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A new species of *Colletes* (Hymenoptera: Apoidea: Colletidae) from northern Florida and Georgia, with notes on the *Colletes* of those states

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Abstract. *Colletes ultravalidus* Hall & Ascher, new species, is described from several sites in northwestern Florida and southeastern Georgia. It is a member of the *inaequalis* species group, very similar to *C. validus* Cresson, a specialist of Ericaceae, but can be distinguished by an even more elongate malar area and the absence of conspicuous tergal fascia. *Colletes ultravalidus* has been found flying from early winter to early spring when it forms nest aggregations in xeric sites adjacent to shrub bog or basin swamp, the habitat of *Pieris phylllyreifolia* (Hook.) DC. (Ericaceae), the most likely, but as yet unconfirmed, host plant of the new species. State records of *Colletes* for Florida and Georgia are reviewed and discrepancies in taxonomy and distributional limits between Stephen's 1954 revision of the genus and Mitchell's 1960 monograph of eastern North American bees are noted. We concur with Stephen that the distributions of several taxa in *Colletes* are more limited than that reported by Mitchell.

INTRODUCTION

Females of a new species of *Colletes* Latreille (Colletidae: Colletinae) were first detected by JSA in a sample of unsorted bee specimens in the Cornell University Insect Collection (Ithaca, New York), collected near Apalachicola, Florida. Subsequently, the species was found flying in the northwestern region of the Florida Peninsula and nesting at additional sites in the eastern Florida Panhandle. Here we describe this new

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Figure 1. Photograph of female of *Colletes ultravalidus*, new species.

species, *Colletes ultravalidus* Hall & Ascher, new species, a relatively large cellophane bee (Fig. 1) characterized by an exceptionally long malar area that distinguishes it from North American congeners. *Colletes validus* Cresson, widely distributed in the eastern United States but not present in Florida, is very similar to the new species but has a shorter malar area and conspicuous tergal fascia.

Bees of the genus *Colletes* from America North of Mexico were revised by Stephen (1954). His work can still be relied upon to identify most species encountered, especially in eastern North America. However, the *Colletes* of northern and central Florida were not well understood at the time of his revision, as most material then available from the state was from Miami and other coastal sites in southern Florida, where extensive collecting had been done by Graenicher (1930; resurveyed by Pascarella *et al.*, 2000) and others. More recently, systematic surveys of bees from the Lake Wales Ridge in the central Peninsula (Deyrup *et al.*, 2002) included discovery of a new species of *Colletes* (Deyrup & Deyrup, 2011). Surveys in Alachua and Putnam Counties of north-central Florida included the first Florida records of *C. howardi* Swenk and discovery of the male of *C. longifacies* Stephen (Hall & Ascher, 2010, 2011, 2014). Here we provide an annotated list of *Colletes* from Florida and Georgia, addressing discrepancies in state distributions between Stephen (1954) and Mitchell (1960).

MATERIAL AND METHODS

The holotype and allotype of the new species discussed herein are deposited in the Division of Invertebrate Zoology, American Museum of Natural History (AMNH), New York, NY, USA. Paratypes are deposited in the AMNH, the Smithsonian National Museum of Natural History (SNMNH), Washington, D.C., USA, the Florida State Collection of Arthropods (FSCA), Gainesville, FL, USA, and the HGH collection at the



Figures 2–3. Dorsal habitus of females. 2. *Colletes validus* Cresson. 3. *C. ultravalidus*, new species. Note difference in size, hair color on body and legs, infuscated wings, and metasomal tergal fascia. Scale bars = 3 mm.

University of Florida (UF), Gainesville, FL, USA. Morphological terminology follows that of Michener (2007) and Harris (1979), and the format for the description is a modification of those of Stephen (1954) and Gibbs (2011). Photographs are composites of focal plane images, produced by Helicon Focus software, taken with a Canon EOS 7D camera mounted on a Leica M165C stereo microscope, with a motorized focus column. Measurements were taken with an ocular reticule. The abbreviations F1 through F10 represent flagellomeres; T1 through T7 represent metasomal terga; and S1 through S7 represent metasomal sterna.

SYSTEMATICS

Genus *Colletes* Latreille
inaequalis species group

Colletes ultravalidus Hall & Ascher, new species

ZooBank: urn:lsid:zoobank.org:act:AC1D4A58-9479-4557-BA0C-0F30437DE68F

(Figs. 1, 3, 5, 7, 9, 11, 13, 15)

DIAGNOSIS: Both female and male of *C. ultravalidus* are distinguished from those of all other eastern North American species of the genus by their exceptionally long malar area, especially the male. This is a large bee with dense fulvous mesosomal pubescence, dark metasomal terga with apical fasciae absent or weak, and strongly infuscated wings. Color varies, and some specimens have paler pubescence. *Colletes ultravalidus* is most similar to, but somewhat larger than, *C. validus* Cresson (Figs. 2, 3).

Table 1. Ratios of lengths of malar area and compound eyes to head (from apex of clypeus to mid ocellus).

Sex	Species	Malar area/head	Compound eyes/head
Females	<i>C. ultravalidus</i> , n. sp.	0.31	0.57
	<i>C. validus</i> Cresson	0.25	0.63
Males	<i>C. ultravalidus</i> , n. sp.	0.31	0.54
	<i>C. validus</i> Cresson	0.26	0.59

