Heller (2007): 215–216; Menzel & Smith (2009): 30–31, figs 18–20.

Material studied: Holotype: Male, ii 1953, Hawai‘i, O‘ahu, Kuliouou Valley, 457 m, leg. C.P. Hoyt (BPBM, No. 2490). 2 males, 1–13.viii.1997, O‘ahu, ‘Ewa, urban area, Malaise trap, leg. Gonsalves (PWMP).

Conservation status. Embedded in Canada balsam. Head, palpus, antennae and wings isolated, wings under a separate cover slip. All morphological structures are in good condition, the hypopygium somewhat depressed.

Comments. The species is characterized by rather long flagellomeres, 3 segmented palpus with 1 bristle on the basal segment, a nearly comb-like row of bristles at the apex of fore tibia, rather long hairs on scutum, hypopygium with short hairs at the ventral base and the inner margin of the short gonocoxites, gonostylus nearly as large as the gonocoxites, with 3 short apical spines and a somewhat stronger spine in the apical third of the inner side. It belongs to the *C. parvula* species group sensu Menzel & Mohrig (2000) as postulated by Steffan (1973a) and Menzel & Smith (2009). The hypopygium of the type species is depressed. The real proportions are shown by the specimen collected from ‘Ewa (figure 7) and by figures 18 and 19 by Menzel & Smith (2009).

The species is very widely distributed within the Southern Hemisphere from Hawaii via Micronesia up to the Seychelles Islands. It enters the Northern Hemisphere in the United Arab Emirates (Menzel & Smith 2009).

Menzel & Smith (2009) synonymized *Corynoptera praegladiota* Mohrig, 2004 from Papua New Guinea with *C. latistylata* (Hardy). *C. praegladiota* is smaller, has short and broad wings, shorter flagellomeres, a lesser colour contrast between thorax and legs and a slender gonostylus with stronger winged dorsal sides. Both species are very similar to each other but not necessarily identical.

Distribution. Hawai‘i; Micronesia; Seychelles Islands; United Arab Emirates.

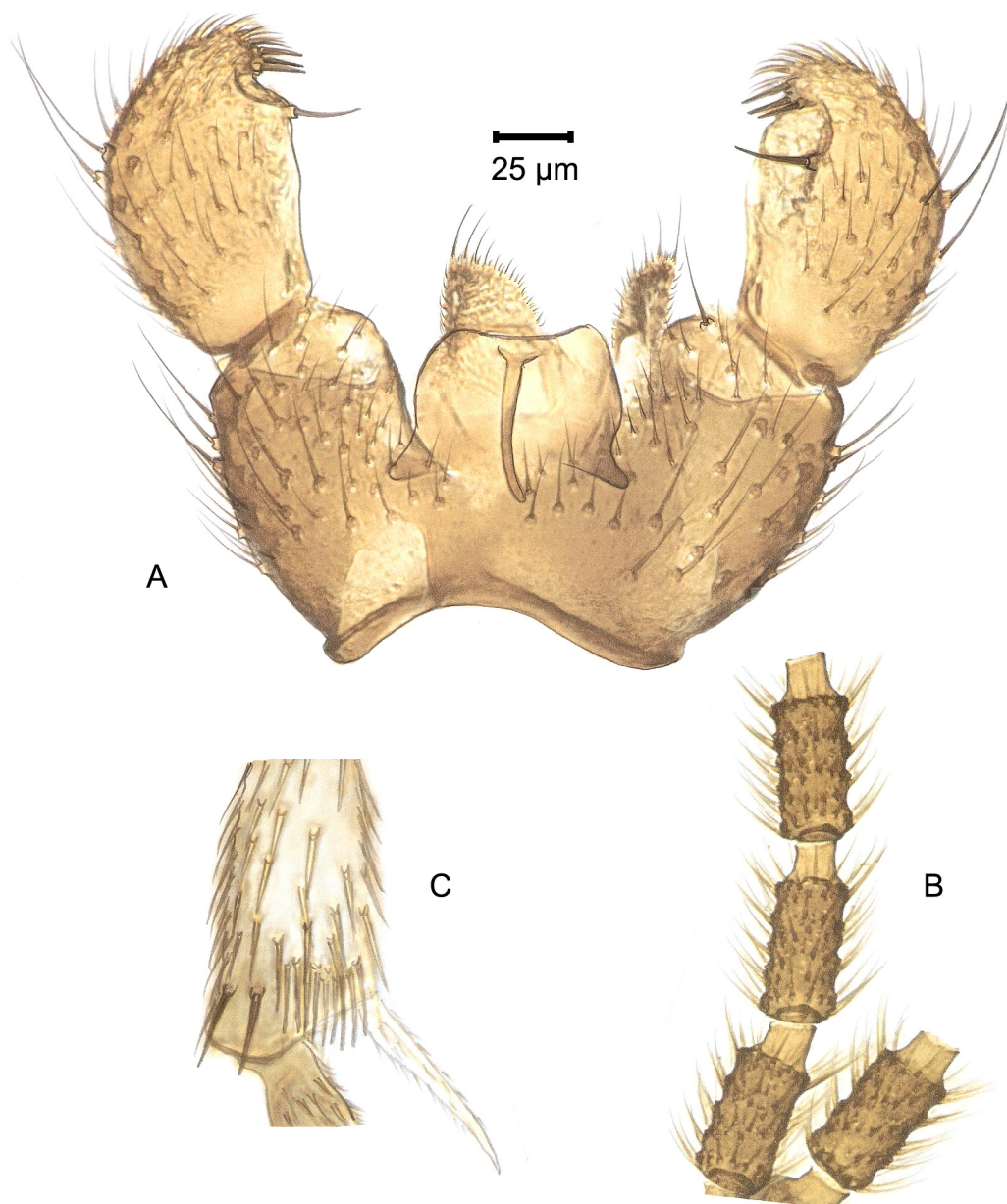


FIGURE 6 A–C. *Corynoptera latistylata* (Hardy, 1956). Holotype. A. Hypopygium; B. Flagellomeres 3–5; C. Apex of fore tibia.

***Corynoptera prominens* (Hardy, 1956) comb. n.**

(Fig. 8 A–B)

Sciara (Lycoriella) prominens Hardy, 1956 [Hardy (1956): 83–84, fig. 8 a–b].

Literature: Hardy (1960): 227, fig. 75 a–b.

Material studied: Holotype: Male, 27.x.1952, Hawai‘i, O‘ahu, Pupukea, leg. C.P. Hoyt (BPBM, No. 2492).

Conservation status. Embedded in Canada balsam. Head, antennae and wings isolated, wings under a separate cover slip. All morphological structures are in good condition.

= *Corynoptera gladiota* Mohrig, 2004, **syn. n.**

Corynoptera gladiota Mohrig, 2004 [Mohrig (2004): 162, fig. 29 a–c].

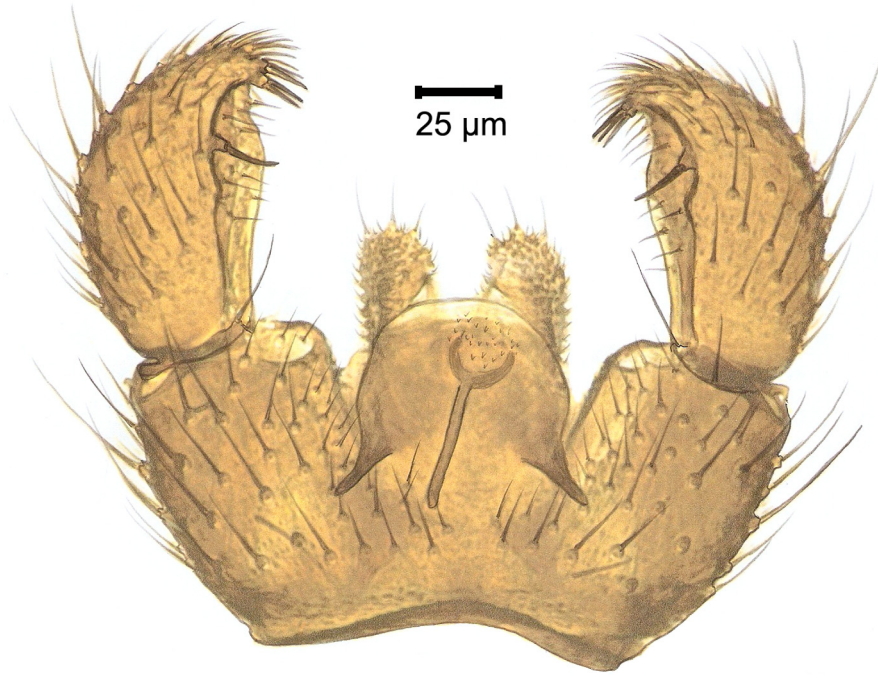


FIGURE 7. *Corynoptera latistylata* (Hardy, 1956). Specimen from Ewa. Hypopygium.

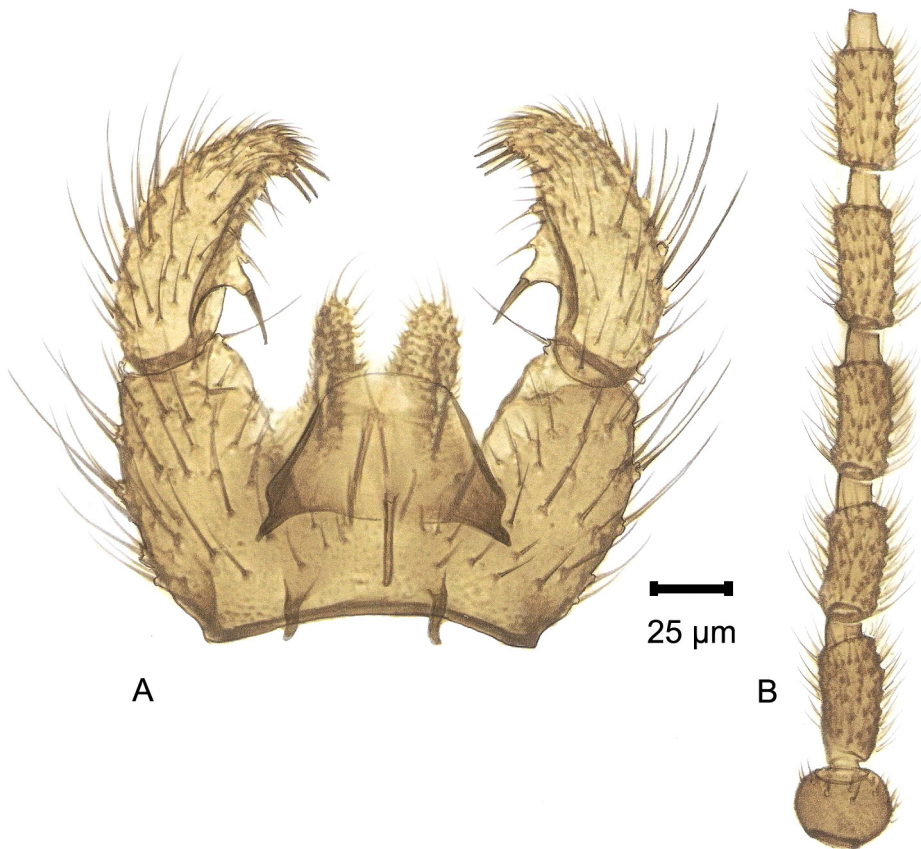


FIGURE 8 A–B. *Corynoptera prominens* (Hardy, 1956). Holotype. A. Hypopygium; B. Basal segments of antenna.

Comments. The species is characterized by rather long and rough flagellomeres, a 3 segmented palpus with 1 bristle on the basal segment, a nearly comb-like row of bristles at the apex of the fore tibia, rather long hairs on the scutum, the hypopygium with short sparse hairs at the ventral base and the inner margin of the short gonocoxites, gonostylus as long as the gonocoxites, with 3 short apical spines and a longer spine on a broad base somewhat below the middle of the inner side. It belongs to the genus *Corynoptera* within the *C. parvula* species group sensu Menzel & Mohrig (2000). It is conspecific with *Corynoptera gladiota* Mohrig from Papua New Guinea. The tibial organ is more strongly comb-like than in specimens from Papua New Guinea.

Distribution. Rather common on Hawaiian Islands; Papua New Guinea.

***Cosmosciara* Frey, 1942**

Type species: *Plastosciara perniciososa* Edwards, 1922 [Edwards (1922): 160–161 (original designation)].
Selected literature: Frey (1942): 24, 39.

***Cosmosciara hartii* (Johannsen, 1912)**

(Fig. 9 A–B)

Sciara hartii Johannsen, 1912 [Johannsen (1912): 144].
Common synonyms: *Cosmosciara perniciososa* (Edwards); *Plastosciara perniciososa* Edwards.

Selected literature: Steffan (1973b): 1265–1266, fig. 1–2 (as *Plastosciara perniciososa*); Menzel & Smith (2009): 32–33, fig. 21–25; Menzel *et al.* (2013): 288, fig 6–7 (both as *Cosmosciara perniciososa*); Mohrig *et al.* (2013): 223–224, fig. 43 a–c (as *Pnyxia hartii*); Broadley *et al.* (2018): 213–214, figs 7 A–B, 8 A–C, 9 A–D.

= *Plastosciara (Plastosciara) latipons* Hardy, 1956 **syn. n.**

[Hardy (1956): 77, fig. 4 a–d].

Literature: Hardy (1960): 217, fig. 68 a–d; Steffan (1969): 690–692, fig. 8 a–h (as *Plastosciara latipons*).

Material studied: Holotype: Male, iv.1955, Hawai‘i, O‘ahu, ‘Ewa, light trap, leg. not known (BPBM, No. 2484).

Conservation status. Embedded in Canada balsam. Head with palpus and antennae, wings and hypopygium isolated. All morphological structures rather strongly deformed.

= *Plastosciara (Cosmosciara) brevicealcarata* Hardy, 1956

Plastosciara (Cosmosciara) brevicealcarata Hardy, 1956 [Hardy (1956): 73–75, fig. 2 a–e].

Literature: Steffan (1973a): 360 (as *Plastosciara (Termitosciara) perniciososa*).

Material studied: Holotype: Male, 6.xii.1952, Oahu, ex window, leg. C.P. Hoyt (BPBM No. 2481).

Conservation status. Embedded in Canada balsam. Head with palpus and antennae and hypopygium separated. All morphological structures are in good condition.

Comments. The species is characterized by a 1-segmented palpus with a small relict of the second segment, short flagellomeres, and a gonostylus with a short subapical tooth, covered with fine macrotrichia. *Plastosciara latipons* Hardy and *Plastosciara (Cosmosciara) brevicealcarata* Hardy are identical to *Cr. hartii* (Johannsen, 1912) and therefore junior synonyms of the latter species.

Distribution. Cosmopolitan.

***Cratyna* Winnertz, 1867**

Type species: *Cratyna atra* Winnertz, 1867: 176, fig. 7.

Selected Literature: Tuomikoski (1960): 31–41 (as *Plastosciara*); Hippa *et al.* (1998): 1–86 (as *Pseudozygoneura*); Menzel & Mohrig (1998): 362–363 (as *Cratyna*); Mohrig (1999): 167–182; Menzel & Mohrig (2000): 261–292; Mohrig (2004): 141–144; Vilkamaa & Hippa (2005): 457–480; Mohrig & Menzel (2014): 138–143; Shin *et al.* (2014): 344–354; Huang *et al.* (2015): 77–95 (as *Pseudozygoneura*).

