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NEW SPECIES OF *VOLUCELLA* FROM HAWAII AND THE UNITED STATES (SYRPHIDAE, DIPTERA)

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Up to the present time, the only volucelline fly recorded from Hawaii is *Ornidia obesa* Fabricius, which appears in the literature as *Volucella obesa*. This species is widely distributed in tropical America and over many of the Pacific islands. Study of a series of specimens from Mr. F. X. Williams, tentatively determined as *V. johnsoni* Curran, showed that two species were present in the lot, both different from any species from tropical America. However, representatives of one of them, captured in Lower California, have been received from Dr. E. S. Ross of the California Academy of Sciences.

Both species are related to the species I have determined as *tricincta* Bigot. In both there is a strong transverse depression before the apex of the scutellum. In one of the species there is a large, subtriangular depression on each side of the scutellum; in the second these are represented by weak transverse depressions. The species of *Volucella* with these characteristics are confined to tropical and subtropical America, so it is obvious that both species were introduced from America, but the manner in which they reached Hawaii is unknown.

Nothing is known about the biology of this group of species, but the adults have the habit of sitting on the tips of dead twigs, and they also spend the night in such places. I have never taken them at flowers, but most of the specimens captured in Hawaii were on flowers of *Hoya*.

The continental species included herein are common species represented in collections under the name *vesiculosa* Fabricius. *V. vesiculosa* is a South American species which apparently belongs to a different species group than the United States species. The types are in the American Museum of Natural History.

The following key will separate the volucelline flies so far known to occur in Hawaii:

1. Bright metallic green, blue or violaceous; face with lateral swellings.
..... *Ornidia obesa* Fabricius
Not bright metallic; face without lateral swellings; scutellum with preapical depression. 2
2. Scutellum with lateral depressions almost as long as wide; femora black on basal third or more; frontal triangle of male yellow.
..... *hoya*, new species
Scutellum with weak transverse lateral depressions; femora all reddish; frontal triangle of male black or brown. *dracaena*, new species

Volucella hoya, new species

Yellowish, with brown and ferruginous markings, the mesonotum trivittate; scutellum with three depressed areas, the lateral ones almost as long as wide; femora broadly shining black basally. Length, 6.5 to 7 mm.

MALE: Frontal triangle small, rusty yellowish, with whitish pile; vertical triangle black or brown, small, the pile white in front, rusty yellowish at the vertex. Occiput cinereous pollinose, with very short white pile, but it becomes longer towards the cheeks. Cheeks moderately wide, with long pile behind and extremely short pile in front. Face and cheeks reddish yellow, separated by a brown line that is usually obsolete towards the oral margin; face strongly produced downward and forward, sharply conical, with a large tubercle on the median third; upper concavity rather deep, white pollinose; pile rather sparse, white, more or less yellow on the tubercle. Antennae pale orange; the third segment slightly tapering, about two and one-half times

longer than wide; arista with the rays and apex black. Eyes thickly whitish pilose.

Thorax yellowish; disc of mesonotum with three ferruginous vittae, the lateral ones black or brown on the outer side, the median one shorter and broader and usually black or brown posteriorly; the dark color may extend over almost all of the vittae; the pectus is black and this color extends broadly to the posterior spiracle, which is brown. Pile whitish on the pleura, very pale brassy yellow on the mesonotum, a few black hairs towards the sides and a band of black hair before the scutellum. Scutellum brown or blackish, the sides and venter pale reddish; a large pyriform reddish spot covers the middle, its broad end covering the preapical depression, the narrow end reaching the very narrowly reddish base; the large lateral flattened areas are strongly roughened, the apical depression rather deep; hair whitish with slight brassy tinge; black on the sides. All the bristles on the thorax and scutellum are black.

Coxae yellow, the anterior pair more or less extensively brown apically, the middle pair usually brown on the outer half; femora black basally, the anterior pair on about the basal third, middle pair on slightly less than half, and the hind pair on somewhat more than the basal half, the apices reddish; tibiae brownish red, the apices more or less darkened; tarsi blackish, the base brownish yellow. Pile of the legs black, yellow on the coxae.