The malar area exceeds in length that of *C. validus*, previously considered the Nearctic species with the longest malar area within the genus. The proportionately longer malar area comes at the expense of a proportionately shorter compound eye (Figs. 4–11; Table 1). In contrast to *C. ultravalidus*, *C. validus* has pronounced apical fasciae on the metasomal terga, ochraceous rather than fulvous pubescence, most notable on the mesosoma, and lighter wings. *Colletes ultravalidus* tends to have more fuscous hairs intermixed with light hairs, for example on the legs of females. *Colletes ultravalidus* resembles *C. thoracicus* Smith, as both have abundant mesosomal fulvous pubescence, strongly infuscated wings, and lack metasomal fascia in females. However, both sexes of *C. thoracicus* are easily distinguished from *C. ultravalidus* by their much shorter malar area (less than half the width of the mandible base in females, subequal in males) and shorter clypeus. Females of *C. thoracicus* are slightly smaller and more slender, males more so. Three other species of *Colletes* in the eastern United States have notably long malar areas, *C. longifacies* Stephen, *C. productus* Robertson, and *C. compactus* Cresson. All have conspicuous tergal fascia, an average smaller body size than *C. ultravalidus*, and malar area not exceeding the width of the mandible at its base, thus much shorter than the malar area of either *C. ultravalidus* or *C. validus*. The S7 of *C. ultravalidus* and *C. validus* males have a nearly identical shape which separates them from other species of *Colletes* (Figs. 12, 13). Genital armatures of the two species differ subtly in the position of the dorsal wings (Figs. 14, 15).

DESCRIPTION: ♀: **Structure.** Body length 14.27±0.98 mm, inter-tegular distance 3.62±0.05 mm (n=7) [13.37±0.55 mm and 3.17±0.17 mm (n=6), respectively, for *C. validus*]. Head 3.78±0.18 mm long (n=7), length about 0.9x head width. Mandibles strongly crossed in ventral view, one extending nearly one-fifth its length beyond side of other. Clypeus, 0.44x head length, extends below mandible articulation by 0.5x length of malar area, strongly protuberant, with moderately deep median sulcus; apical margin with paired, variably shaped, depressions. Supraclypeal area strongly protuberant. Malar area about 0.31x length of head, 0.49x length of compound eye, almost 1.9x width of mandible base [0.25x, 0.37x, and 1.66x respectively for *C. validus*]. Vertex excavated lateral to ocelli. Antenna F2 about 0.8x length of F1, F2–F9 subequal in length, length subequal to width, F10 about 1.1x length of F1. Compound eye about 0.57x length of head [0.63x for *C. validus*], inner margin subparallel (UOD/LOD ratio = 0.99). Lateral ocelli slightly closer to each other than to compound eyes. Facial fovea short, wide, and shallow, lower margin about one-third distance from antenna to lateral ocellus, upper margin nearly level with lower margin of lateral ocellus. Facial fovea curves from inner orbital margin toward lateral ocellus, ending about half distance between these two. Genal area about 1.2x width of eye. Pronotal ridge with short, lateral angle, with wide base. Metapleural protuberance acarinate. Fore coxal spine lacking. First recurrent vein of forewing meets center of second submarginal cell. Pos-



Figures 4–5. Face of females. 4. *Colletes validus* Cresson. 5. *C. ultravalidus*, new species. Scale bars = 1 mm.

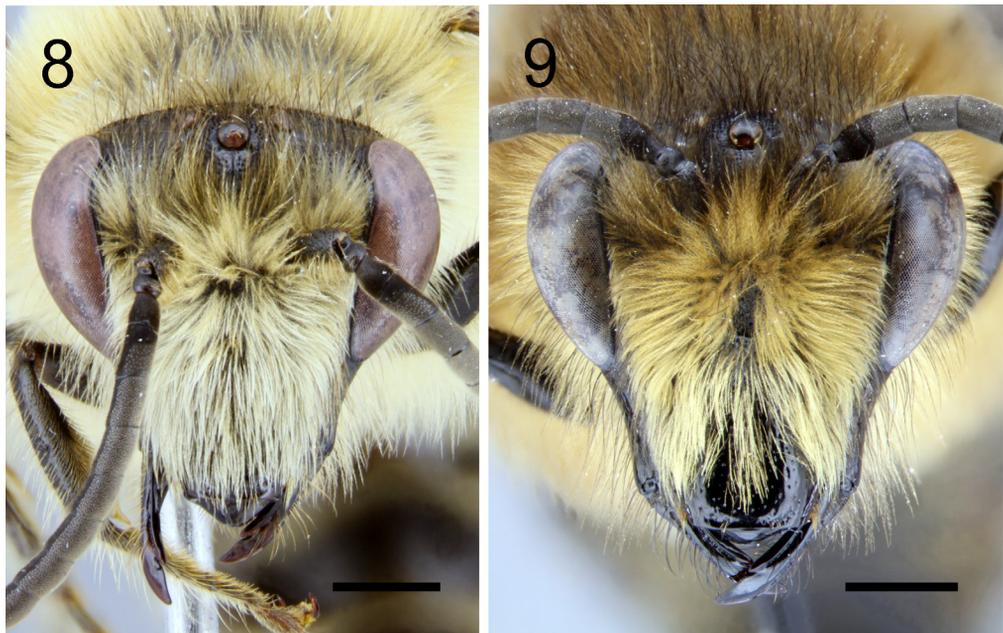
terior basitarsus 3.9x as long as broad. T1 slightly impressed narrow apical rim; T2–T5 apical impressed area widens from about one fourth to one third of exposed surface of segment; S1 with narrow, central, rounded, elevated protuberance; S5 with wide, shallow, semicircular emargination.