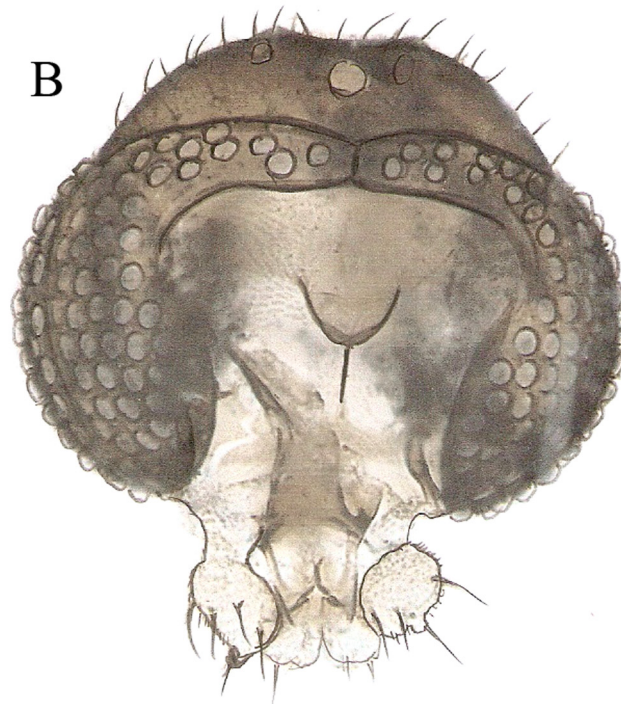
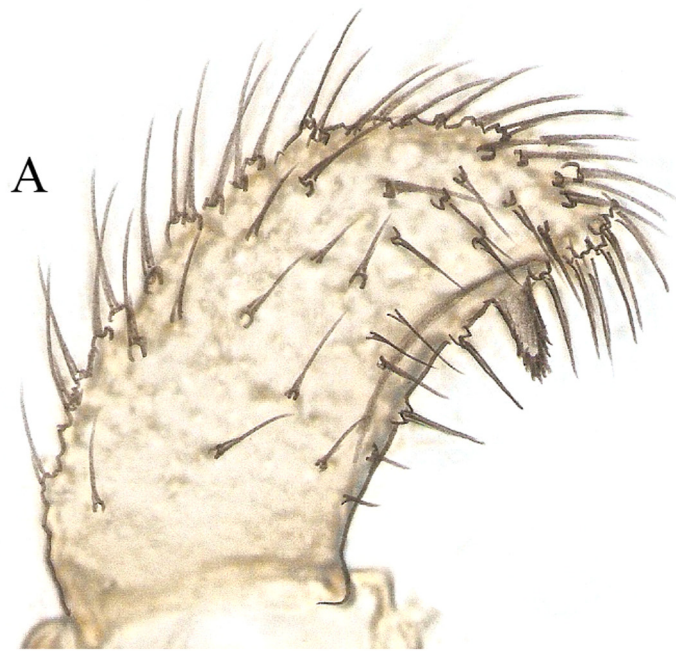


FIGURE 9 A–B. *Cosmosciara hartii* (Johannsen, 1912) Holotype of *Plastosciara brevicealcarata* Hardy. A. Gonostylus; B. Head and palpus.

***Cratyna (Pictosciara) adrostylata* (Hardy, 1956)**

(Fig. 10 A–D, 11 A–C)

Plastosciara (Cosmosciara) adrostylata Hardy, 1956 [Hardy (1956): 72–73, fig. 1 a–c].

Literature: Hardy (1960): 214, fig. 67 a–c (as *Plastosciara (Cosmosciara) adrostylata*).

Material studied: **Holotype:** Male, 4.ix.1927, Hawai‘i, O‘ahu, Waikāne, ex dead *Xanthoxylum*, leg. E. H. Bryan (BPBM, No. 2483). **Paratype:** 1 male, 4.ix.1927, Oahu, Waikāne, dead *Xanthoxylum*, “genitalia figured”, leg. E.H. Bryan (BPBM).

Conservation status. Embedded in Canada balsam. Head with antennae, palpus, wings and hypopygium isolated. All morphological structures are more or less strongly deformed, especially the body with legs and the hypopygium. The embedding medium is turbid from water originating from the specimen.

Comments. The species is characterized by a very short and swollen 3-segmented palpus with a large basal segment and a distinct palpifer, head with an eye bridge of 2-3 rows of facets, antenna very short, flagellomeres short, nearly quadrate in shape; legs rather short, apex of the fore tibia with a small irregular patch of bristles and a short spur; gonocoxites short and robust, gonostylus short, pointed to the apex, with a short apical tooth and 3 equal spines near the base of the tooth. The species belongs to the subgenus *Pictosciara* Mohrig in terms of the shape of the gonostylus and the arrangement of the spines. It is very similar (maybe identical) to *Cr. brevipalpis* Steffan from Micronesia. The only apparent differences are the short and nearly quadratic flagellomeres of *Cr. adrostylata* Hardy, versus those of *Cr. brevipalpis* Steffan, which are distinctly longer than wide. All other details seem to be identical despite the deformed morphological structures. The body is bleached but it appears that both species have the gonostylus darker than the gonocoxites. This is typical for *Cratyna (Pictosciara) vera* Mohrig, 2004, as well.

Distribution. Hawaiian Islands (O‘ahu).

***Cratyna (Cratyna) longicosta* (Hardy, 1956) comb. n.**

(Fig. 12 A–C)

Plastosciara (Cosmosciara) longicosta Hardy, 1956 [Hardy (1956): 75–77, fig. 3 a–d].

Material studied: **Holotype:** Male, 24.xi.1952, Hawai‘i, O‘ahu, Hālawā Ridge, ex moss, leg. C.P. Hoyt (BPBM, No. 2482).

Conservation status. Embedded in Canada balsam. Head, palpus, antennae and wings isolated, wings under a separate cover slip. All morphological structures are rather well preserved.

Comments. The species is characterized by a 1-segmented palpus with a small rudimentary second segment, the basal segment not swollen, short oval and without a deepened sensory pit; antenna rather short, 4th flagellomere with a l/w index of 1.2, hairs fine and somewhat shorter than the diameter of the basal node; legs slender, fore tibia without a distinct bristle patch; hypopygium with short and rather robust gonocoxites; gonocoxites with short and sparse hairs on the ventral inner side, gonostylus elongate, somewhat bulbous, apically with 2 fine and slightly curved spines and 2 fine subapical spines at the inner side. Hardy put the species into the genus *Plastosciara*, subgenus *Cosmosciara*. We agree with Hardy concerning the position in the genus *Cratyna* (= *Plastosciara*) because of a shortened palpus and two pairs of fine spines on the inner side of the gonostylus.

***Epidapus* Haliday, 1851**

Type species: *Epidapus venaticus* Haliday, 1856 [Haliday in Walker (1856): 56]; monotypy [= *Tipula atomaria* De Geer, 1778].

Selected literature: Tuomikoski (1960): 96–100; Mohrig & Jaschhof (1999): 29–36; Menzel & Mohrig (2000): 299–339; Mohrig (2004): 150–159; Vilkkamaa *et al.* (2014): 429–436.

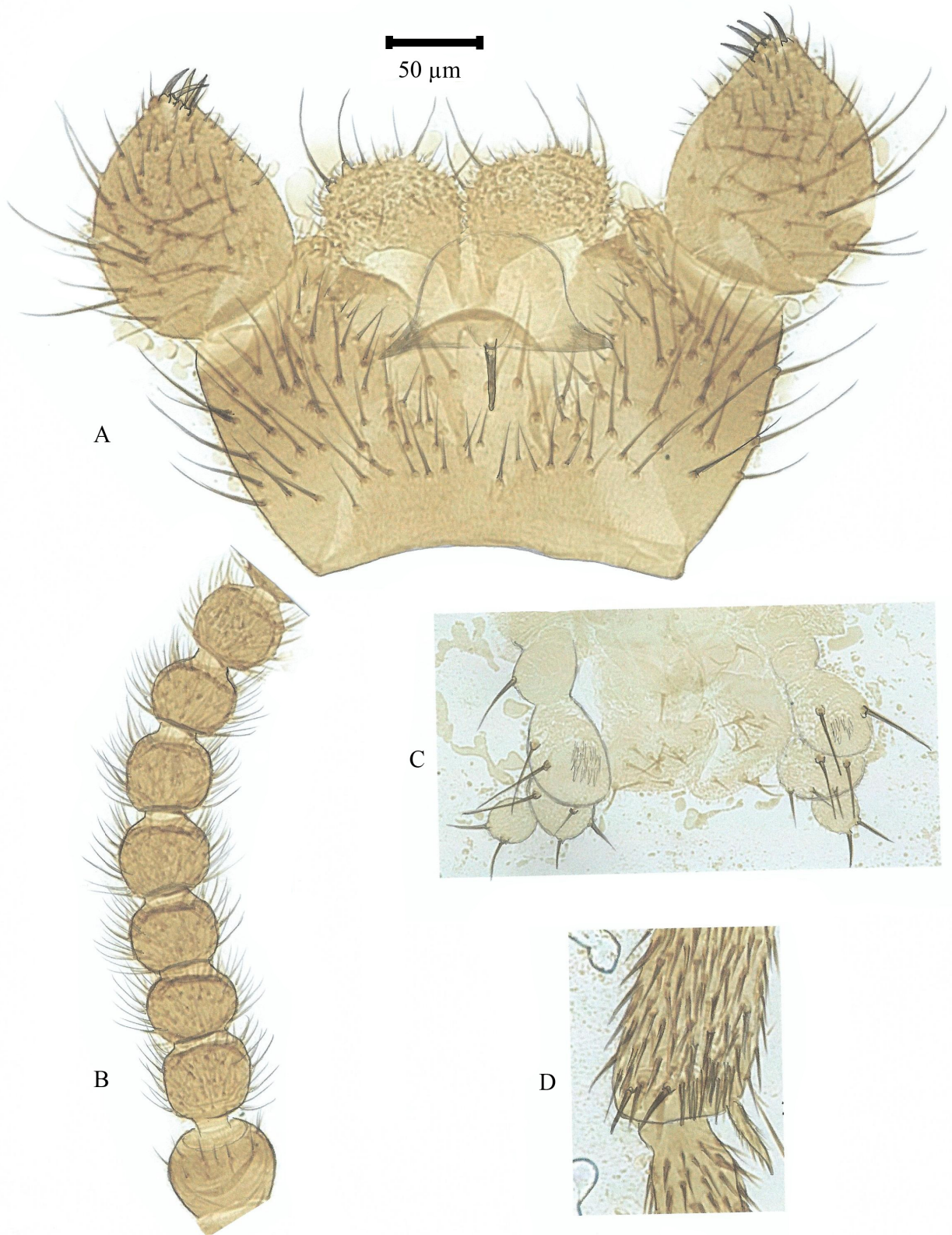


FIGURE 10 A–D. *Cratyna adrostylata* (Hardy, 1956). Holotype. A. Hypopygium; B. Basal segments of antenna; C. Palpus; D. Apex of fore tibia.

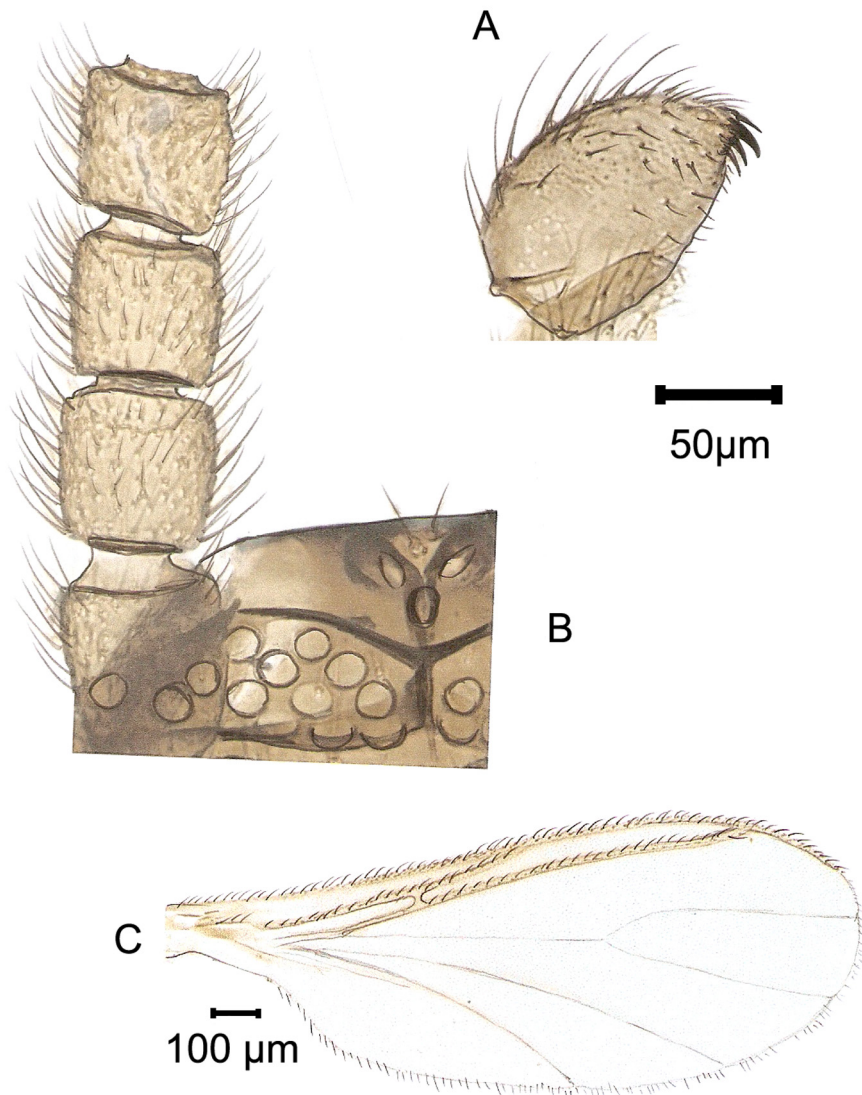


FIGURE 11 A–C. *Cratyna adrostylata* (Hardy, 1956). Paratype from O’ahu. A. Gonostylus; B. Head with eye bridge and flagellomeres 1–4; C. Wing.

***Epidapus (Pseudoaptanogyna) pallidus* (Séguy, 1961)**

(Fig. 13 A–E)

Afrosciara pallida Séguy [Séguy (1961): 415–417, figs 1–5].

Literature: Menzel & Heller (2007): 219–220; Menzel & Smith (2009): 37–38, figs 36–38.

Material studied. 8 males, 1 female, 1–13.viii.1997, Hawaiian Islands, O’ahu, ‘Ewa, suburban area, Malaise trap, leg. Gonsalves (PWMP, 1 in PABM, 1 in BPBM).

Comments. This very small species (0.7 mm) is characterized by the wings with a wedge-shaped base and a reduced anal area, an isolated base of CuA_1 and CuA_2 , and the gonostylus pointed towards the apex, with 3 densely grouped apical spines. The female is fully winged, the eye bridge 1–2 facets wide with loosely arranged ommatidia.

Distribution. Africa (Guinea); Seychelles; Hawai’i (**new record**).