Wings cinereous hyaline, the veins bordered with brown, the cross veins at the middle of the wings a little more heavily bordered; stigmal spot brown; marginal cell closed and petiolate. Squamae with slight brown tinge, the fringe brown. Halteres white.

Abdomen rusty reddish yellow, the two basal segments yellow except laterally; the second segment with a blackish posterior fascia occupying the posterior third but not reaching the lateral margins; third segment with the posterior fifth and narrow lateral margins black, and with a broad, subbasal band on the median half, this band sometimes reduced in size; fourth segment with an irregular, incomplete,

subbasal brown band and an apical fascia that is widest in the middle, rarely produced forward to touch the anterior band. Pile whitish, somewhat brassy laterally. Venter yellow, white pilose, the fourth sternite brown or black and black haired. Genitalia large, reddish to ferruginous, the hair black.

FEMALE: Front brown or black, except on the narrow anterior border, the pile short and white. Anterior brown bands on segments three and four broader, the yellow band on the fourth narrower than either brown band; fifth segment all brown; pile shorter, black on the extreme lateral margins of the third and following segments.

TYPES: Holotype, male, Honolulu, March 3, 1946, at *Hoya* flowers (F. X. Williams); allotype, female, Mokuleia, Oahu, May, 1946 (R. H. Vanzwal); paratypes, three males, Honolulu, March 3, 1946, and February 3, 1946 (Williams); male and two females, Las Animas, Sierra Laguna, Lower California, October 12, 1941 (Ross and Bohart), and one male, July 26, 1938 (Michelbacher and Ross).

This species belongs in the group which includes *tricincta* Bigot, and it closely resembles certain forms of that species. It is readily distinguished by the whitish pilose front, large genitalia, and color of the femora.

***Volucella dracaena*, new species**

Rusty reddish or reddish yellow, the mesonotum with three ferruginous vittae; lateral depressions on the scutellum transverse, sometimes only faintly indicated; marginal cell open; legs dark reddish. Length, 5.5 to 7.5 mm.

MALE: Frontal and vertical triangles brown or blackish, pale yellowish pilose. Occiput cinereous to ochraceous pollinose, the pile pale yellowish, very short above; several black occipital cilia above. Cheeks moderately wide, sometimes brownish posteriorly, the hair brassy yellow, but there are usually some black hairs intermixed near the eyes. Face reddish yellow, strongly produced forward and downward, the tubercle of medium size; face and cheeks separated by a more or less distinct

brown line, the face moderately concave above; pile sparse, brassy yellow. Antennae reddish, the third segment about twice as long as wide; rays and apex of the arista black. Eyes with short, dense, reddish brown pile.

Thorax rusty reddish, the broad sides of the mesonotum luteous, the humeri pale yellow. Mesonotum with three ferruginous vittae, the median one short and usually gemminate. Pile black, on the disc of the mesonotum mostly brassy yellowish; wholly yellow adjacent to the humeri and on the propleura. Scutellum brown, somewhat metallic, with a large rusty reddish pale spot that varies somewhat in shape but is always narrower in front; sides of the thorax reddish; hair black, brownish red or yellow on the apex. The basal depressions are sometimes quite weak and never more than one-fourth as long as wide; the apical depression, when viewed from the side, is on a horizontal plane, not concave as in many of the species.

Legs reddish, but somewhat variable, usually with brownish or fuscous tinge; the apical four segments of the front tarsi, two of the middle, and three of the hind pair black or brown. Hair black; yellow on the apical half of the posteroventral surface of the posterior tibiae.

Wings cinereous hyaline, the veins reddish brown basally, becoming brownish yellow or dull yellowish towards the apex of the wing, the costa yellowish beyond the small stigmal spot. Squamae brownish, with black fringe. Halteres yellow, with white knob.