Pubescence and Color. Integument nearly all black/piceous. Labrum and mandible with long, thick, erect, simple, fuscous hairs along ventral edge of mandible and apex of labrum, may be intermixed with few light hairs [pubescence all light in *C. validus*]. Lower paraocular area with sparse, short, ochraceous, plumose hairs intermixed with few, longer, fuscous, simple or somewhat branched hairs. Upper paraocular area and frons with dense, long, fulvous-brownish, plumose hairs intermixed with smaller number of fuscous hairs between and lateral to antennae, relatively bare between antennal base and vertex. Vertex with long, plumose fuscous hairs intermixed with shorter light hairs; more dense row of long light pubescence extending from upper occiput along upper margin of vertex. Genal area with sparse, long, fuscous, simple or somewhat branched hairs below and adjacent to compound eyes, mixed with long, fulvous, plumose pubescence above, more dense toward occipital ridge. Mesosoma with dense, light, fulvous hairs on pronotal lobe, as row along omaulus, on lateral mesoscutum anterior to wings, on metanotum, and on boundary between lateral and posterior surfaces of propodeum. Sparser, light, fulvous pubescence, intermixed with varying amounts of fuscous pubescence, on disc of mesoscutum [Stephen (1954) describes presence of abundant black pile on median discal areas of mesoscutum and mesoscutellum of *C. validus*, whereas these areas largely worn bare in both *C. ultra-*



Figures 6–7. Lateral view of female heads. 6. *Colletes validus* Cresson. 7. *C. ultravalidus*, new species. Scale bars = 1 mm.

validus and *C. validus* specimens investigated here, with fulvous pubescence mainly on mesoscutum anteriorly and mostly long, erect, fuscous pubescence along posterior margin of mesoscutellum]. Mesepisternum with long, light pubescence, sparse below wings, more dense ventrally [distribution of hairs on mesepisternum of *C. validus* similar, but pubescence ochraceous to white versus light fulvous in *C. ultravalidus*]. Leg pubescence generally dark brown on basal segments, becoming dark brown or fuscous on distal segments [variable, three FSCA specimens with light leg pubescence; in *C. validus* light brown pubescence on basal segments, becoming ochraceous or white on distal segments]. Wings deeply infuscated [lightly infuscated in *C. validus*], veins and stigma piceous. T1 with fulvous hairs long and sparse on anterior declivitous surface, denser laterally; in some specimens fringe of pale ochraceous hairs along outermost lateral margin [hair distribution similar to that described by Stephen (1954) for *C. validus*, pubescence light ochraceous and less dense laterally]. Apical tergal fascia entirely or mostly absent, but better developed in some specimens with appressed, isolated, individual hairs or weak, fragmented, patches of tomentum along apical rim,



Figures 8–9. Face of males. 8. *Colletes validus* Cresson. 9. *C. ultravalidus*, new species. Scale bars = 1 mm.

sometimes more substantial laterally and across T4 and T5 rims [moderately wide and dense, apical fascia present in *C. validus*, interrupted medially, broadly on T1 narrowly on T2, entire on T3–T5; Stephen (1954) described sparse, long, erect, black pile on tergal discs of *C. validus*, whereas pile very short and light on discs of specimens examined]. Unworn specimens of *C. ultravalidus* have very sparse, short fuscous and light pubescence on tergal discs. T2–T5 pubescence erect, simple, light, short laterally, becoming sparser, darker, and longer from anterior to posterior; apical rims black or faint amber [impunctate tergal rims of *C. validus* noticeably amber where fascia has been lost]. T6 with dense, appressed, fuscous pubescence covering disc; erect, long, fuscous pubescence laterally. S1 protuberance with long fulvous hairs. S2–S5 with sparse fascia arising along basal margin of narrow, impressed, amber, apical rim; pubescence becoming denser, longer, lighter laterally; disc with appressed, short, sparse, light and sparse, erect, fuscous pubescence; light hairs of disc become increasingly longer, denser laterally. S6 with long, thick, appressed, fuscous hairs intermixed with fewer light hairs on disc.

Surface Sculpture. Clypeus with large and small deep punctures, widely and unevenly separated along entire length; punctures much denser, somewhat elongate and separated by one to two puncture diameters in median sulcus and along margin adjacent to lower paraocular area; interspaces smooth and shiny over nearly entire length; extreme base with elongate, dense punctures and/or rough texture. Supraclypeal area densely and coarsely punctured except center and lower margin; interspaces faintly imbricate except strongly imbricate along upper and upper-lateral margins and lineolate laterally and on lower margin. Malar area with few (~18) widely spaced, deep punctures; interspaces smooth and shiny, faintly lineolate just above mandible base and just below compound eye. Lower paraocular area with narrow rugulose-punctate strip of punctures, irregular in size and shape with some elongate, adjacent to and



Figures 10–11. Lateral view of male heads. 10. *Colletes validus* Cresson. 11. *C. ultravalidus*, new species. Scale bars = 1 mm.

delineated from smooth malar area; punctures becoming large, deep, dense interiorly, spaced by less than one puncture diameter, more elongate lateral to antenna; interspaces shiny. Upper paraocular area rugulose-punctate with smaller, nearly confluent, elongate, obscure punctures; interspaces rough. Frons with large, elongate, confluent punctures. Vertex with smooth patch above compound eye and fovea, with widely spaced large punctures and fine, small punctures inbetween; obscure punctures between ocelli and along upper margin of vertex; surface rough between ocelli, imbricate along upper margin. Genal area densely punctured along orbit and between eye and preoccipital ridge, lineolate along hypostomal cavity. Pronotum dorsal surface and preomalar area with widely spaced punctures, evenly imbricate. Mesoscutum with deep, dense punctures, nearly contiguous on anterior half, laterally, and along posterior margin; punctures larger, less dense on disc. Mesoscutellum with dense, deep punctures, somewhat elongate, laterally and posteriorly, widely spaced anteriorly with shiny interspaces; imbricate along anterior-most margin and posteriorly [in *C. validus* punctures more poorly defined and somewhat denser on anterior of mesoscutum and posterior of mesoscutellum]. Tegula with fine punctures separated by two to three puncture diameters. Mesepisternum with deep, dense punctures, well defined on hypopimeral area, separated by no more than one puncture diameter; surface