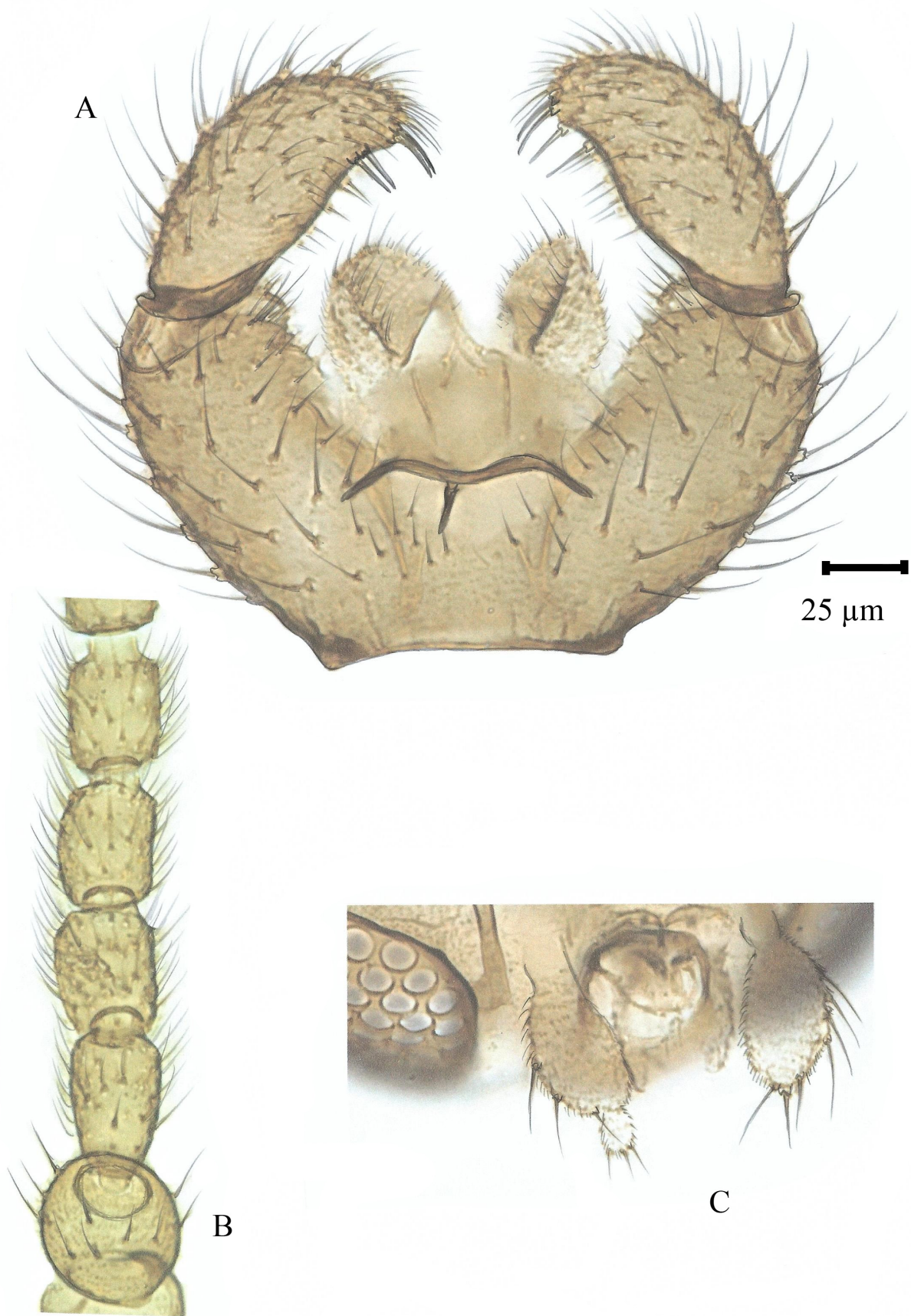


FIGURE 12 A–C. *Cratyna longicosta* (Hardy, 1956). Holotype. A. Hypopygium; B. Basal segments of antenna; C. Palpus.

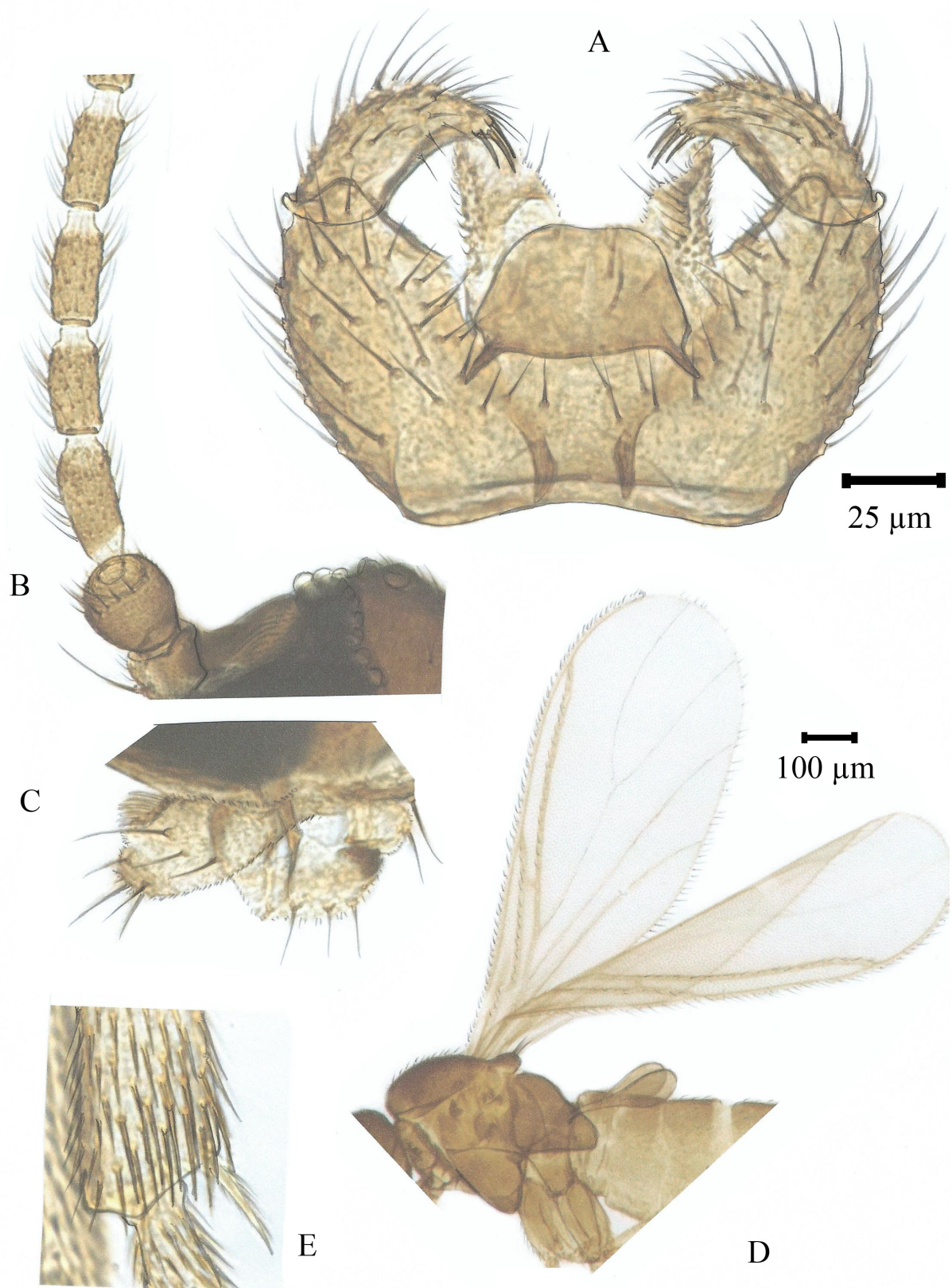


FIGURE 13 A–E. *Epidapus pallidus* (Séguy, 1961). A. Hypopygium; B. Basal segments of antenna; C. Palpus; D. Thorax with wings and haltere; E. Apex of fore tibia.

***Hyperlasion* Schmitz, 1918**

Type species: *Hyperlasion wasmanni* Schmitz, 1918 [Schmitz (1918): 96–99, fig. 1].

Selected literature: Hardy (1960): 232; Rudzinski (1993): 446–448; Menzel & Mohrig (2000): 343–348.

***Hyperlasion wasmanni* Schmitz, 1918**

(Fig. 14 A–C)

Hyperlasion wasmanni Schmitz, 1918 [Schmitz (1918): 96–99, fig. 1].

= *Scythropochroa magnisensoria* Hardy, 1956 **syn. n.**

Scythropochroa magnisensoria Hardy, 1956 [Hardy (1956): 89–90, fig. 12 a–d]

Material studied: Holotype: Male, 7.ii.1953, Hawai‘i, O‘ahu, Kuliouou Valley, 457 m, leg. C. P. Hoyt (BPBM, No. 2485). **Paratypes:** 1 male, ii.1953, O‘ahu, Maunawili, leg D.E. Hardy; 1 female, Pu‘u Ali‘i, Moloka‘i, vii.1953, 1 male/1 female, 17.i.1953, O‘ahu, Opae‘ula [as “Opacula”], leg. C.P. Hoyt; 3 males, 2.vi.1953, Lāna‘ihale Lāna‘i [as “Lana”], 3200 ft., leg. D.E. Hardy; 1 female, 18.ii.1920, O‘ahu, Lanihuli, leg. E.H. Bryan Jr.; 1 male, vii.1953, Kahuku Ranch, 3000 ft. (leg. D.E. Hardy); 1 male, 17.i.1953, O‘ahu, Pu‘u Pe‘ahinai‘a [as “Peahina”], leg. C.P. Hoyt; 1 male, iv.1953, Maui, Pu‘u Kukui, leg. M. Tamashiro; 1 male, 4.x.1929, Upper Hamakua, Ditch Trail, on Lula Palm, leg. R.R. Whitten (PWMP). **Other material:** 2 males, 10.ii.1953, O‘ahu, Maunawili, on tree trunk, leg. D.E. Hardy.

Conservation status. Embedded in Canada balsam. Head, palpus and antennae, wings and hypopygium isolated, wings under a separate cover slip. All morphological structures rather well preserved.

Comments. *Hyperlasion wasmanni* is characterized by a 1-segmented palpus that is large and swollen, with a large sensory pit of variable shape at the front and a robust curved bristle on the upper border of the pit; rather long antennae; 4th flagellomere with a l/w index of 2.0, with hairs longer than the basal node; indifferent bristles at the apex of the fore tibia, rather short gonocoxites, with short hairs at the base and the inner ventral margin; gonostylus nearly as long as the gonocoxites, apically rounded, without an apical tooth, with 5–7 short and fine hyaline spines in the distal half.

Menzel *et al.* (2013) discussed the differences between *H. viridiventris* (Frey, 1945), *H. wasmanni* Schmitz (1918) and *H. aliens* Mohrig (2004). The main characters of *H. viridiventris* (Frey) are the swollen 1-segmented palpus with a large sensory pit in front and a long and robust curved bristle on the upper margin, rather long flagellomeres and an elongate gonostylus without an apical tooth, but with few (5–7) fine hyaline spines (poorly visible even with a good microscope). The morphological differences with the European specimens of *Hyperlasion wasmanni* Schmitz are minimal. We think that *viridiventris* (Frey) and *wasmanni* Schmitz are conspecific. In this sense we agree with Hardy (1960): 232 that Tuomikoski also found (in correspondence) that the two species are conspecific. The species is common in open landscapes, and is perhaps connected with ants. The females are often monogenic and in a given period only females are found or a minimal percentage of a population are males.

Distribution. Hawai‘i. Widespread and common in Europe.

***Lycoriella* Frey, 1942**

Type species: *Bradysia (Chaetosciara) paucisetulosa* Frey, 1948 [Frey (1948): 57, 63, 82, plate 15, fig. 86; designated by Menzel & Heller (2005) (= *Lycoriella sativae* (Johannsen, 1912)]

***Lycoriella (Lycoriella) ingenua* (Dufour, 1839)**

Sciara ingenua Dufour, 1839 [Dufour (1839): 29, figs 20–28].

Common synonyms: *L. caesar* (Johannsen); *L. mali* (Fitch); *L. solani* (Winnertz); *L. pauciseta* (Felt).

Selected literature: Mohrig *et al.* (2013): 210–212; Broadley *et al.* (2018): 215–216, fig. 5 A–E.

Not studied. Reported from the Hawaiian Islands by Steffan (1973a): 357–358; Steffan (1974a): 47 (both as *L. mali*).

Distribution: Cosmopolitan.

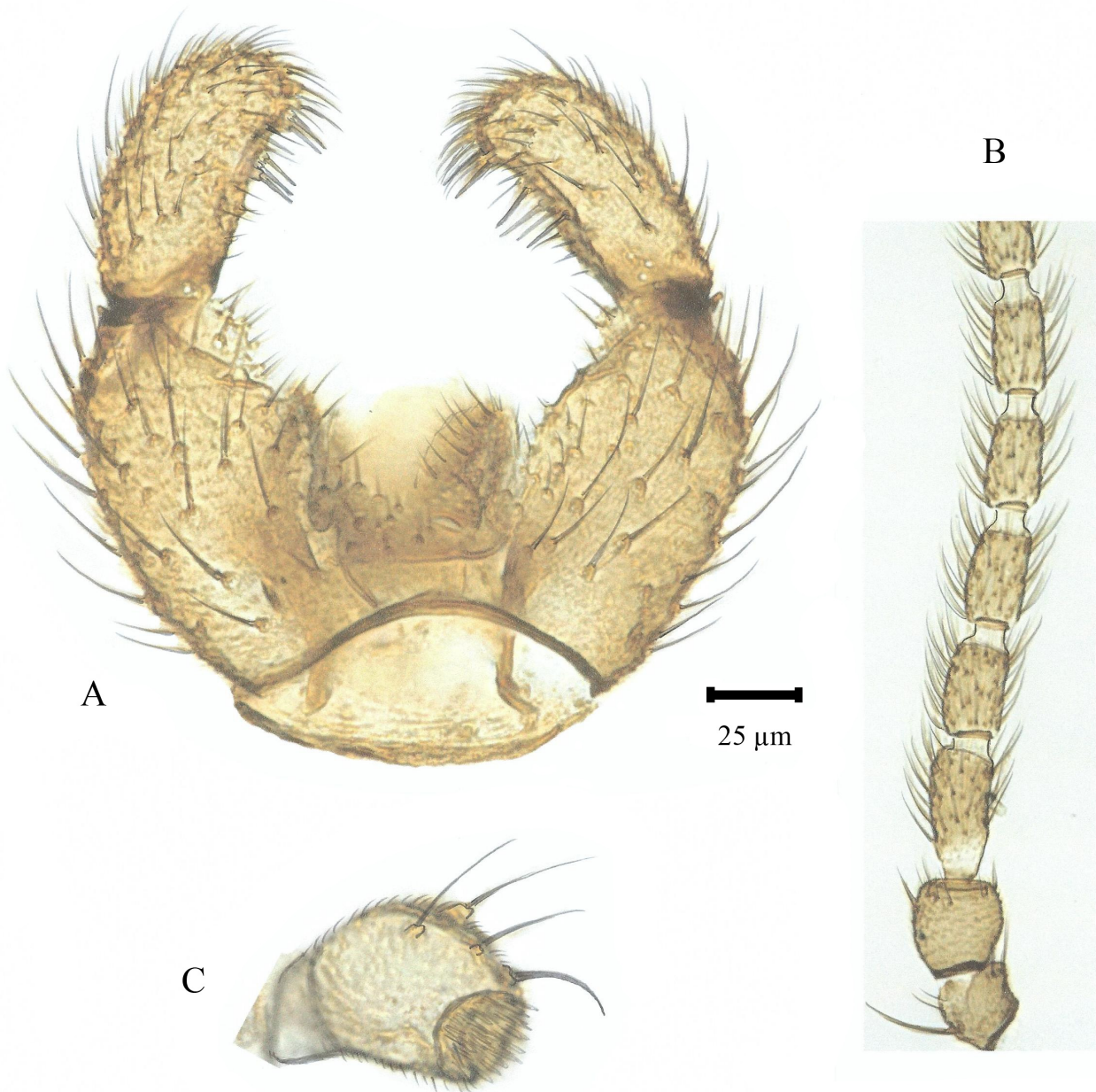


FIGURE 14 A–C. *Hyperlasion wasmanni* Schmitz, 1918. Holotype of *Scythropochroa magnisensoria* Hardy. A. Hypopygium; B. Basal segments of antenna; C. Palpus.