Abdomen rusty reddish yellow, pale rusty reddish, or dark rusty reddish, the first segment and the second, except on the broad sides, yellowish; second segment with the apical fourth brown or ferruginous, with black apex; third segment with a slightly narrower apical fascia, the fourth at most very narrowly dark at the apex. Pile white; brown or black on the sides of the second segment basally; darker on about the apical half and broad sides of the third segment and on the broad base of the fourth, the color varying from tawny to black. Venter yellowish to dull reddish, usually darker apically; pile yellow on the

basal two or three sternites, black apically. Genitalia rather small, brownish yellow, the hair black.

FEMALE: Front shining black, usually ferruginous along the orbits and about the ocelli, narrowly reddish in front, the pile white. There is less black pile on the thorax, the disc usually being all pale haired, and the scutellum has pale pile except on the broad sides. Abdominal pile all whitish; narrow apices of the fourth and fifth segments black.

TYPES: Holotype, male, Honolulu, December 31, 1946, at *Dracaena* flowers (F. X. Williams); allotype, female, Honolulu, March 3, 1946, at *Hoya* flowers (Williams). Paratypes, eight males and four females, Honolulu, February 3, 1946, March 3, 1946, and December 31, 1946 (Williams); one male, December 20, 1946 (R. H. Van Zweluenburg); male and female, Makiki, Oahu, February 4, 1946 (Williams).

In all the specimens the thorax appears moderately violaceous when viewed in some lights; the vittae are rarely darkened, but when so the whole disc of the mesonotum appears blackish when viewed without magnification.

THE *V. vesicularia* GROUP

At the time I described *V. barei*, I compared it with the species that was generally identified as *vesiculosa* Fabricius and that is still so named in collections. A comparison of specimens from the United States with the original description shows that our species cannot possibly be *vesiculosa*, which was described from South America, and which must be closely related to *correcta* Curran. I am therefore describing our common and widely distributed species as *vesicularia*.

Volucella vesicularia, *barei*, and *vesiculana*, new species, form an interesting, small group in the genus *Volucella*. They are separated from all other known species by the remarkable thickening of the outer half of the lower squama. The thickened portion is convex below and flat above but with a concavity anteriorly. It varies in color from yellow through orange to dark rusty red. The upper eye facets of the

males are enlarged, less so in *vesicularia* than in the two other species, and with short, rather thick pile. The abdomen is usually a little broader than long and conspicuously wider than the thorax, which has a brilliant green and violaceous opalescence.

The three species may be separated as follows:

TABLE OF SPECIES OF THE
vesicularia GROUP

1. Pleura of male wholly black pilose, abdomen dark metallic green, with black base; lower lobe of squamae rusty red on swollen area; scutellum with black hair *barei* Curran
Pleura mostly or wholly yellow pilose; abdomen ferruginous or brown with green and violet opalescence and pale base; lower lobe of squamae yellow to orange; scutellum pale haired 2
2. Basal two visible sternites yellow, or if dark then the first sternite brown, the second yellow in the middle; enlarged eye facets of medium size *vesicularia*, new species
Basal visible sternite luteous, the following all with strong opalescence; upper eye facets greatly enlarged *vesiculana*, new species

***Volucella vesicularia*, new species**

Volucella vesiculosa of authors, not Fabricius.
Volucella vesiculosa MACQUART, 1848, *Diptères exotiques nouveaux ou peu connus*, suppl. 3, p. 39; WILLISTON, 1886, *Synopsis of North American Syrphidae*, p. 141.

Metallic greenish with violaceous reflections, and appearing violaceous when viewed without magnification; base of abdomen yellow; wings clear with small stigmal spot. Length, 8.5 to 11 mm.

MALE: Face and frontal triangle reddish yellow, the face white pollinose in the depression, the pile pale brassy yellow. Vertical triangle black, black pilose, but several pale hairs in front. Occiput black, cinereous pollinose, the pile white; there are no long cilia above. Cheeks rather narrow, brownish behind. Face produced moderately downward, the large, low tubercle lying partly below the lower edge of the eyes; in profile the face is rather gently

concave above and perpendicular below the tubercle. Antennae orange, the third segment greatly constricted in the middle; arista with black rays and apex. Eyes with tawny pile.