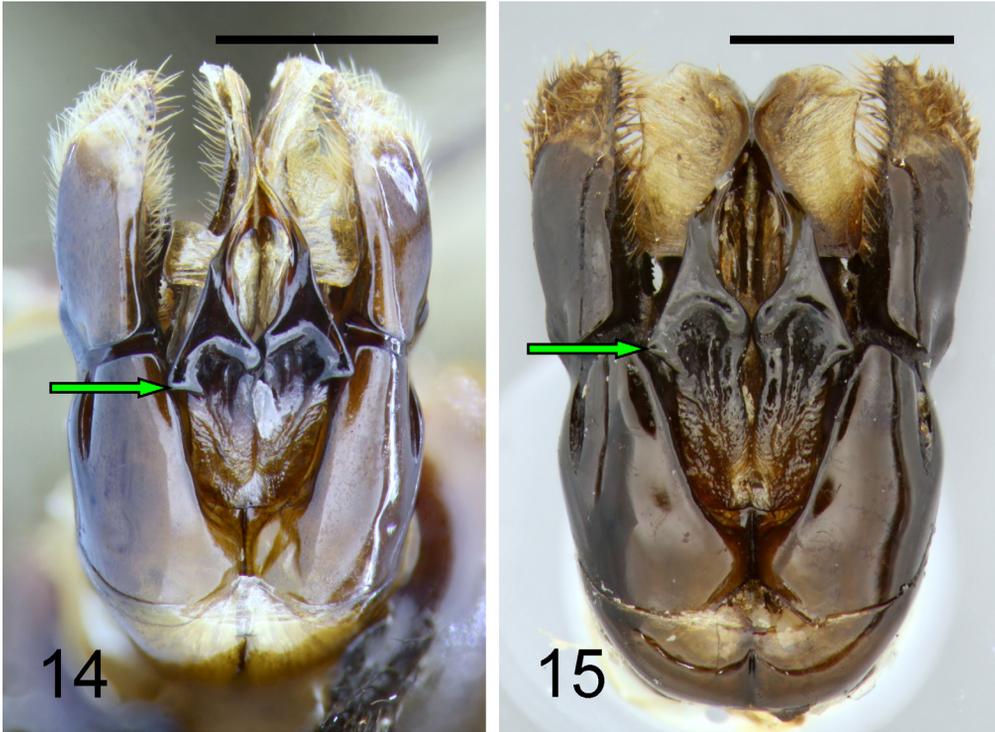


Figures 12–13. Metasomal sternum seven. **12.** *Colletes validus* Cresson, dorsal view. **13.** *C. ultra-validus*, new species, ventral view. Scale bars = 0.5 mm.

somewhat rough, although shiny; punctures more obscure, surface increasingly rough and lineolate ventrally. Metapleural protuberance with shallow obscure punctures; surface very rough and somewhat rugulose. Metepisternum rugulose ventrally with slanted rugae dorsally. Metanotum finely rugulose. Metapostnotum with vertical (longitudinal), evenly spaced rugae forming a transverse row of shiny pits. Propodeum, lateral surface with few indistinct, very widely spaced punctures; granulate; posterior surface rugulose. T1 with declivitous anterior surface nearly impunctate; deep large punctures on disc, separated by one to three puncture diameters, becoming smaller and denser along slightly impressed apical rim; interspaces shiny; apical-most narrow margin impunctate. T2–T5 with punctures somewhat smaller than those on T1, denser basally and along narrow, median area; finer punctures along impressed apical rim; interspaces shiny. Metasomal sterna with widely-spaced punctures separated by three to six puncture diameters, finer and denser on posterior segments; interspaces imbricate.

♂: **Structure.** Body length 12.62 ± 0.36 mm, inter-tegular distance about 2.9 ± 0.14 mm ($n=6$) [somewhat larger than *C. validus*, 11.76 ± 0.25 mm and 2.71 ± 0.27 mm ($n=7$), respectively]. Form more slender than female. Head about 3.66 ± 0.11 mm long, length about $0.97 \times$ head width. Clypeus about $0.44 \times$ length of head. Malar area about $0.31 \times$ length of head, $0.53 \times$ length of compound eye, about $2.3 \times$ width of mandible base [$0.26 \times$, $0.41 \times$, and $1.92 \times$, respectively for *C. validus*]. Antennae, F2 about $1.5 \times$ length of F1, F2–F9 subequal in length, and length about $1.5 \times$ their width, F10 about $1.5 \times$ length of F1. Compound eyes about $0.54 \times$ length of head [$0.59 \times$ for *C. validus*], inner margins very slightly convergent below (UOD/LOD ratio = 1.1). Facial fovea shallow, shorter than in female, upper margin nearly level with lower margin of middle ocellus. Genal area width about $0.9 \times$ width of eye. Mandibles, clypeus, ocellar spacing as in female. Posterior basitarsi $4.8 \times$ as long as broad. Mesosoma and metasoma structure as in female. S5 lacks median emargination present in female. Genital armature with dorsal wing of penis valve (terminology from Stephen, 1954) slightly more distal than that of *C. validus* (Figs. 14, 15).

Pubescence and Color. Generally greater percentage of fuscous hairs relative to fulvous hairs than in female. Integumental color as in female. Clypeus with dense, long, fulvous, plumose pubescence on dorsal third drape over middle third. Lower paraocular area with long, fulvous hairs and a few scattered, fuscous, simple or somewhat branched hairs laterally. Upper paraocular area and frons with dense, mixed



Figures 14–15. Genital armature. **14.** *Colletes validus* Cresson. **15.** *C. ultravalidus*, new species. Arrows point to dorsal wings of penis valves, slightly more distal in *C. ultravalidus*. Scale bars = 1 mm.