***Lycoriella (Lycoriella) sativae* (Johannsen, 1912)**

Sciara sativae Johannsen, 1912 [Johannsen (1912): 133, figs 120, 140].

Common synonyms: *L. fucorum* (Frey); *L. castanescens* (Lengersdorf); *L. solispina* (Hardy).

Selected literature: Hardy (1956): 84–85, fig. 9 a–c; Hardy (1960): 228–229, fig. 76 a–e (all as *Sciara (Lycoriella) solispina*); Steffan (1973a): 358; Steffan (1974a): 47 (both as *Lycoriella solispina*); Mohrig *et al.* (2013): 216–217, fig. 39 a–d; Broadley *et al.* (2018): 216–217, 220–222, 224, fig. 6 A–D.

Material studied: *Lycoriella solispina* (Hardy), **Holotype:** Male, x.1952, Hawai‘i, Ka‘ula Gulch, north slopes of Mauna Kea, 213 m, leg. D.E. Hardy (BPBM, No. 2489).

Conservation status. Embedded in Canada balsam, Wings isolated and under a separate cover slip. All morphological structures are in good condition.

Comments. Steffan (1973a) assumed that the species is very closely related or conspecific with *L. similans* (Johannsen, 1925) [= *sativae* (Johannsen, 1912)], but did not synonymize the two species.

Distribution. Cosmopolitan.

***Phytosciara* Frey, 1942**

Type species: *Sciara halterata* Lengersdorf, 1926 [Lengersdorf (1926): 250, fig. 12].

Literature: Tuomikoski (1960): 103–110; Hippa & Vilkamaa (1991): 113–155; Mohrig & Menzel (1994): 167–210; Menzel & Mohrig (2000): 429–451.

***Phytosciara (Prosciara) vulcanata* Steffan, 1973**

(Fig. 15 A–D)

Phytosciara (Prosciara) vulcanata Steffan, 1973 [Steffan (1973a): 358, fig. 2 a–h].

Material studied: Holotype, 10.-17.vii.1972, Hawai'i Island, east slope Mauna Loa, 7000 ft., pitfall trap, leg. J. Jacobi (Bishop Museum 9942). **Paratypes**: 1 male, 15.vii.1972, Hawai'i I., Kazumura Lava Tube near Mt. View, 400 m, leg. F. Howarth; 1 male, 1.xii.1968, Hawai'i I., Kīpuka "6", 19.7 miles W of Hilo, 5250 ft., sweeping, leg. W. Gagné (1 in PWMP).

Further material: 1 male, 29.iv.1972, Hawai'i I., West Maui, Haiku Cabin, Pu'u Kukui Trail, Malaise trap, leg. J.L. Gressitt (BPBM).

Conservation status: Embedded in Euparal. Body and head separated, all details in good condition.

Comments. Steffan correctly assigned the species to the subgenus *Prosciara*. It looks like a typical species of *Bradysia*, only the base of the apical spines is pronounced and the claws strongly toothed, not common in the genus *Bradysia*. It is further characterized by the rough flagellomeres with short curved hairs and short dense hairs in the intergonocoxal space (there is not a true lobe). The slide labelled holotype bears the number BPBM 9942 which differs from the number listed in Steffan's original description and in his type catalogue (BPBM 9943) (Steffan 1973a; 1976).

Distribution. Hawai'i.

***Pseudolycoriella* Menzel & Mohrig, 1998**

Type species: *Sciara bruckii* Winnertz, 1867 [Winnertz (1867): 38–39].

Literature: Menzel & Mohrig (1998); Mohrig & Jaschhof (1999): 36–43; Menzel & Mohrig (2000): 464–480; Rudzinski (2003): 97; Mohrig *et al.* (2004): 277–287; Vilkamaa *et al.* (2012a): 1–21; Mohrig (2013): 136–167; Mohrig *et al.* (2013): 225–231; Köhler & Mohrig (2016): 101–106, as referred to in the references; Mohrig & Kauschke (2019): 261–283.

***Pseudolycoriella nigrofemoralis* Mohrig, Kauschke & Broadley sp. n.**

(Fig. 16 A–D)

Type locality: Hawaiian Islands, O'ahu, Mānoa, Honolulu, 21.304 N 157.823 W.

Holotype: Male, 10–15.i.2018, 70 masl, UV light trap, leg. CPDT Gillett (BPBM).

Paratypes: 13 males, 9 females, same data as holotype (3 males, 1 female in PWMP, 2 males, 2 females in BPBM, 3 males, 3 females in UHIM, 3 males, 2 females in PABM, 2 males, 1 female in ANIC).

Description. Male. **Head:** Ovoid, mouthparts short; eye bridge 3–4 facets wide; antenna short, dark brown; 4th flagellomere with a l/w index of 1.5, with surface somewhat rough, hairs as long as the diameter of the basal node, necks whitish, somewhat bicoloured; palpus 3-segmented; long, basal segment with 3–4 bristles and a patch of

short sensillae. **Thorax:** Dark brown; scutum with long dorsocentral and lateral hairs; scutellum with 4 long posterior hairs; postpronotum bare. Wing brownish, with distinct veins; $R_1 = 3/4 R$; R_5 with dorsal macrotrichia; C somewhat longer than w; $y = x$, bare; posterior wing veins without macrotrichia. Haltere short, with darkened knobs; legs yellowish-brownish, femora of p_3 brown; fore tibia at the inner apex with a patch of bristles and a horseshoe-shaped border; spurs of middle and hind tibiae of the same size, brownish, as long as the diameter of the apex; claws strongly toothed. **Abdomen:** Hypopygium dark brown, the inner ventral margin of gonocoxites with short hairs; gonostylus robust, somewhat club-shaped, broadly rounded apically and densely haired, with 5 rather long and thin spines (arranged mostly in two pairs plus a single spine) and one or two longer whip-lash hairs; tegmen small, as long as wide, apically rounded; aedeagus rather short, with a narrow furca. Body length: 3.2 mm.

Female. Antenna very short, 4th flagellomere with a l/w index of 1.0-1.2, neck very short; other characters as in males. Body length: 4 mm.

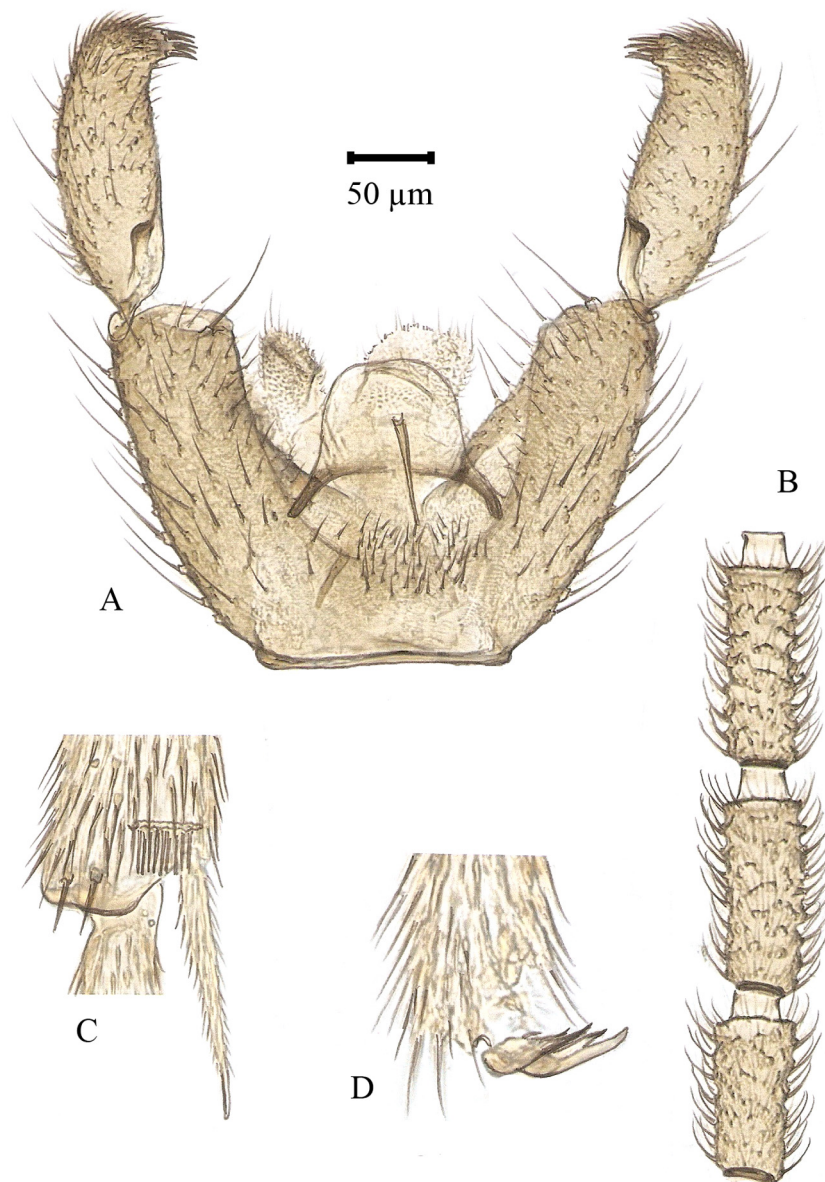


FIGURE 15 A–D. *Phytosciara (Prosciara) vulcanata* Steffan, 1973. A. Hypopygium; B. Flagellomeres 3–5; C. Apex of fore tibia; D. Claw.

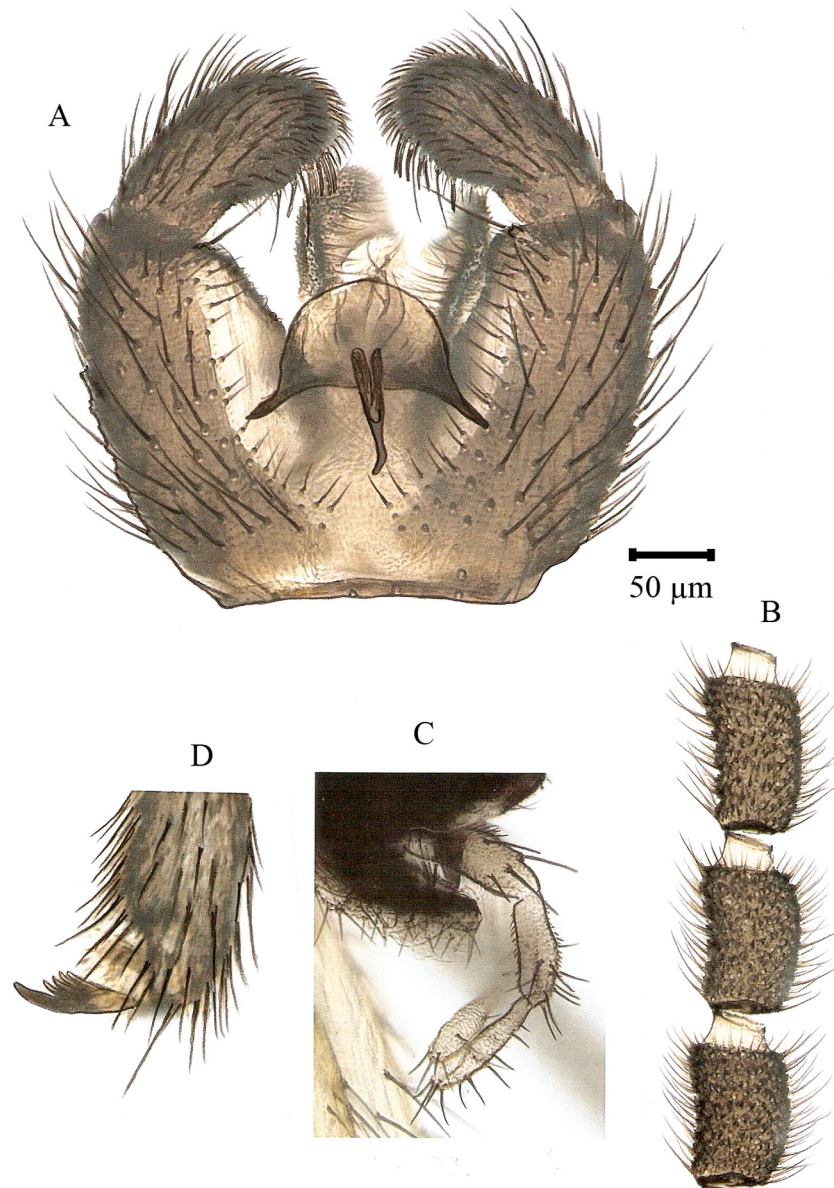


FIGURE 16 A–D. *Pseudolykoriella nigrofemoralis* sp. n. Holotype. A. Hypopygium; B. Flagellomeres 3–5; C. Palpus; D. Claw.

Comments. The species is characterized by the short flagellomeres with whitish necks, the dark thorax with long hairs on the scutum and 4 long marginal bristles on the scutellum, hind femur dark in contrast to the yellowish-brown fore and middle legs, very strongly toothed claws and a club-shaped gonostylus with 5 thin spines on the inner side and 1-2 longer whiplash hairs. A good character for distinguishing this species are the dark hind femora. The robust flagellomeres with bicoloured necks and the strongly toothed claws are similar to *Pseudolykoriella skusei* Mohrig, Kauschke & Broadley, described from Queensland and Norfolk Island, Australia (Mohrig *et al.* 2016).

Distribution. Hawaiian Islands (O‘ahu).

***Pseudolycoriella setigera* (Hardy, 1960)**

(Fig. 17 A–E)

Spathobdella setigera Hardy, 1960 [Hardy (1960): 234–235, fig. 80 a–c].

Literature: Steffan (1973a): 356 (as *Bradysia setigera*); Menzel & Smith (2009): 41–43, fig. 45–47; Menzel *et al.* (2013): 292–293, fig. 22–23; Köhler & Menzel (2013): 69.