Thorax reddish brown, mostly with very strong opalescent green sheen; the prothorax, sides of the mesonotum behind the suture, and the upper half of the pleura behind the base of the wings yellowish, the humeri whitish. Pile pale brassy yellow; a row of black, bristly hairs and shorter black hairs in front of the scutellum, and some black hair below the base of the wings and on the upper part of the mesopleura. Scutellum translucent light brownish, with the disc opalescent; hair black, yellow on the apex. All the bristles are black, and there may be a few scattered black hairs towards the sides of the mesonotum.

Legs reddish, the apical three or four segments of the tarsi brown; anterior four femora brown on about the basal half, the hind pair on the basal four-fifths. Hair black; pale yellowish on the posterior coxae and on the basal half of the posterior surface of the middle femora.

Wings hyaline, the veins reddish yellow; a weak brown cloud extends from the stigmal spot over the anterior cross vein; cross veins at middle of wing brown; stigma pale luteous.

Abdomen opalescent green, with violaceous reflection, the first segment and broad base of the second luteous or yellowish. Pile thick, short, white. Venter yellowish basally, becoming rusty brownish and more or less metallic apically. Genitalia rusty brown to dark brown, the hair black.

FEMALE: Front reddish yellow to greenish yellow, darker and more or less rusty above, very slightly narrowing upwardly. Hair pale yellowish, sometimes black at the vertex; scutellum usually all yellowish haired.

TYPES: Holotype, male, Station for Study of Insects, Tuxedo, New York, June 30, 1928 (Curran); allotype, female, Ramsey, New Jersey, June 23, 1925. Paratypes, male, Avon Old Farms, Connecticut, June 18, 1929 (Curran); male, Cold Spring Harbor, Long Island, August 9, 1930; male, Beltsville, Maryland, June,

1936 (W. M. Davidson); male, Dyer, Indiana, June 4, 1899, in the American Museum of Natural History; male and two females, North Carolina; male, C. V. Riley Collection; female, Offult's Island, Maryland, July 8, 1919 (H. S. Barber); female, Bowie, Maryland, May 31, 1945 (DDT Exp.); male, Washington, D. C., August 29, 1926 (J. M. Aldrich); female, Washington, D. C., August 19, 1911 (F. Knab); female, Linglestown, Pennsylvania, July 26, 1911 (W. S. Fisher); male, Connecticut, June 18 (Williston Collection); male, Plummer's Island, Maryland, June 24, 1916 (R. C. Shannon) in United States National Museum; female, Oakwood, Illinois, June 18, 1926 (Frison and Hayes), in Canadian National Collection; five males and six females, Flint, Oklahoma, July 15, 1934 (J. Stankavich); one female, Flint, June 14, 1934; male, Wilburton, Oklahoma, June 13, 1934, and two males and one female, Broken Run, Oklahoma, June 18, 1934 (A. E. Pritchard); female, Broken Run, June 17, 1934 (J. Stankavich); male, Fernville, Michigan, June 2, 1929 (L. G. Gentner); two females, Madison, Wisconsin, August 28, 1917, and July 18, 1943, and one female, Rhinelander, Wisconsin, July 18, 1946 (C. L. Fluke), female, Atlanta, Georgia, July 4, 1935 (P. W. Fattig), in C. L. Fluke Collection; five males and seven females, Douglas County, Kansas, July 15 to 23, 1942 (R. H. Beamer); male, no locality (S. W. Williston), and male, Barnes, Arkansas, June 8, 1932 (R. H. Beamer) in Kansas University Museum; male, Kentucky, and two females, Pennsylvania (Osten Sacken Collection); male, Philadelphia, Pennsylvania, June 24, 1911, male, Riverton, New Jersey, June 29, 1889, and female, Delaware Water Gap, New Jersey, July, 1918 (C. W. Johnson Collection); female, Cold Spring Harbor, Long Island, August 9, 1930 (J. Bequaert); female, Glencarlyn, Virginia, June 28 (N. Banks); female, Wellesley, Massachusetts, June 8, 1913 (W. G. Bolster); female, Lasalle County, Illinois, July 7, 1938 (F. G. Werner) in Museum of Comparative Zoölogy; male, Lake Forest, Illinois, July 9, 1904 (J. G. Needham), and male, Ithaca, New York, June, 1902,