brown and fuscous pubescence around and just above antennal base, relatively bare between just above antennal base and vertex. Antenna with brown, short black hairs on scape longer and more apparent than on female [light, short, and less apparent in *C. validus* males and females]. Vertex with dense, mostly fuscous pubescence mixed with fulvous hairs between ocelli and along upper margin. Genal area with long, fulvous, plumose pubescence below; hairs shorter above, and denser toward occipital ridge, intermixed with a few, fuscous, simple or somewhat branched hairs, mainly along orbit. Mesosomal hair distribution and color similar to female, darker and somewhat denser on mesoscutum but not obscuring surface. Legs with dense, fulvous, plumose pubescence on posterior of femur, somewhat less dense on hind femur; hairs simple on tibia and tarsomeres and slightly darker on some specimens. Wings deeply infuscated, somewhat lighter than females [clear in *C. validus* males]; veins and stigma piceous. T1 anterior and lateral hair distribution similar to female but lacking lateral fringe of light pubescence; erect, short, light and dark hair mixture on disc. T1–T5 with sparse, appressed, short, light tomentum forming weak, fragmented, apical fascia, more substantial than on female [fascia on *C. validus* males more dense and complete]. T2 and T3 discs with abundant short, erect, fuscous, simple hairs, intermixed with sparse longer erect fuscous hairs on T4 and T5. T6 and T7 with decumbent long hairs over disc, dark on T6, mixed with fulvous on T7. Metasomal sternal hair distribution similar to female but longer and much denser overall. S2–S5 with long plumose fulvous hairs on discs becoming progressively shorter and confined to apical center on posterior segments, flanked by short erect fuscous pubescence on remainder of discs. S4 and S5 with simple, long, erect, light pubescence laterally.

Surface Sculpture. Clypeus surface largely hidden by pubescence; apical three-quarters more densely punctate, especially basally and laterally, than in female; patches of elongate, contiguous punctures adjacent to rugulose-punctate areas. Supraclypeal area more densely and evenly punctate than in female; punctures large, deep and contiguous. Malar area shiny and sparsely punctate as in female, more distinctly lineolate on lower fourth above mandibles and just below compound eyes. Lower paraocular area more evenly punctate than in female, punctures separated by no more than one puncture diameter adjacent to malar area; interspaces shiny, surface rugulose and rough; punctures become contiguous toward antennal bases. Upper paraocular area rugulose-punctate with large, deep, somewhat elongate punctures; surface rough. Frons with large, deep, round, confluent punctures. Vertex as in female but smooth patch above compound eyes not well defined. Genal area similar to female but punctures more obscure and surface rougher. Mesoscutum and mesoscutellum punctures as in female but spaced somewhat more evenly. Mesepisternum and metepisternum as in female. Terga similar to female; punctures slightly more dense and more evenly separated; T4–T7 interspaces with faint imbrication becoming more pronounced posteriorly. Metasomal sterna similar to female.

HOLOTYPE: ♀, USA [United States of America]: FL [Florida]: Franklin County: Apalachicola, 29.755084N 85.100426W, 27 January 2013. D.T. & L.D. Almquist (deposited in AMNH).

ALLOTYPE: ♂, USA: FL: Wakulla County, St. Marks NWR [National Wildlife Refuge], Medart, 30.057731N 84.386362W, 29 December 2013. D.T. & L.D. Almquist (deposited in AMNH).

PARATYPES: 1♀, USA: FL: Levy County: Goethe State Forest, 10 mi Road, 29.12139N 82.589167W, 2 April 2011, H.G. Hall (deposited in HGH collection). All the following caught at same location by same collectors as allotype: 2♀♀, 10 February 2013 (1 each deposited in SNMNH and FSCA); 1♀, 24 February 2013 (deposited in AMNH); 2♀♀, 11 March 2013 (1 each deposited in FSCA and HGH collection); 2♂♂, 29 December 2013 (1 each deposited in AMNH and SNMNH); 2♂♂, 12 January 2014, C. Siervogel additional collector (1 each deposited in FSCA and HGH collection); 8♀♀, 22 March 2014, HGH additional collector (2 deposited in AMNH, 2 in FSCA, 1 in HGH collection, 3 in SNMNH).

ADDITIONAL MATERIAL EXAMINED: 1♀, Okaloosa County, Eglin AFB, 13 February 1993, P. Skelley, M. Thomas, R. Turnbow (FSCA); 1♀, Taylor County: Steinhatchee, 27 February 1993, Lloyd Davis (FSCA); 1♀, USA: GA [Georgia]: Brantley County: Hoboken, 16 February 1997, P. Skelley, (FSCA); 1♀, USA: FL: Franklin County: near Apalachicola, first specimens discovered could not be relocated at time of description (Cornell University Insect Collection).

DISTRIBUTION: Along the Gulf Coastal areas of northern Florida, extending to southeastern Georgia, in sandhill communities adjacent to wetlands (Fig. 16).

ETYMOLOGY: The specific epithet *validus*, Latin for “powerful”, refers to the similar species *C. validus*, with the prefix *ultra* from Latin, “beyond”, referencing the longer malar area of the new species.

COMPARATIVE MATERIAL EXAMINED FOR COLLETES VALIDUS: USA: NORTH CAROLINA: Sampson County: 1♀, Ivanhoe, 15 March 1949, T.B. Mitchell (FSCA); USA: NEW JERSEY: Burlington County: 3♂♂, Lebanon State Forest, 27 April 1974, C. Porter (FSCA); Ocean County: 1♀, 2♂♂, 1 June 1973, J.G. & K.C. Rozen, R. McGinley, C. Thompson, (AMNH_BEE 18759, 18761, 18764); USA: MASSACHUSETTS: Dukes County, Martha’s Vineyard: 1♂, Manuel F. Correllus State Forest, 7 May 1994, P.Z.



Figure 16. Map of collection sites (green circles) and nesting sites (red circles).

Goldstein (AMNH_BEE 131834); 1♀, 2♂♂, Aquinnah, 41 19.122 N 70 48.100 W, 30 April 2011– 27 May 2011, P.Z. Goldstein (AMNH_BEE 170009, 170008, 170006); 1♂, Edgartown, 1–3 May 2011, P.Z. Goldstein (AMNH_BEE 166683).