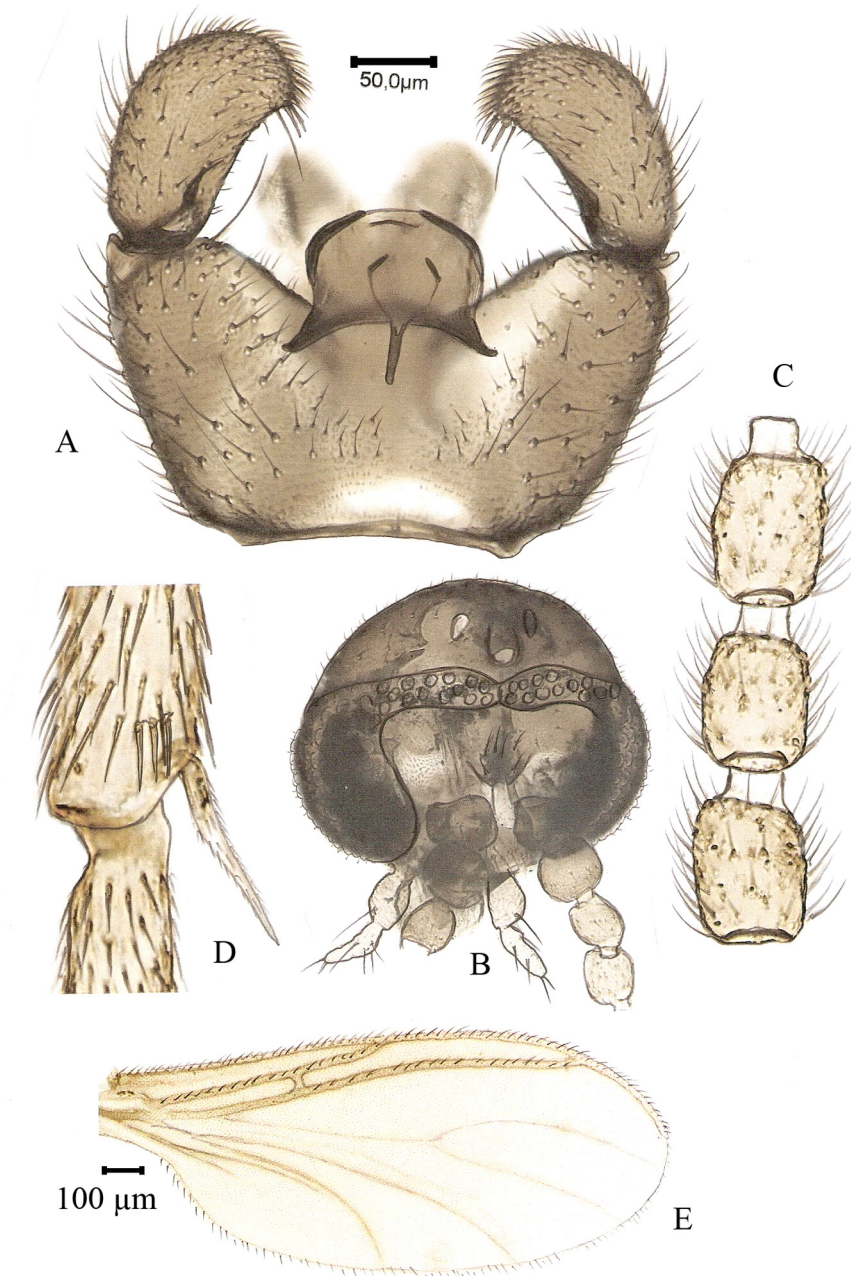


FIGURE 17 A–E. *Pseudolycoriella setigera* (Hardy, 1960). Holotype. A. Hypopygium; B. Head; C. Flagellomeres 3–5; D. Apex of fore tibia; E. Wing.

Material studied: Holotype, 29.x.1952, Hawai‘i, Keanakolu, 5200 ft., leg. C.P. Hoyt (BPBM, No. 2487). Further material: 1 male, 28.iv.1972, Chain of Craters & Hilina Pali Rd. Junction, 3880 ft., leg. W. Gagné (BPBM); 1 male, 1 female, 27.x.1970, Hawai‘i Islands, leg. W.A. Steffan (1 male in PWMP).

Comments. The species is characterized by a 3-segmented palpus, sometimes with the tendency to reduction to two segments in both sexes (unusual in the genus), forehead with a few short bristles, wings with strong C and R₅

veins, short flagellomeres (l/w index 1.2-1.4), fore tibia with an indistinct tibial organ (3-4 somewhat isolated bristles, not different from the ground hair), gonostylus with short hairs and 2 short subapical spines and a long whiplash hair, gonocoxites with short hairs at the ventral inner margin.

Distribution. Hawai'i; New Caledonia; Seychelles Islands; Tristan da Cunha.

Scatopsiara Edwards, 1927

Type species: *Sciara quinquelineata* Macquart, 1834: 149 (= *Sciara vitripennis* Meigen, 1818).

Literature: Tonnoir & Edwards (1927): 798 (as subgenus of *Sciara* Meigen); Tuomikoski 1960: 150–156; Menzel & Mohrig (2000): 480–508; Mohrig (2004): 166–168; Vilkamaa *et al.* (2012d): 67–74.

Scatopsiara hardyi sp. n.*

(Fig. 18 A–C)

Material: **Holotype:** Male, 1.-13.viii.1997, Hawaiian Islands; O'ahu, 'Ewa, suburban area, Malaise trap, leg. Gonzales (BPBM).

Description. Male. **Head.** Eye bridge 2–3 facets wide. 4th flagellomere with a l/w-index of 2.4, haired as long as width of basal node. Palpus 3-segmented, short; basal segment with a small shallow sensory pit and 1 bristle. **Thorax.** Brown. Scutum with brownish hairs. Wing pale; R₁ short = 1/3 R; c somewhat longer than 1/2 w; y short = 1/2 x, bare; posterior veins bare. Haltere short, brownish. Legs paler than thorax; tibial organ small, comb-like; spurs of middle and hind tibia with two long but unequal spurs; claws toothless. **Abdomen.** Brown. Hypopygium brown, ventral base more densely haired than the inner ventral margin of the gonocoxites; gonocoxites longer than the gonostylus; gonostylus elongate, slightly pointed towards the apex and bulbous in the middle of the inner sides, without an apical tooth but with 3 equal spines at the apex. Tegmen large, wider than long. Aedeagus rather short, with a distinct furca. Body size: 1.2 mm.

Comments. The species is characterized by a short palpus with a shallow sensory area, wings with a short y and a rather short C, hypopygium with an elongate gonostylus, bulbous in the middle of the inner side, without an apical tooth but with 3 equally long spines.

Distribution. Hawaiian Islands (O'ahu).

*The species is named in honour of D. Elmo Hardy (3 September 1914–17 October 2002), (Figure 1).

Scatopsiara hoyti (Hardy, 1956) comb. n.

(Fig. 19 A–B, 20 A–D)

Sciara (*Lycoriella*) *hoyti* Hardy, 1956 [Hardy 1956: 80–82, fig. 6 a–c].

Literature: Hardy (1960): 224–225, fig. 72a–c (as *Sciara* (*Lycoriella*) *hoyti*; Steffan (1973a): 357 (as *Lycoriella* (*Lycoriella*) *hoyti*); Steffan (1974b): 46–47 (as *Lycoriella hoyti*).

Material studied: **Holotype:** Male, 29.x.1952, Hawai'i I, Keanakolu, 1585 m, leg. C.P. Hoyt (BPBM, No. 2493); 2 males, 28.xii.2000, Hawai'i, Maui I., Hana, rain forest, caught by net, leg. W. Mohrig (PWMP).

Conservation status. Holotype is embedded in Canada balsam, head, antennae, palpus and wings isolated, wings under a separate cover slip. All morphological structures are in quite good condition.

= *Scatopsiara spiculata* Vilkamaa, Hippa & Mohrig, 2012 syn. n.

Scatopsiara spiculata Vilkamaa, Hippa & Mohrig, 2012 [Vilkamaa *et al.* (2012d): 69–70, fig. 2 A–D]

Comments. The species was combined by Steffan (1973a) erroneously into the genus *Lycoriella* near the species *L. pallidor* Tuomikoski. The rather short antenna, short palpus with a weakly deepened sensory pit, wing with short R₁, fore tibia with a comb-like row of bristles, without a horseshoe-shaped border and gonostylus with an apical tooth and subapical spines, but without a whiplash hair on the inner side suggests it belongs to the genus

Scatopsciara Edwards. The species is characterized by the gonostylus narrowed towards the apex with a strong apical tooth and 4 subapical spines, one spine near the base of the tooth, three spines separated in a row in the distal half of the inner side. The hypopygium of the type is somewhat depressed, so that the three spines on the inner side of the gonostylus seem to be inserted on an exposed keeled base (see Steffan's comparison to *L. pallidor* Tuomikoski). The two specimens from Maui represent the real morphological shape. It is conspecific with *Sc. spiculata* Vilkamaa, Hippa & Mohrig from New Caledonia (Vilkamaa *et al.* 2012d). The specimens from New Caledonia show apicolateral corners, which could be artefacts, due to flipped margins. The nodes of the flagellomeres seem to be somewhat more robust however all other morphological details are completely identical.

Distribution. Hawai'i; New Caledonia.

Scatopsciara (Scatopsciara) nigrita Hardy, 1956

(Fig. 21 A–C)

Scatopsciara (Uddmaniella) nigrita Hardy, 1956 [Hardy (1956): 86–89, fig. 11 a–d].

Literature: Hardy (1960): 231–232, fig. 78 a–d.

Material studied: Holotype: Male, 14.iii.1953, Hawai'i, O'ahu, Palolo Valley, reared from rotting *Plumeria*, leg. C.P. Hoyt [BPBM, No. 2488 in the literature (on slide 2388 and 2488)].

Further material: 2 males, 28.xii.2000, Hawai'i, Maui, Hana, rain forest, caught by net, leg. W. Mohrig (PWMP).

Conservation status. Embedded in Canada balsam. Head, palpus, antennae and wings isolated with wings under a separate cover slip. All morphological structures are in good condition.

Comments. The species is characterized by a short 3-segmented palpus with a large basal segment, fore tibia with a small comb-like row of bristles, a short R_1 , hypopygium with a bare intergonocoxal space and short and sparse hairs on the inner ventral margin of the gonocoxites; gonostylus small, pointed to the apex, with a short apical tooth and 4 long subapical spines; a wide and flat tegmen, and short aedeagus.

Distribution. Hawaiian Islands (O'ahu, Maui).

Scatopsciara steffani Mohrig, Kauschke & Broadley sp. n.*

(Fig. 22 A–C)

Material: **Holotype:** Male, 6.xii.1992, Galápagos Islands, Isabela I., Sierra Negra, Pozzo del Cura, 700 m, net, leg. Ger (PWMP). **Paratype:** 1 male, 1–13.viii.1997, Hawaiian Islands; O'ahu, 'Ewa, suburban area, Malaise trap, leg. Gonzales (PWMP).

Description. Male. **Head.** Eye bridge 2–3 facets wide. 4th flagellomere with a l/w-index of 2.6, with hairs longer than the diameter of the basal node and a rather long neck. Palpus rather short, 3-segmented, basal segment with a small and slightly deepened sensory pit and 1 bristle. **Thorax.** Brown. Scutum with brownish hairs. Wing slightly brownish; R_1 short; c much longer than $\frac{1}{2}$ w; y short = $\frac{1}{2}$ x, bare; posterior veins bare and clearly visible. Haltere short, brownish. Legs somewhat paler than thorax; tibial organ small, comb-like; spurs of middle and hind tibia with two long but unequal spurs; claws toothless. **Abdomen.** Brown. Hypopygium brown, ventral base and the inner ventral margin of gonocoxites sparsely haired; gonocoxites longer than gonostylus; gonostylus elongate, somewhat club-shaped, not bulbous in the middle of the inner sides; without an apical tooth but with 4 equal apical/subapical spines between dense bristle-like hairs on the apex. Tegmen large, wider than high. Aedeagus long, with a distinct furca. Body size: 1.5 mm.

*The species is named in honour of Wallace A. Steffan (20 August 1934–30 September 2016).

Comments. The species is characterized by a rather short palpus with a distinctly deepened sensory area, a short y, long C, hypopygium with an elongate, somewhat club-shaped gonostylus without an apical tooth but with 4 subequal spines between bristle-like hairs at the apex.

Distribution. Hawaiian Islands (O'ahu); Galápagos Islands (Isabela I.).

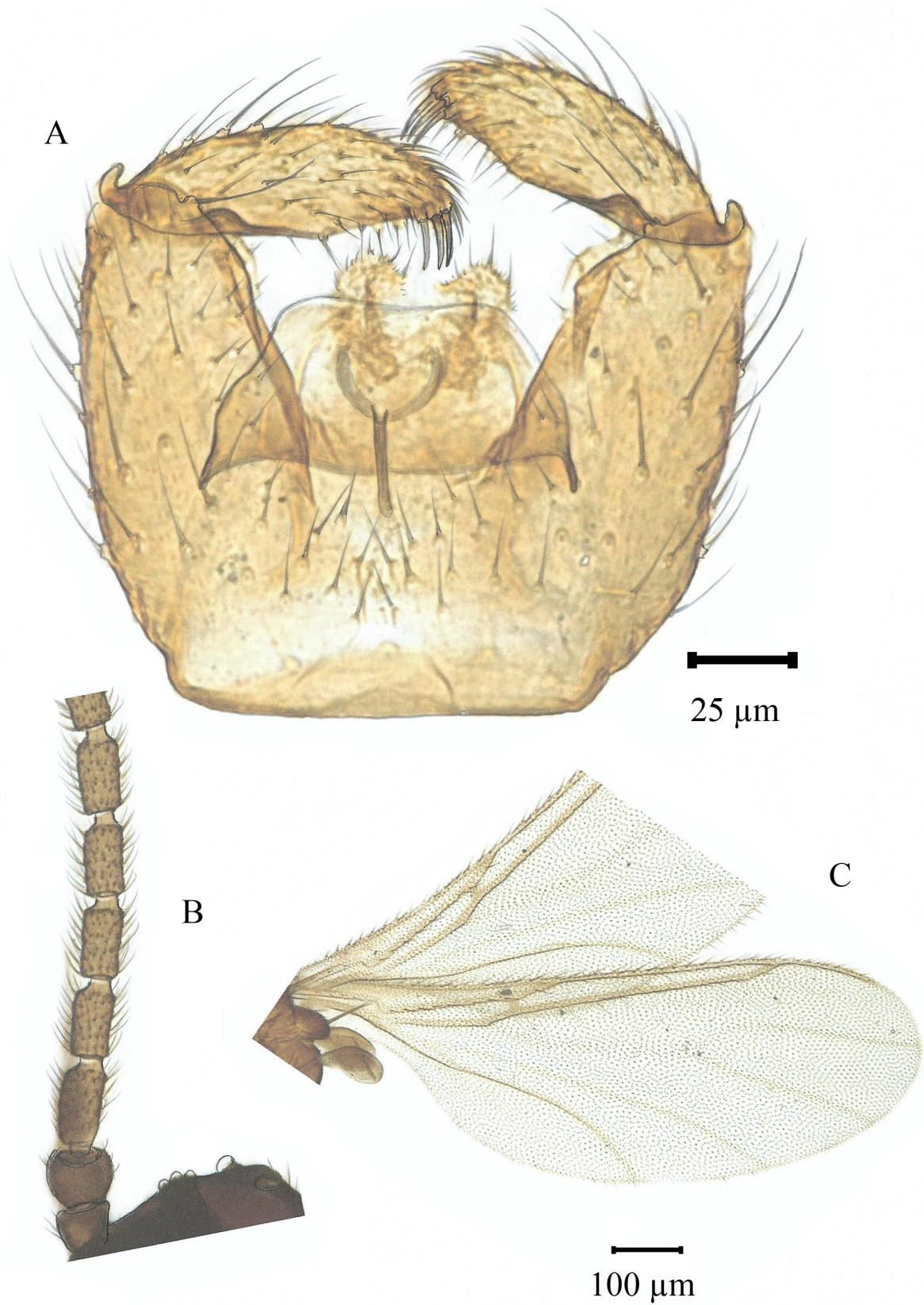


FIGURE 18 A–C. *Scatopsciara hardyi* sp. n. A. Holotype. Hypopygium; B. Basal segments of antenna; C. Wings.