in Cornell University Collection; two males, three females, Oxford, Mississippi, May, 1944 (F. M. Hull); female, Ranken, Missouri, July 15, 1934 (E. P. Meiners).

There is some variation in the extent of the black or brown on the legs; it may extend much more than halfway from the base on the anterior four femora, and all the tibiae may be darkened on the apical third or more. In one very dark specimen, the first visible sternite is brown, the second yellow in the middle and slightly metallic on the sides.

Volucella vesiculana, new species

This species is so similar to *vesicularia* that a comparison with that species will serve as well as a full description.

The face is not produced downward quite so much, and the eye facets in the male are much larger and run in an almost straight line from the corner of the eye to the frontal triangle (in *vesicularia* they are strongly curved above owing to the smaller size of the upper facets). The thorax is always paler, ferruginous or lighter, and the opalescence is less strongly evident, being very slight on the scutellum. The base of the abdomen is reddish yellow, rather than pale luteous, while the remainder of the abdomen is usually much more green, and the violaceous opalescence is generally much less apparent. The sternites, except the first visible, are all metallic, the first being reddish.

TYPES: Holotype, male, and allotype, female, Globe, Arizona, July 30, 1933 (F. H. Parker); paratypes, male, Santa Rita Mountains, Arizona, June, in the American Museum of Natural History; male (headless), and female, Texas (Belfrage) in the United States National Museum; 44 males, 32 females, Santa Rita Mountains, Arizona, June (F. H. Snow), in the Canadian National Collection, California Academy of Sciences, and the University of Kansas Museum; seven males and one female, Palmerlee, Arizona, July (J. Bequaert and N. Banks), and one female, Blanco County, Texas (C. W. Johnson Collection), in the Museum of Comparative Zoölogy.

The coloration of the second visible sternite serves as a ready means of separat-

ing *vesicularia* and *vesiculana*. In the former it is always yellow in the middle, usually very broadly pale yellow with the first sternite pale yellow, or brown when the second is broadly dark laterally. In *vesiculana* the second visible sternite is normally all metallic, but if reddish in the middle, the first sternite is also reddish or rusty reddish yellow. The males are readily separated by the difference in the size of the eye facets.

***Volucella barei* Curran**

Volucella barei CURRAN, 1925, Canadian Ent., vol. 57, p. 255.

This species was originally described from two males from Texas and Kansas. I have before me a male collected by Dr. Frank M. Hull at Oxford, Mississippi, and am informed that the species is fairly common.

In the United States National Museum there are two specimens from Florida that I place here with considerable doubt. The male is quite small, only 7.5 mm. in length,

and has the upper eye facets only slightly enlarged. The female is unusually large, about 11.5 mm., and with the spot at the middle of the wing twice as large as usual. In all the males of *barei* I have seen, the upper eye facets are greatly enlarged and the anterior median wing spot is little more than a broad line. Until more material is available for study, I prefer to place the specimens under *barei* for the present.

There is a possibility that *barei* may prove to be the same as *opalescens* Townsend, described from New Mexico, but Townsend compares his species with Mexican forms which have a preapical scutellar depression and normal squamae. Unless the type of *opalescens* can be found, the species must remain unidentifiable.

ADDITIONAL RECORDS: Male, Kilbar-ton, Oklahoma, June 9, 1934 (A. E. Pritchard); female, Yonah Mountain, Georgia, June 22, 1935 (P. W. Fattig), in C. L. Fluke Collection; three females, Oxford, Mississippi, May, 1944, and June, 1946 (F. M. Hull).