DISCUSSION

Most of the *C. ultravalidus* type series was obtained from a nesting site in Wakulla County on St. Marks National Wildlife Refuge (SMNWR) property at the western edge of the “Big Bend” of Florida, where the Gulf of Mexico coast curves southward from the Panhandle into the Peninsula. Two other, seemingly small, nesting sites were found in this county, one of which is within Ochlockonee River State Park and one just outside the park, also on SMNWR; both of these sites are adjacent to far eastern Franklin County. Another nesting site was found in southwestern Franklin County near the Gulf County border. The site in Ochlockonee River State Park was in scrubby flatwoods, and the other three sites were in sandhill communities (vegetation communities defined by the Florida Natural Area Inventory — <http://www.fnai.org/natural-commguide.cfm>; last accessed 22 October 2015). The Goethe State Forest site is farther southeast, near the southern edge of the “Big Bend”. This forest is composed of several different communities, including sandhill. However, the lone female from Goethe was collected while flying in mesic pine flatwoods. These plant communities are similarly dominated by Longleaf pine (*Pinus palustris* Mill.) and Wiregrass (*Aristida stricta* Michx.), with a denser understory of Saw Palmetto [*Serenoa repens* (Bartram) Small] in pine flatwoods. Collection and nesting sites are shown in figure 16.



Figure 17. Tumuli and burrow entrances of nests of *Colletes ultravalidus*, new species.

Although these communities were common in Florida prior to human development, evidently only a few remain the right habitat for *C. ultravalidus*, as the species is unknown from well-surveyed sandhill habitat such as Ordway-Swisher Biological Station in Putnam County, east of Goethe closer to the Atlantic coast (Hall & Ascher, 2014), from the Gainesville area (Hall & Ascher, 2010, 2011), from the Lake Wales Ridge (Deyrup *et al.*, 2002), and from southern Florida (Graenicher, 1930; Pascarella *et al.*, 2000). The only specimen from Georgia, a female specimen from Brantley County in the southeastern part of the state, was recorded on the label as “burrowing in the sand” in Longleaf Pine sandhill habitat. All four Florida sites in which *C. ultravalidus* nests were found, either sandhill or scrubby flatwoods, are adjacent to shrub bog or dome or basin swamp. Aerial views revealed that the mesic flatwoods site in Goethe State Forest, where one female bee was captured, is also near several dome swamps. All known localities are near-coastal, which may be an artifact of limited survey effort.

In March 2014, preliminary observations were made of the *C. ultravalidus* nest aggregations at the Wakulla County site. Several clusters of burrows excavated in sandy soil, each cluster consisting of up to about two dozen burrows, were spaced along a stretch of approximately 350 m of an unpaved sandy roadway, with a total of more than 200 burrows. The burrows had entrances about 1 cm in diameter with prominent tumuli approximately 8–10 cm across at their base, some separated by less than 20 cm (Fig. 17). Some burrows extended vertically, two of which measured at least 40 cm deep but not traced to the end. Other burrows extended a short distance subhorizontally below the surface before turning downward vertically. The nesting site discovered earlier in January 2013 in Franklin County had about 75 burrows along about 50 m of road. There, *Liris* wasps (Crabronidae) were observed frequently entering and exiting burrows.

From museum collection data and our observations, it appears that nesting activity of females peaks in late winter to early spring, with offspring emerging and mating early the following winter. We have caught males, which are apparently protandrous, only in December and January. The flight time of this species is unusually early, as few other native bees are active in December or January in northern Florida (as opposed to subtropical southern Florida where year-long flight activity is well documented). Females were caught as they flew over or dug burrows from late January through early April, with the earliest records perhaps pertaining to females emerging from their natal aggregations and constructing new nests to be provisioned once their host plant is in full bloom.

Colletes validus is associated with Ericaceae (Rajotte, 1979) and is a potentially important pollinator of blueberry, with its elongate malar area an apparent adaptation to reach nectar within the long tubular corolla of flowers in this plant family. Batra (1980) found cells of *C. validus* containing mostly Deerberry (*Vaccinium stamineum* L.) pollen, but up to 15% pine pollen and smaller amounts of other non-ericaceous pollen. From preliminary analyses, 97% of the pollen obtained from a female *C. ultravalidus* from the Wakulla County site was from Ericaceae, the species not identified; the other 3% was from pine (prepared by Rosalyn Johnson, UF; identified by Vaughn Bryant, Texas A&M). Climbing Fetterbush [*Pieris phylllyreifolia* (Hook.) DC.] (Ericaceae), the likely but as yet unconfirmed host plant of this new bee species, may be an essential resource restricting the bee's occurrence. *Pieris phylllyreifolia* is largely restricted to the types of wetland communities [(Wunderlin & Hansen, 2003) — <http://www.fnps.org/plants/plant/pieris-phylllyreifolia>; last accessed 22 October 2015] occurring in the vicinity of all the discovered *C. ultravalidus* nesting sites. The blooming period of this plant peaks in January and February but extends as late as May (<http://www.gilnelson.com/PanFlora/barchart.php?specieschoice=1784&dosearch=Go>; last accessed 22 October 2015), coinciding with this bee's nesting period. It was observed blooming at the larger Franklin County nesting site when the bee was flying (P.F. Russo, pers. comm.). The exceptionally long malar area of *C. ultravalidus* further supports *P. phylllyreifolia*, with its very long corolla, as its host plant. The juxtaposition of different vegetation communities, including both sandhill in which the bee nests and the wetland habitat of its likely floral host, may together define and limit the habitat of this bee.

We assigned *C. ultravalidus* a NatureServe conservation status rank of G2G3, meaning that in its total range (global), it is imperiled (2) to vulnerable (3), with more information needed to classify it more definitively. As all but one of the known localities are present in Florida, we assigned a corresponding state rank of S2S3 (subnational). A conservation status in Georgia could not be assessed from the single specimen found nearly 20 years ago. The ranks reflect few occurrences of the species and its evidently narrow habitat of sandhill, or other xeric habitat, directly adjacent to certain types of wetlands. Sandhill habitat itself is of conservation concern, being ranked as G3 and S2 in Florida.