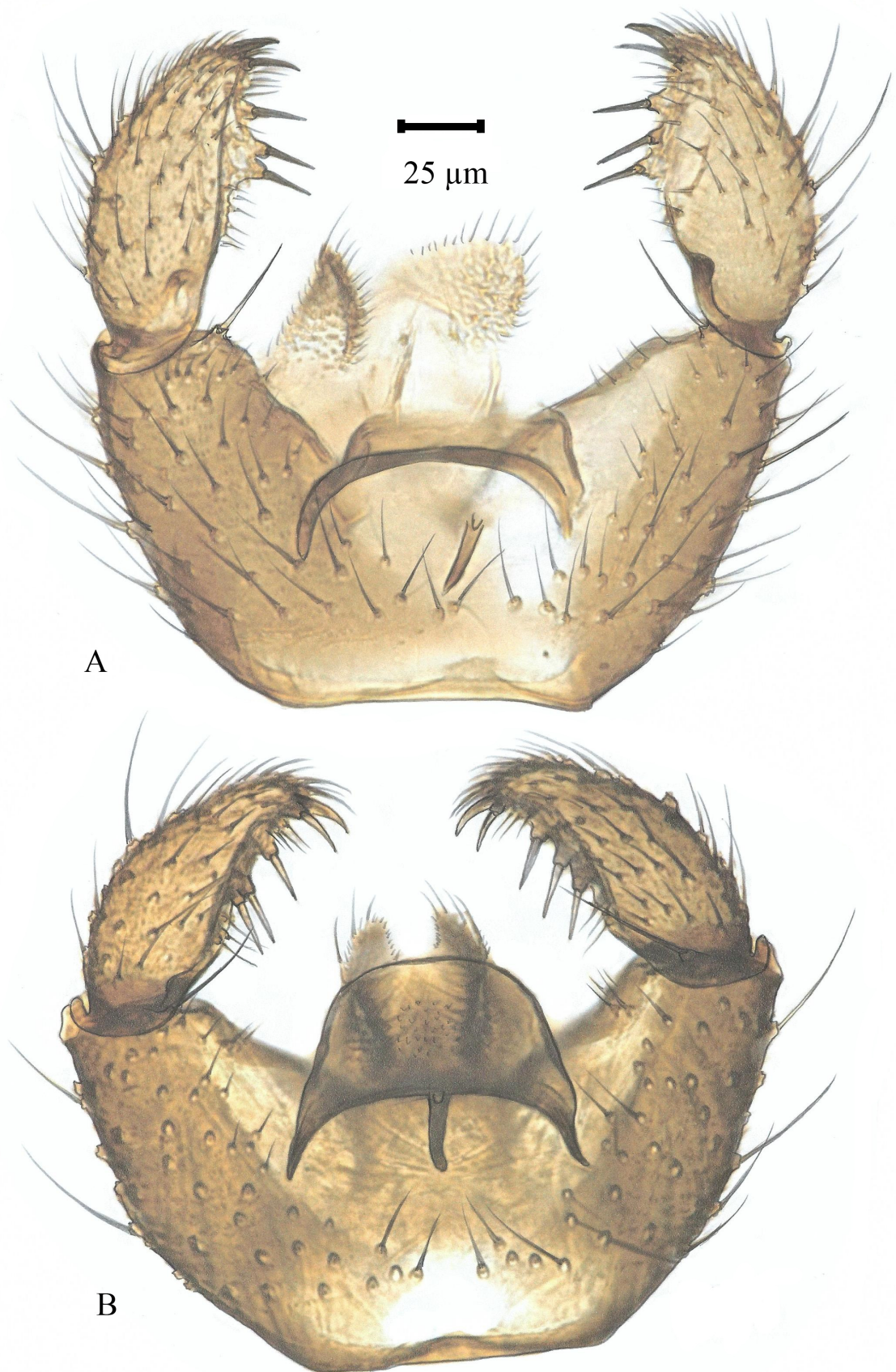


FIGURE 19 A–B. *Scatopsciara hoyti* (Hardy, 1956). A. Hypopygium (holotype); B. Hypopygium (specimen from Maui).

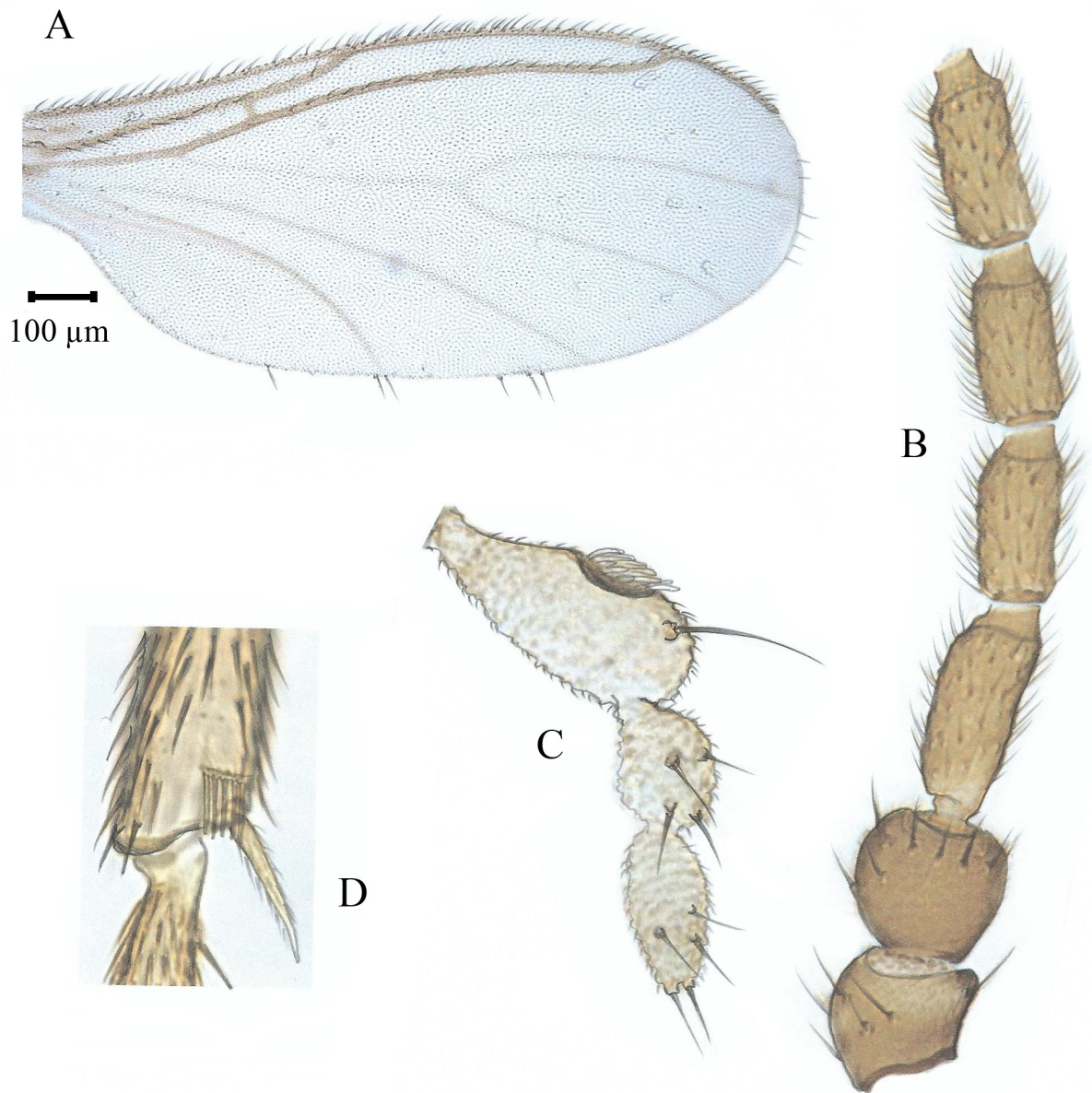


FIGURE 20 A–D. *Scatopsciara hoyti* (Hardy, 1956). Holotype. A. Wing; B. Basal segments of antenna; C. Palpus; D. Apex of fore tibia.

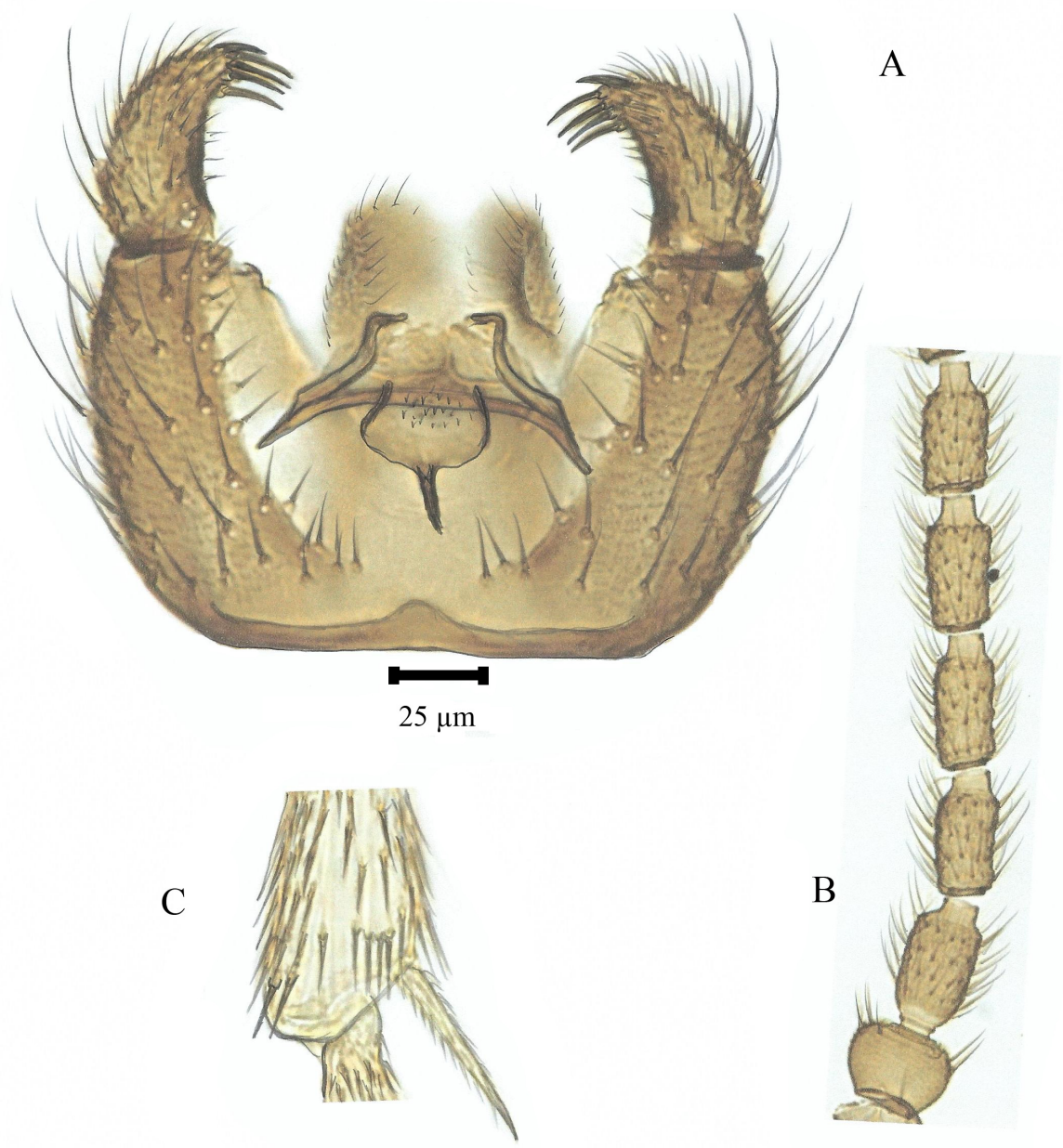


FIGURE 21 A–C. *Scatopsiara nigrita* Hardy, 1956. Holotype. A. Hypopygium; B. Basal segments of antenna; C. Apex of fore tibia.

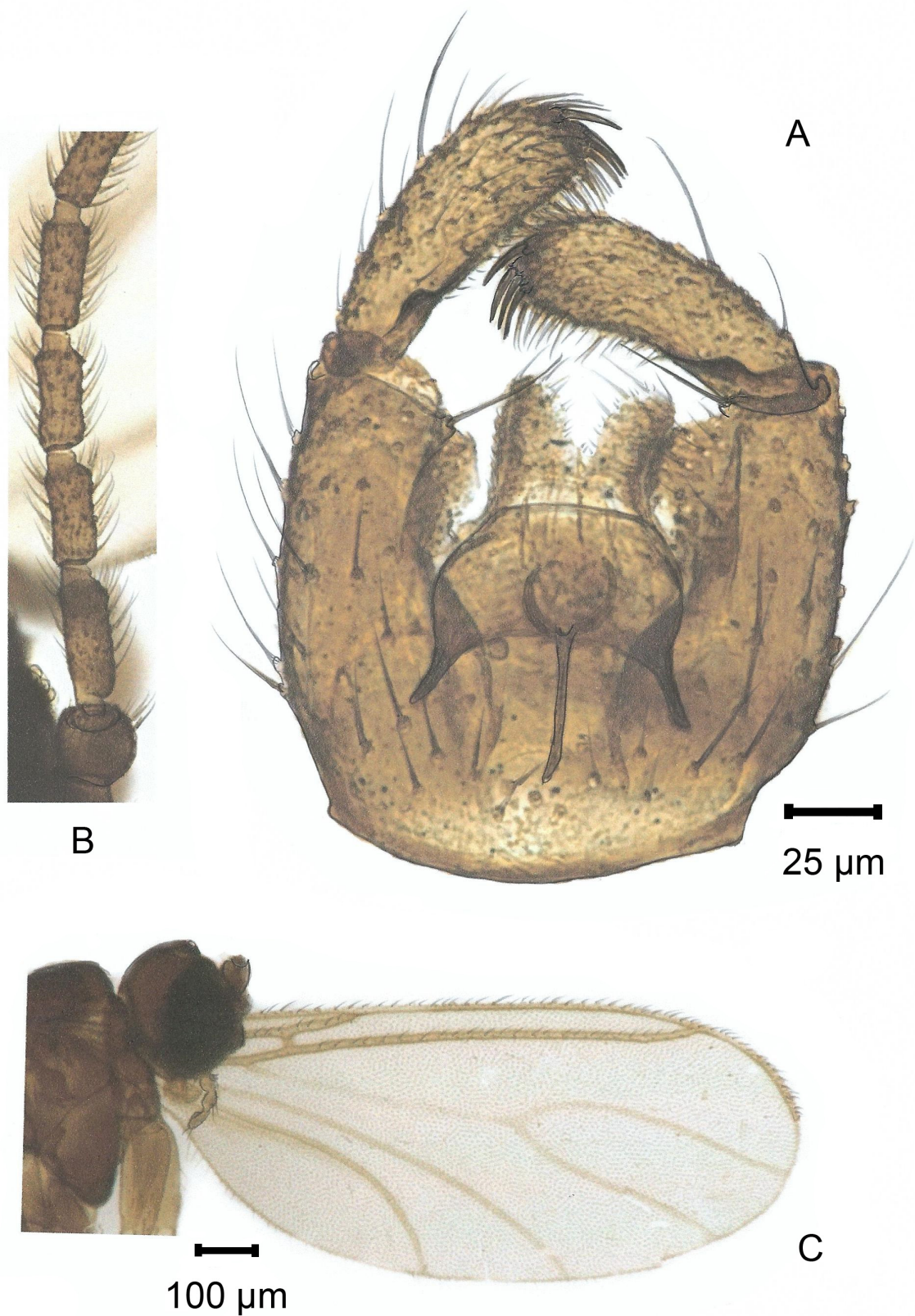


FIGURE 22 A–C. *Scatopsciara steffani* sp. n. Holotype. A. Hypopygium; B. Basal segments of antenna; C. Wing.