Stephen's (1954) revision of the bee genus *Colletes* was remarkably comprehensive and accurate, especially for eastern North American species, and only a few taxonomic updates have been published (e.g., Kuhlmann & Ascher, 2011). His work can still be relied upon to identify most species encountered, but for parts of the United States from which historical material was sparse, additional taxonomic review is required. Although the Miami area of southern Florida was well studied by Graenicher (1930) and was resurveyed by Pascarella *et al.* (2000), only recently have the bees of scrub habitats on the Lake Wales Ridge been well characterized (Deyrup *et al.*, 2002). A

Table 2. The species of *Colletes* now known from Florida and Georgia. Written in bold are taxa known definitively only from Florida (three species and one subspecies) or this state and adjacent southern Georgia (the new species). An asterisk precedes species that have been reported in the literature (e.g., Mitchell, 1960) from these states but require further verification due to the possibility of misidentifications.

<i>C. aestivalis</i> Patton	Georgia only, where not found recently; of conservation concern due to lack of recent records (Colla <i>et al.</i> , 2012) despite a historical range extending northeast to Massachusetts. Perhaps overlooked due to oligolecty on <i>Heuchera</i> (Saxifragaceae).
* <i>C. americanus</i> Cresson	Recorded from both Georgia and Florida, but all records, especially from the latter state, should be reassessed with great care as <i>C. mandibularis</i> and <i>C. speculiferus</i> can be very similar and are hard to separate without examination of exposed S7.
<i>C. banksi</i> Swenk	Florida and Georgia. Associated with <i>Ilex</i> (Deyrup <i>et al.</i> , 2002). Occurs north to Connecticut and Michigan but often overlooked as collections are sparse.
<i>C. brevicornis</i> Robertson	Florida and Georgia. Occurs north to New Jersey (one historical record) and the Midwestern States.
<i>C. brimleyi</i> Mitchell	Florida and Georgia. This species is common in the southeastern USA but is not well documented north of North Carolina. Stephen (1954; accepted by Mitchell, 1960) published a New Jersey, Camden County record, but no <i>C. brimleyi</i> were found in an extensive review of material from that state by JSA & Hadel Go (pers. comm.). Known to visit oaks in Florida (Deyrup <i>et al.</i> , 2002).
* <i>C. compactus compactus</i> Cresson	Recorded from Georgia only by Mitchell (1960), but Stephen (1954) concluded that it was “not known to occur in the deep south” and listed Bryson City, North Carolina as a marginal (southern) locality. This species might plausibly occur in Georgia in the mountains, but further verification of occurrence in the state is desirable.
<i>C. distinctus</i> Cresson	Florida and Georgia (lectotype locality). Southeastern USA regional specialist also known from North Carolina, South Carolina, and Louisiana.
* <i>C. eulophi</i> Robertson	Hypothetical occurrence in Georgia only based on Mitchell’s (1960) report of <i>C. kincaidii</i> Cockerell (see below).
<i>C. francesae</i> M. Deyrup & L. Deyrup	Florida, Lake Wales Ridge endemic. Its placement to species group requires further study.
<i>C. howardi</i> Swenk	Florida and North Carolina (type locality: Southern Pines) only. A sandhill specialist recently recorded in north-central Florida by Hall & Ascher (2014).

Table 2. Continued.

<i>C. inaequalis</i> Say	Cited for Georgia only by Stephen (1954), from Marion County, but not from Florida or Georgia by Mitchell (1960). Putative specimens from north Florida (HGH, unpubl. data) deserve further study. Whereas Stephen (1954) recorded “no evident variation” in this species across its wide range in eastern and northern North America other than trivial differences in hair color, we regard Florida <i>C. inaequalis</i> as atypical and worthy of further taxonomic study.
<i>C. latitarsis</i> Robertson	Florida and Georgia. A specialist on <i>Physalis</i> (Solanaceae) occurring widely across the eastern and central United States.
<i>C. longifacies</i> Stephen	Florida endemic. Males first reported by Hall & Ascher (2014). Collected from <i>Liatris tenuifolia</i> Nutt. (Asteraceae).
<i>C. mandibularis</i> Smith	Florida and Georgia (type locality). As with <i>C. brimleyi</i> we have been able to confirm records from the Atlantic Coastal states north only to North Carolina. Putative New Jersey and Delaware occurrences may pertain to <i>C. speculiferus</i> (Kuhlmann & Ascher, 2011). Reported to be polylectic and to have distinct spring and fall broods in Florida (Deyrup <i>et al.</i> , 2002).
<i>C. nudus</i> Robertson	Florida and Georgia. Occurs north to Massachusetts and Michigan.
<i>C. productus</i> Robertson	Florida and Georgia. Associated with Maleberry [<i>Lyonia ligustrina</i> (L.) DC)] (Ericaceae) across its range, which extends northeast to New England (Wagner <i>et al.</i> , 2014). Like other oligolectic <i>Colletes</i> it has been underrecorded in historical collections.
<i>C. simulans miamiensis</i> Mitchell	Known definitively only from Florida, but specimens likely referable to this taxon occur in Mississippi and Georgia. Differs considerably from <i>C. simulans armatus</i> , a common bee across much of eastern North America. <i>Colletes s. miamiensis</i> is recorded only from Florida by its author (1960), but Stephen (1954) reported “intermediate forms” from Hattiesburg, Mississippi, these evidently treated as <i>C. armatus</i> by Mitchell (1960; see below), and (rather implausibly) El Paso, Texas, and concluded, “it appears that the Florida specimen represents the eastern terminus of an east-west cline extending through Texas and the southern states”. We have not had a chance to study the putative intermediates, so make no formal taxonomic changes here, but we suspect that <i>C. s. miamiensis</i> will prove to be deserving of species rank and that Mississippi record will pertain to <i>C. s. miamiensis</i> whereas the bee from distant El Paso will prove distinct.