Species list

Bold = valid species

adrostylata (Hardy, 1956) (*Cratyna*) **comb. n.**
aspercera Mohrig, 2015, **syn. n.** of *crassicornis* (Skuse, 1890) (*Bradysia*)
bishopi Steffan, 1973 (*Bradysia*)
brevicalcarata (Hardy, 1956), **syn.** of *hartii* (Johannsen) (*Cosmosciara*)
centidens Vilkamaa, Hippa & Mohrig, 2012, **syn.** of *bishopi* Steffan (*Bradysia*)
crassicornis (Skuse, 1890) (*Bradysia*)
gladiota Mohrig, 2004, **syn. n.** of *prominens* Hardy, 1956 (*Corynoptera*)
hardyi Mohrig, Kauschke & Broadley **sp. n.** (*Scatopsciara*)
hartii (Johannsen, 1912) (*Cosmosciara*)
hawaiiensis (Hardy, 1956) **comb. n.** (*Austrosciara*)
hoyti (Hardy, 1956) **comb. n.** (*Scatopsciara*)
impatiens (Johannsen, 1912) (*Bradysia*)
ingenua (Dufour, 1839) (*Lycoriella*)
latipons Hardy, 1956, **syn. n.** of *hartii* (Johannsen) (*Cosmosciara*)
latistylata (Hardy, 1956) (*Corynoptera*)
longicosta (Hardy, 1956) **comb. n.** (*Cratyna*)
magnisensoria Hardy, 1956, **syn. n.** of *wasmanni* (Schmitz) (*Hyperlasion*)
mali (Fitch, 1856), **syn.** of *ingenua* (Dufour, 1839) (*Lycoriella*)
molokaiensis (Grimshaw, 1901), **syn. n.** of *crassicornis* (Skuse) (*Bradysia*)
mutuata Mohrig, 2016, **syn.** of *bishopi* Steffan (*Bradysia*)
nigrita Hardy, 1956 (*Scatopsciara*)
nigrofemorialis Mohrig, Kauschke & Broadley **sp. n.** (*Pseudolycoriella*)
ocellaris (Comstock, 1882) (*Bradysia*)
pallidus (Séguy, 1961) (*Epidapus*), **new record**
perniciosa (Edwards, 1922), **syn.** of *hartii* (Johannsen) (*Cosmosciara*)
prominens (Hardy, 1956) **comb. n.** (*Corynoptera*)
radicum (Brunetti, 1912) (*Bradysia*)
sativae (Johannsen, 1912) (*Lycoriella*)
setigera (Hardy, 1960) (*Pseudolycoriella*)
solispina Hardy, 1956, **syn.** of *sativae* (Johannsen) (*Lycoriella*)
spatitergum (Hardy, 1956), **syn. n.** of *radicum* (Brunetti) (*Bradysia*)
spiculata Vilkamaa, Hippa & Mohrig, 2012, **syn. n.** of *hoyti* (Hardy) (*Scatopsciara*)
steffani Mohrig, Kauschke & Broadley **sp. n.** (*Scatopsciara*)
tritici (Coquillett, 1895), **syn.** of *ocellaris* (Comstock) (*Bradysia*)
vulcanata Steffan, 1973 (*Phytosciara*)
wasmanni Schmitz, 1918 (*Hyperlasion*)

Remarks on the sciarid fauna of the Galápagos Islands

The Galápagos Islands straddle the equator in the eastern Pacific Ocean, roughly 1000 km west of Ecuador. The archipelago is volcanic in origin, the oldest islands considered to be 3-4 million years old (Sinclair 2009), and consists of 123 islands, islets and rocky outcrops. There are 13 main islands, five of which (Baltra, Floreana, Isabela, San Cristobal and Santa Cruz) are permanently inhabited.

When compared to the fauna of Hawai'i, the Diptera fauna of the Galápagos Islands is regarded as depauperate (Sinclair 2009). Suggestions for why this is so are the overall aridity, distance from mainland Ecuador and difficulty for naturally dispersed taxa to establish (Sinclair 2009). Indeed, there are few published records of sciarids collected from the Galápagos Islands.

The first record was four *Sciara* sp. females collected by M. Willows Jr from Baltra (South Seymour) Island on

11 July 1932 (Curran 1934). The identity of this species remains uncertain (Sinclair, pers. comm.). It is interesting to note that aerial and sea surface (pleuston) nets suspended from boats sailing between islands of the Galápagos archipelago collected very large numbers of Sciaridae during a 1992 El Niño climatic event (Peck 1994a; 1994b). Most of these were reported to be females of an undetermined species of *Bradysia* (Sinclair, pers. comm.).

Bradysia bishopi Steffan (1973) [Steffan (1973a): 353–355, fig. 1 a–f].

Not studied. Reported from the Galápagos Islands by Causton *et al.* (2006): 135; Causton & Sevilla (2007): 145 (both as *Bradysia radicum*).

Bradysia ocellaris (Comstock, 1882)

Selected literature: Menzel *et al.* (2003): 454; Causton *et al.* (2006): 135; Causton & Sevilla (2007): 145.

1 male, 11.xii.1992, Floreana I., Quelle Finca Wittmer, caught by net, leg. Ger (PWMP).

Bradysia radicum (Brunetti, 1912)

4 males, 12.xii.1992, Floreana I., Quelle Finca Wittmer, caught by net, leg. Ger (PWMP). It is a new record for the Galápagos Islands.

Cosmosciara hartii (Johannsen, 1912)

Selected literature: Mohrig, 2003: 64 (as *Epidapus (Clandestina) perniciosus*); Causton *et al.*, 2006: 135.

1 male, 12.xii.1992, Floreana I., Quelle Finca Wittmer, caught by net, leg. Ger (PWMP).

Pseudolykoriella planiforceps (Steffan, 1971)

Eugnoriste planiforceps Steffan, 1971 [Steffan (1971): 54–57, fig. 1 a–l].

Selected literature: Causton *et al.* (2006): 135 (*Eugnoriste*); Mohrig *et al.* (2013): 229–230, fig. 47 a–f; Mohrig & Kauschke (2019): 271, fig. 8 A–D, Plate IV, Fig. VIII.

Material: 3 males, 23.iv.1992, Floreana I., Harbour with boats departing for Española I., caught by net; 1 male, 4.v.1992, Santa Fe I., Harbour with boats departing for Santa Cruz, caught by net, leg. S. Peck; 1 female, 12.xii.1992, Floreana I., Quelle Finca Wittmer, caught by net, leg. Ger. (PWMP, 1 male in PABM).

Scatopsciara steffani Mohrig, Kauschke & Broadley **sp. n.**

(Fig. 22 A–C)

Material: 1 male, 6.xii.1992, Galápagos Islands, Isabela I., Sierra Negra, Pozzo del Cura, 700 m, net, leg. Ger (PWMP).

List of Galápagos species

bishopi Steffan, 1973 (*Bradysia*)

hartii (Johannsen, 1912) (*Cosmosciara*)

ocellaris (Comstock, 1882) (*Bradysia*)

planiforceps (Steffan, 1971) (*Pseudolykoriella*)

radicum (Brunetti, 1912) (*Bradysia*)

steffani Mohrig, Kauschke & Broadley **sp. n.** (*Scatopsciara*)

Acknowledgements

We thank Dr Neal Evenhuis and Jim Boone (Bernice P. Bishop Museum, Honolulu) for kindly loaning us a collection of slides including types; Dr Daniel Rubinoff and Dr Conrad Gillett, University of Hawai‘i at Mānoa for the loan of the *Bradysia molokaiensis* homotypes and for collecting fresh material; Dr Duncan Sivell, British

Museum of Natural History, London, United Kingdom, for the loan of the *Bradysia radicum* syntypes; and Dr Bradley Sinclair, Canadian Food Inspection Agency and Canadian National Collection of Insects, Ottawa, Canada for information in relation to the Galápagos records. We also thank Neal Evenhuis for kindly providing comments to help improve the manuscript.

References

- Broadley, A., Kauschke, E. & Mohrig, W. (2016) Revision of the types of male Sciaridae (Diptera) described from Australia by F.A.A. Skuse. *Zootaxa*, 4193 (3), 401–450.
<http://doi.org/10.11646/zootaxa.4193.3.1>
- Broadley, A., Kauschke, E. & Mohrig, W. (2018) Black fungus gnats (Diptera: Sciaridae) found in association with cultivated plants and mushrooms in Australia, with notes on cosmopolitan pest species and biosecurity interceptions. *Zootaxa*, 4415 (2), 201–242.
<https://doi.org/10.11646/zootaxa.4415.2.1>
- Brunetti, E. (1912) Diptera Nematocera (excluding Chironomidae and Culicidae). In: Shipley, A.E. (Eds.), *The fauna of British India, including Ceylon and Burma. Vol. 1.* Today & Tomorrows Printers & Publishers, New Delhi & London, pp. i–xii, 1–581.
<https://doi.org/10.5962/bhl.title.100757>
- Causton, C.E., Peck, S.B., Sinclair, B.J., Roque-Albelo, L., Hodgson, C.J. & Landry, B. (2006) Alien Insects: Threats and Implications for Conservation of Galápagos Islands. *Annals of the Entomological Society of America*, 99 (1), 121–143.
- Causton, C.E. & Sevilla, C.R. (2007) Latest records of introduced invertebrates in Galápagos and measures to control them. *Galápagos Report 2006–2007*, 142–145. Available from: <https://www.galapagos.org/wp-content/uploads/2012/04/biodiv9-introduced-invertebrates.pdf> (accessed 18 March 2019)
- Comstock, J.H. (1882) Report on miscellaneous insects. In: Riley, C.V., *Report of the Entomologist. Annual Report of the Department of Agriculture 1882 (1881)*. Government Printing Office, Washington, pp. 195–214.
- Curran, C.H. (1934) The Templeton Crocker Expedition of the California Academy of Sciences, 1932. No. 13 Diptera. *Proceedings of the California Academy of Science*, Series 2, 21 (13), 147–172.
- De Geer, K. (1778) *Mémoires pour servir à l'histoire des insectes* 7. Imprimerie de Pierre Hesselberg, Stockholm, 950 pp.
- Dufour, L. (1839) Mémoire sur les métamorphoses de plusieurs larves fongivores appartenant à des Diptères. *Annales des Sciences Naturelles*, Série 2, Zoologie, 12, 5–60.
- Edwards, F.W. (1922) A third new British *Plastosciara* (Diptera, Sciaridae). *Entomologists monthly magazine*, 58, 160–161.
<https://doi.org/10.5962/bhl.part.10330>
- Edwards, F.W. (1928) Fasc. 2. Nematocera. In: The Trustees of the British Museum (1927–1935) (Ed.), *Insects of Samoa and other Samoan terrestrial arthropoda. Part VI. Diptera*. The British Museum (Natural History), London, pp. 23–102.
- Edwards, F.W. (1935a) Some Tahitian Mycetophilidae and Chironomidae. *Bulletin Bernice P. Bishop Museum*, 113, 85–86.
- Edwards, F.W. (1935b) Mycetophilidae, Culicidae and Chironomidae and additional records of Simuliidae, from the Marquesas Islands. *Bulletin Bernice P. Bishop Museum*, 114, 85–92.
- Eldredge, L.G. & Evenhuis, N.L. (2003) Hawaii's Biodiversity: A Detailed Assessment of the Numbers of Species in the Hawaiian Islands. *Records of the Hawaii Biological Survey for 2001–2002. Bishop Museum Occasional Papers*, 76, 1–30.
- Evenhuis, N.L. (2004) Biography of D. Elmo Hardy (1914–2002). In: Evenhuis, N.L. & Kaneshiro, K.Y. (Eds.), *D. Elmo Hardy Memorial Volume. Contributions to the Systematics and Evolution of Diptera. Bishop Museum Bulletin in Entomology*, 12, pp. 1–11. Available from: <http://hbs.bishopmuseum.org/pubs-online/pdf/be12-1.pdf> (accessed 26 Apr. 2019)
- Evenhuis, N.L. (2008) A Compendium of Zoological Type Nomenclature: a Reference Source. *Bishop Museum Technical Report*, 41, 1–23. Available from: <http://hbs.bishopmuseum.org/publications/pdf/bm-tp41.pdf> (accessed 26 Apr. 2019)
- Evenhuis, N.L. (2009) Chapter 10. Hawaii's Diptera Biodiversity. In: Pape, T., Bickel, D. & Meyer, S. (Eds.), *Diptera Diversity: Status, Challenges and Tools*. Brill, Leiden, pp. 47–70.
<https://doi.org/10.1163/ej.9789004148970.1-459.11>
- Frey, R. (1942) Entwurf einer neuen Klassifikation der Mückenfamilie (Sciaridae, Lycoriidae). *Notulae Entomologicae Helsingfors*, 22, 5–44.
- Frey, R. (1945) Tiergeographische Studien über die Dipterenfauna der Azoren. 1. Verzeichnis der bisher von den Azoren bekannten Dipteren. *Societas Scientiarum Fennica Commentationes biologicae*, 8 (10), 1–114.
- Frey, R. (1948) Entwurf einer neuen Klassifikation der Mückenfamilie Sciaridae (Lycoriidae). II. Die nordeuropäischen Arten. *Notulae Entomologicae*, 27 (2–4), 33–112.
- Grimshaw, P.H. (1901) Diptera. In: Sharp, D. (Ed.), *Fauna Hawaiiensis*. 3 (1–4). The University Press, Cambridge, pp. 1–77.
- Hardy, D.E. (1956) New Hawaiian Sciaridae (Diptera). *Proceedings of the Hawaiian Entomological Society*, 16 (1), 72–90.
- Hardy, D.E. (1960) Family Sciaridae. In: Zimmerman, E.C. (Ed.), *Insects of Hawaii. A Manual of the Insects of the Hawaiian Islands, including an Enumeration of the Species and Notes on their Origin, Distribution, Hosts, Parasites etc.* 10. University Hawaii Press, Honolulu, pp. 208–235.