Table 2. Continued.

<i>C. speculiferus</i> Cockerell	Florida and Georgia. Has been under-recorded due to identification and taxonomic problems (Kuhlmann & Ascher, 2011), but now well known from coastal and interior sand dunes in the mid-Atlantic and southeastern states where associated with autumnal composites, especially <i>Solidago</i> .
<i>C. thoracicus</i> Smith	Florida (type locality: St. John's Bluff, Florida, where likely first collected by Edward Doubleday in the 1830s) and Georgia. Occurs north to Massachusetts.
<i>C. thysanellae</i> Mitchell	Florida (type locality: Pensacola) and Georgia. A southeastern specialist occurring north on the Atlantic Coastal coastal plain to Virginia.
<i>C. titusensis</i> Mitchell	Florida endemic. New records for this poorly known species include males from Old Town, Dixie County, 14 April 1938, collected by F.E. Lutz, det. JSA (AMNH); and Canaveral National Seashore, Brevard County, 29 March 2013, J. Steiner, pan trap, det. S. Droege (United States Geological Survey, Sam Droege database).
<i>C. ultravalidus</i>, n. sp.	Endemic to northern Florida and adjacent southern Georgia. Known from near-coastal sandhill or scrubby flatwoods adjacent to shrub bog or dome or basin swamp.
* <i>C. validus</i> Cresson	Recorded from Georgia (but not Florida) and South Carolina by Mitchell (1960), whereas Stephen (1954) listed Raleigh and Ivanhoe, North Carolina, as marginal (southern) localities. Specimen vouchers for Mitchell's Georgia record need to be rechecked as these may pertain to the new species <i>C. ultravalidus</i> .
<i>C. willistoni</i> Robertson	Best known from the midwestern and the Central United States, but recorded from the mid-Atlantic states northeast to Nova Scotia and west to Utah. Recorded by Mitchell (1960) from Florida but not other southeastern states, whereas Stephen (1954) cited a marginal locality of Raleigh, North Carolina. Recorded by Pascarella & Hall (2015) from Florida only from Cedar Key in Levy County presumably based on a specimen determined by T.B. Mitchell in the AMNH, collected 2 March 1956 by H.V. Weems, Jr., on Solanaceae. Also reported from Georgia (http://native-bees-of-georgia.ggc.edu/?page_id=521 ; last accessed 22 October 2015).

recently described species, *C. francesae* Deyrup & Deyrup, from Archbold Biological Station associated with *Sideroxylon tenax* L. (Sapotaceae) was described by Deyrup & Deyrup (2011). From northern Florida, Hall & Ascher (2014) documented previously unrecorded *C. longifacies* males and extended the range of the sandhills specialist *C. howardi* from North Carolina south to Florida.

Table 3. Species of *Colletes* excluded from the region of study.

<p><i>C. kincaidii</i> Cockerell</p>	<p>Recorded by Mitchell (1960) in his Table 1 from Virginia, Tennessee, North Carolina, and Georgia, whereas his text indicated a more limited distribution “southward through the Appalachians as far as North Carolina”. We concur with Stephen (1954) that Ithaca, in Tompkins County, central New York State (from where there seem to be no recent records), is a marginal (southern) locality for this species and suspect that Mitchell’s records from the southeastern states pertain to <i>C. eulophi</i>. Thus, we remove <i>C. kincaidii</i> from the list of bees confirmed to occur in Georgia and add <i>C. eulophi</i> to the hypothetical list for the state (see Table 2).</p>
<p><i>C. simulans armatus</i> Patton</p>	<p>Stephen (1954) recorded this subspecies south only to Raleigh, North Carolina, but Mitchell (1960) recorded it in his distributional table from both Mississippi and Georgia. Mississippi specimens, from Hattiesburg, were treated by Stephen (1954) as a form intermediate between <i>C. simulans simulans</i> and <i>C. s. miamiensis</i>. Given that Mitchell (1960) did not address the uncertainty in Stephen’s identification, we think both the Mississippi and Georgia records require further verification before <i>C. s. armatus</i> can be accepted on lists for those two states.</p>
<p><i>C. solidaginis</i> Swenk</p>	<p>Recorded from both Florida and Georgia by Mitchell (1960), but Stephen (1954) recorded the species south only to North Carolina: Raleigh; Swannanoa. In our experience this is a northern species, and we regard Florida and Georgia records as unlikely. It is readily confused with other members of the <i>americanus</i> species group well known from the region such as <i>C. mandibularis</i>.</p>
<p><i>C. wilmattae</i> Cockerell</p>	<p>Recorded from Georgia by Mitchell (1960), but he considered the record “somewhat doubtful.” Due to the possibility of confusion with poorly known species such as <i>C. howardi</i>, we regard this record as doubtful. The nearest fully confirmed records are from Wisconsin (Wolf & Ascher, 2008).</p>

More generally, the distribution of species of *Colletes* in the southeastern United States and Georgia in particular has been poorly documented. Mitchell (1960) provided still useful keys to the eastern *Colletes* species, illustrations of the male terminalia, and a table of distribution by state. The latter requires further scrutiny, as he reported distributions for certain *Colletes* south to Georgia that Stephen (1954) reported as reaching their southern limits much farther north. Differences in these reports reflect the great difficulty in separating certain species in the *simulans* group, notably *C. eulophi* Robertson from its northern relative *C. kincaidii* Cockerell, and also species in the *americanus* species group (Stephen, 1954; Kuhlmann & Ascher, 2011). We concur with Stephen’s (1954) more conservative view of the ranges of these species, based on our restudy of historical material and consideration of general biogeographic patterns for regional bees. The species of *Colletes* confirmed from Florida and Georgia are listed and annotated in Table 2 and excluded or hypothetical species in Table 3.

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