- Hippa, H. & Vilkkamaa, P. (1991) The genus *Prosciara* Frey (Diptera, Sciaridae). *Entomologica Fennica*, 2 (3), 113–155.
- Hippa, H., Vilkkamaa, P. & Heinakroon, A. (1998) The genus *Pseudozygoneura* Steffan (Diptera, Sciaridae). *Acta Zoologica Fennica*, 210, 1–86.
- Hippa, H., Vilkkamaa, P. & Heller, K. (2010) Review of the Holarctic *Corynoptera* Winnertz 1867, s. str. (Diptera, Sciaridae). *Zootaxa*, 2695 (1), 1–197.
<https://doi.org/10.11646/zootaxa.2695.1.1>
- Huang, J., Shi, K., Li, Z. & Wu, H. (2015) Review of the genus *Pseudozygoneura* Steffan (Diptera, Sciaridae) from China. *Entomological News*, 125 (2), 77–95.
<https://doi.org/10.3157/021.125.0201>
- Johannsen, O.A. (1912) The fungus gnats of North America, Part IV. *Bulletin of the Maine Agricultural Experimental Station*, 200, 57–146.
<https://doi.org/10.5962/bhl.title.86614>
- Johannsen, O.A. (1925) A new sciarid from the Eastern United States (Dipt.: Mycetophilidae). *Entomological News*, 36 (9), 266–267.
- Köhler, A. & Menzel, F. (2013) New records of Black Fungus Gnats (Diptera: Sciaridae) from New Caledonia, with the description of two new *Bradysia* species and an updated checklist. *Zootaxa* 3718 (1), 63–72.
<http://dx.doi.org/10.11646/zootaxa.3718.1.5>
- Köhler, A. & Mohrig, W. (2016) Additions to the New Zealand fauna of black fungus gnats (Diptera: Sciaridae), with descriptions of six new species. *New Zealand Entomologist*, 39 (2), 99–109.
<https://doi.org/10.1080/00779962.2016.1153233>
- Lengersdorf, F. (1926) Die Sciariden des Naturhistorischen Museums in Wien. *Konowia*, 5 (3), 247–255.
- Lengersdorf, F. (1940) Beitrag zur Kenntnis der Sciariden (Lycoriiden) aus Finnland. *Zoologischer Anzeiger*, 131 (1–2), 23–29.
- Macquart, J.P.M. (1834) Histoire naturelle des insectes. Diptères. Tome 1, Librairie encyclopédique de Rore, Paris, 578 pp.
- Meigen, J.W. (1818) *Systematische Beschreibung der bekannten europäischen zweiflügeligen Insekten 1: v-xxxvi*. Friedrich Wilhelm Forstmann, Aachen, 332 pp.
- Menzel, F. & Heller, K. (2005) Sechs neue Arten aus den Gattungen *Bradysia*, *Camptochaeta* und *Corynoptera* (Diptera: Sciaridae) nebst einigen Bemerkungen zur Nomenklatur europäischer Trauermücken. *Studia dipterologica* 11 (2), 335–357. [2004]
- Menzel, F. & Heller, K. (2007) Bemerkungen zur Nomenklatur der Sciariden (Diptera, Bibionomorpha: Sciaridae). *Studia dipterologica*, 13 (2), 209–229. [2006]
- Menzel, F. & Mohrig, W. (1998) Beiträge zur Taxonomie und Faunistik der paläarktischen Trauermücken (Diptera, Sciaridae). Teil VI. Neue Ergebnisse aus Typenuntersuchungen und die daraus resultierenden taxonomisch-nomenklatorischen Konsequenzen. *Studia dipterologica*, 5 (2), 351–378.
- Menzel, F. & Mohrig, W. (2000) Revision der paläarktischen Trauermücken (Diptera: Sciaridae). *Studia dipterologica*, 6 (Supplement), 1–761.
- Menzel, F. & Smith, J.E. (2009) Family Sciaridae. In: Gerlach, J. (Ed.), *The Diptera of the Seychelles islands. Pensoft Series Faunistica 85*. Pensoft Publishers, Sofia & Moscow, pp. 19–45.
- Menzel, F., Smith, J.E. & Colauto, N.B. (2003) *Bradysia difformis* Frey and *Bradysia ocellaris* (Comstock): two additional Neotropical species of Black Fungus Gnats (Diptera: Sciaridae) of economic importance: a redescription and review. *Annals of the Entomological Society of America*, 96 (4), 448–457.
- Menzel, F., Vilkkamaa, P. & Smith, J.E. (2013) Overview of the Black Fungus Gnats from the Tristan da Cunha archipelago, including a redescription of *Hyperlasion viridiventris* (Frey) (Diptera, Sciaroidea: Sciaridae). *Contributions to Entomology*, 63 (2), 283–296.
- Mohrig, W. (1999) Die Trauermücken (Diptera: Sciaridae) von Papua-Neuguinea. Teil I. Gattungen *Sciara*, *Schwenckfeldina*, *Aerumnosa* gen. nov., *Cratyna*, *Phytosciara* und *Chaetosciara*. *Studia dipterologica*, 6 (1), 153–203.
- Mohrig, W. (2003) Black fungus gnats of Central America. Part I. (Diptera, Sciaridae). *Beiträge zur Entomologie*, 53 (1), 1–69.
- Mohrig, W. (2004) Die Trauermücken (Diptera: Sciaridae) von Papua-Neuguinea. Teil II. Gattungen *Scythropochroa*, *Cratyna*, *Pseudozygomma*, *Epidapus*, *Hyperlasion*, *Corynoptera*, *Keilbachia*, *Scatopsiara*, *Pelliciplanta* gen. nov. und *Pseudozygomma* gen. nov. *Studia dipterologica*, 11 (1), 129–174.
- Mohrig, W. (2013) Die Trauermücken (Diptera: Sciaridae) von Papua-Neuguinea. Teil III - Gattungen *Ctenosciara* und *Pseudolycoriella*. *Studia dipterologica*, 20 (1), 123–168.
- Mohrig, W. (2016) Die Trauermücken (Diptera: Sciaridae) von Papua-Neuguinea. Teil IV. Gattungen *Bradysia* und *Chiasmata* gen. nov. *Studia dipterologica*, 22 (1), 3–38. [2015]
- Mohrig, W., Heller, K., Hippa, H., Vilkkamaa, P. & Menzel, F. (2013) Revision of Black Fungus Gnats (Diptera: Sciaridae) of North America. *Studia dipterologica*, 19 (1–2), 141–286.
- Mohrig, W. & Jaschhof, M. (1999) *Sciarid flies (Diptera, Sciaridae) of New Zealand*. *Studia dipterologica*, 7 (Supplement), 1–110.
- Mohrig, W. & Kauschke, E. (2019) New Black Fungus Gnats (Diptera, Sciaridae) of North America. Part V. Genera *Pseudolycoriella* Menzel & Mohrig and *Phytosciara* Frey. *Zootaxa* 4543 (2), 261–283.
<https://doi.org/10.11646/zootaxa.4543.2.5>
- Mohrig, W., Kauschke, E. & Broadley, A. (2016) *Pseudolycoriella skusei* sp. nov. (Diptera: Sciaridae), a new dark-winged

- fungus gnat from Norfolk Island and Australia. *Zootaxa*, 4097 (1), 139–142.
<https://doi.org/10.11646/zootaxa.4097.1.11>
- Mohrig, W., Kauschke, E. & Broadley, A. (2017a) Black fungus gnats (Diptera: Sciaridae) of Queensland, Australia. Part I. Genera *Chaetosciara* Frey, *Corynoptera* Winnertz, *Cratyna* Winnertz, *Epidapus* Haliday, *Keilbachia* Mohrig, *Lobosciara* Steffan, *Phytosciara* Frey and *Scatopsiara* Edwards. *Zootaxa*, 4303 (4), 451–481. <http://doi.org/10.11646/zootaxa.4303.4.1>
- Mohrig, W., Kauschke, E. & Heller, K. (2017b) *Austrosciara* Schmitz & Mjöberg, 1924, a senior synonym of *Ctenosciara* Tuomikoski, 1960 (Diptera: Sciaridae) and the description of a new brachypterous species in the genus. *Zootaxa*, 4344 (2), 357–366. <https://doi.org/10.11646/zootaxa.4344.2.10>
- Mohrig, W., Kauschke, E. & Broadley, A. (2018) New black fungus gnats (Diptera: Sciaridae) from Eastern Australia. *Zootaxa*, 4450 (2), 203–241. <https://doi.org/10.11646/zootaxa.4450.2.3>
- Mohrig, W. & Menzel, F. (1994) Revision der paläarktischen Arten von *Phytosciara* Frey (Diptera: Sciaridae). *Beiträge zur Entomologie*, 44 (1), 167–210.
- Mohrig, W. & Menzel, F. (2014) Revision der neotropischen Trauermücken - Teil I. Die Gattungen *Cratyna* Winnertz, *Euricrium* Enderlein, *Metangela* Rübsaamen, *Pseudosciara* Schiner und *Sciara* Meigen (Diptera: Sciaridae). *Contributions to Entomology*, 64 (1), 135–190.
- Mohrig, W., Menzel, F. & Kozánek, M. (1992) Neue Trauermücken (Diptera, Sciaridae) aus Nord-Korea und Japan. *Dipterological Research*, 3 (1–2), 17–32.
- Mohrig W., Röschmann F. & Rulik, B. (2004) The fauna of sciarid flies from the Dominican Republic (Diptera, Sciaridae). *Beiträge zur Entomologie*, 54 (2), 267–331.
- Peck, S.B. (1994a) Aerial Dispersal of Insects between and to Islands in the Galápagos Archipelago, Ecuador. *Annals of the Entomological Society of America*, 87 (2), 218–224.
<https://doi.org/10.1093/aesa/87.2.218>
- Peck (1994b) Sea-Surface (Pleuston) Transport of Insects Between Islands in the Galápagos Archipelago, Ecuador. *Annals of the Entomological Society of America*, 87 (5), 576–582.
- Rudzinski, H.G. (1993) Mitteilungen über Trauermücken aus Frankreich (Diptera: Nematocera: Sciaridae). *Entomologische Zeitschrift*, 103 (23), 444–452.
- Rudzinski, H.G. (2003) Neue Arten der Gattung *Pseudolykoriella* Menzel & Mohrig, 1998 aus Afrika (Diptera Nematocera: Sciaridae). *Entomofauna*, 24 (5), 97–119.
- Schmitz, H. (1918) Neue Beiträge zur Kenntnis der Sciariden mit reduzierten Maxillarpalpen. *Tijdschrift voor Entomologie*, 61 (1–2), 88–111.
- Schmitz, H. & Mjöberg, E. (1924) Results of Dr. E. Mjöberg's Swedish scientific expeditions to Australia 1910–13. 35. Sciaridae und Phoridae. *Arkiv för Zoologi*, 16 (9), 1–8.
- Séguy, E. (1961) Un Lycoriidae aptere de la Guinée (Insectes Dipteres Nematoceres). *Bulletin du Museum national d'Histoire naturelle*, Series 2, 35 (5) (1960), 415–417.
- Shaw, F.R. (1952) New Sciaridae from the Hawaiian Islands (Diptera). *Proceedings of the Hawaiian Entomological Society*, 14 (3), 491–496.
- Shaw, F.R. (1953) A Review of some of the more important Contributions to our Knowledge of the systematic Relationships of the Sciaridae (Diptera). *Proceedings of the Hawaiian Entomological Society*, 15 (1), 25–32.
- Shin, S., Menzel, F., Heller, K., Lee, H. & Lee, S. (2014) Review of the genus *Cratyna* Winnertz (Diptera: Sciaridae) in Korea, including the description of a new species. *Zootaxa*, 3794 (3), 344–354.
<https://doi.org/10.11646/zootaxa.3794.3.2>
- Sinclair, B.J. (2009) Dipteran biodiversity of the Galápagos. In: Pape, T., Bickel, D. & Meier, R. (Eds.) *Diptera Diversity – Status, Challenges and Tools*. Brill, Leiden, pp. 98–117.
<https://doi.org/10.1163/ej.9789004148970.I-459.21>
- Skuse, F.A.A. (1888) Diptera of Australia. Part II. – The Sciaridae. *Proceedings of the Linnean Society of New South Wales*, 2 (3), 657–726.
- Skuse, F.A.A. (1890) Diptera of Australia. Nematocera. – Supplement I. *Proceedings of the Linnean Society of New South Wales*, 2 (5), 373–413.
<https://doi.org/10.5962/bhl.part.18643>
- Steffan, W.A. (1964) Insects of Campbell Island. Diptera: Sciaridae. *Pacific Insects Monograph*, 7, 292–299.
- Steffan, W.A. (1966) A generic revision of the family Sciaridae (Diptera) of America north of Mexico. *University of California Publications in Entomology*, 44, 1–77.
- Steffan, W.A. (1968) Redescription of *Bradysia spatitergum* (Hardy) and new records from Panama and Brazil (Diptera: Sciaridae). *Pacific Insects*, 10 (3–4), 515–519.
- Steffan, W.A. (1969) Insects of Micronesia. Diptera: Sciaridae. *Insects of Micronesia*, 12 (7), 669–732.
- Steffan, W.A. (1970) Diptera: Sciaridae of South Georgia. *Pacific Insects Monograph*, 23, 277–281.
- Steffan, W.A. (1971) North American Sciaridae, II. A new species of *Eugnoriste* from Texas (Diptera). *Proceedings of the Entomological Society of Washington*, 73 (1), 54–57.
- Steffan, W.A. (1972a) *Lycoriella solani* (Winnertz) from the Crozet Islands (Diptera: Sciaridae). *Pacific Insects*, 14 (2), 429–431.

- Steffan, W.A. (1972b) Oriental Sciaridae (Diptera) I. Redescription and review of species described by Edwards and Brunetti. *Pacific Insects*, 14 (3), 589–605.
- Steffan, W.A. (1973a) Notes on Hawaiian Sciaridae (Diptera) and descriptions of two new species. *Pacific Insects*, 15 (3–4), 353–361.
- Steffan, W.A. (1973b) Polymorphism in *Plastosciara pernicioso*. *Science*, 182, 1265–1266.
<https://doi.org/10.1126/science.182.4118.1265>
- Steffan, W.A. (1974a) Laboratory studies and ecological notes on Hawaiian Sciaridae (Diptera). *Pacific Insects*, 16 (1), 41–50.
- Steffan, W.A. (1974b) Redescription of *Bradysia tritici* and *Bradysia reynoldsi* (Diptera: Sciaridae). *Proceedings of the Hawaiian Entomological Society*, 21 (3), 467–474.
- Steffan, W.A. (1976) Catalog of entomological types in the Bernice P. Bishop Museum. Diptera: Sciaridae. *Pacific Insects*, 17 (1), 47–50.
- Steffan, W.A. (1989) 11. Family Sciaridae. In: Evenhuis, N.L. (Ed.), *Catalog of the Diptera of the Australasian and Oceanian Regions*. 86. Bishop Museum Special Publication, Bishop Museum Press & E.J. Brill, Honolulu, pp. 146–151.
- Tonnoir, A.L. & Edwards, F.W. (1927) New Zealand Fungus Gnats Diptera, Mycetophilidae). *Transactions and Proceedings of the New Zealand Institute*, 57, 747–878.
- Tuomikoski, R. (1960) Zur Kenntnis der Sciariden (Dipt.) Finnlands. *Annales Zoologici Societatis Zoologicae Botanicae Fennicae "Vanamo"*, 21 (4), 1–164.
- Vilkamaa, P. & Hippa, H. (2005) Phylogeny of *Peyerimhoffia* Kieffer, with the revision of the species (Diptera: Sciaridae). *Insect Systematics and Evolution*, 35 (4), 457–480.
- Vilkamaa, P., Hippa, H. & Mohrig, W. (2011) The genus *Keilbachia* Mohrig (Diptera, Sciaridae) in New Caledonia, with the description of five new species. *Zootaxa*, 2771 (1), 53–61.
<https://doi.org/10.11646/zootaxa.2771.1.5>
- Vilkamaa, P., Hippa, H. & Mohrig, W. (2012a) The genus *Pseudolycoriella* Menzel & Mohrig (Diptera, Sciaridae) in New Caledonia, with the description of thirteen new species. *Zootaxa*, 3207, 1–21.
- Vilkamaa, P., Hippa, H. & Mohrig, W. (2012b) The genus *Ctenosciara* Tuomikoski (Diptera, Sciaridae) in New Caledonia, with the description of eight new species. *Zootaxa*, 3255, 37–51.
- Vilkamaa, P., Hippa, H. & Mohrig, W. (2012c) The genus *Bradysia* Winnertz (Diptera, Sciaridae) in New Caledonia, with the description of thirteen new species. *Zootaxa*, 3489, 25–44.
- Vilkamaa, P., Hippa, H. & Mohrig, W. (2012d) The genus *Scatopsiara* Edwards (Diptera, Sciaridae) in New Caledonia, with the description of four new species. *Zootaxa*, 3591, 67–74.
- Vilkamaa, P., Hippa, H. & Mohrig, W. (2014) The genus *Epidapus* Haliday (Diptera, Sciaridae) in New Caledonia, with the description of four new species. *Zootaxa*, 3900 (3), 429–436.
<https://doi.org/10.11646/zootaxa.3900.3.6>
- Vilkamaa, P., Hippa, H. & Mohrig, W. (2015) The genus *Sciara* Meigen (Diptera, Sciaridae) in New Caledonia, with the description of two new species. *Zootaxa*, 3974 (4), 589–594.
<https://doi.org/10.11646/zootaxa.3974.4.10>
- Walker, F. (1848) *List of the specimens of dipterous insects in the collection of the British Museum. Vol. 1*. Printed by order of the Trustees, London, 229 pp.
- Walker, F. (1856) *Insecta Britannica. Diptera 3*. Lovell Reeve, London, 352 pp.
- Winnertz, J. (1867) *Beitrag zu einer Monographie der Sciarinen*. W. Braunmüller, Wien, 187 pp.