



C20.1: *U. albicornis* ♀

20. Genus *Urocerus* Geoffroy

Fig. C20.1 (live female)

Urocerus Geoffroy, 1785: 363. Type species: *Ichneumon gigas* Linnaeus; monotypic.

Xanthosirex Semenov 1921: 86. Type species: *Xanthosirex phantasma* Semenov; original designation. Gussakovskij 1935: 340, Benson 1943: 24.

Diagnostic combination

Among genera with antennal sockets quite close (inner edges of antennal sockets 1.5–2.0 times as long as distance between inner edge of eye and outer edge of socket) [*Sirex*, *Sirotrex*, *Xeris*, and *Xoanon*], **both sexes** of *Urocerus* are recognized by the mesoscutum with dense pits on the lateral third, pronotum with anterior vertical surface densely pitted, the gena mainly smooth with a white spot dorsally, and the lack of a ridge behind the eye.

Description

Color. Black portions of body without metallic reflections.

Head. Antennal sockets with distance between their inner edges 1.5–2.0 times distance between inner edge of

eye and outer edge of socket (as in Fig. B1.4). Distance between inner edges of lateral ocelli about as long as distance between outer edge of lateral ocellus and nearest edge of eye (Fig. B4.13). Maximum distance between outer edges of eyes less than maximum width of head (thus, in frontal view, genal edges completely visible and not intersected by outer edges of eyes). Minimum distance between inner edges of eyes about 1.3–1.6 times as long as maximum eye height (as in Fig. B1.2). Gena without ridge behind eye and almost always with white spot in dorsal half (Figs. B1.42 & B1.69), with large pits, each with posterior edge not raised as a low tooth. Head with setae sharp at apex. Antenna with 13 or more flagellomeres (the smallest specimens have the lowest number), and middle flagellomeres in dorsal view 2.0–3.5 times as long as wide; in **female**, middle and apical flagellomeres with sensory pits over all except outer surface, and apical 5–10 flagellomeres with sensory oval impression on dorsal and ventral surfaces; in **male**, with sensory pits on inner surface to almost all or all surfaces, and apical flagellomeres without sensory oval impressions.

Thorax. Pronotum densely pitted over most of anterior vertical surface (Fig. B1.73). Mesoscutum entirely and densely pitted (including lateral third). Mesotarsomere 1 in lateral view not enlarged, its dorsal and ventral

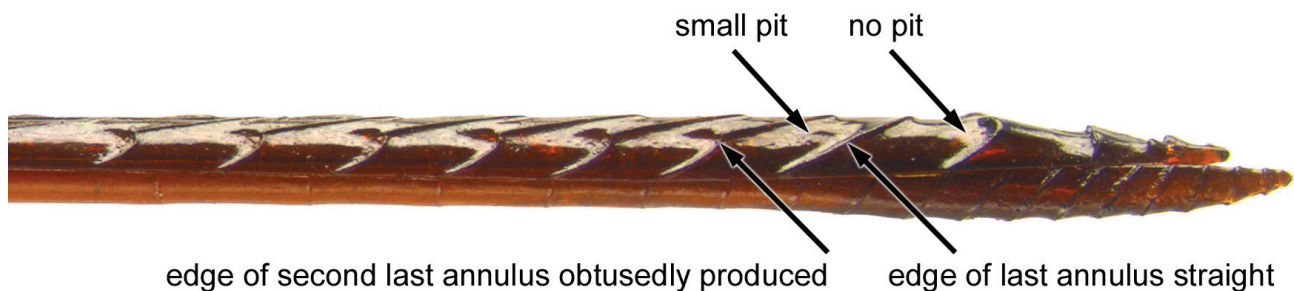
edges almost parallel and base of tarsomere at most 0.7 times its maximum width. Metatibia with two apical spurs, **in male**, metatibia in lateral view 5.5–9.0 times as long as maximum width. In **female**, metatarsomere 2 in lateral view 1.5–3.0 times as long as maximum height. Metatarsomere 5 as long as metatarsomere 2 or shorter than metatarsomeres 2 + 3. Fore wing with apex acutely and angularly rounded, with vein 2r–m joined to cell 2M (Fig. B1.71), with vein 2r–m present, with cell 1Rs2 clearly wider than long, with cell 3R1 3.5–4.5 times as wide as long, with cell 2R1 about 0.5 times as wide as cell 3R1, with vein 2r–rs joining stigma near middle, with stigma gradually attenuated even distal to junction with vein 2r–rs (as in Fig. B1.25), with vein Cu1 absent, very rarely a short stub, with vein 1cu–a joining vein Cu about mid way between veins 1m–cu and M, with vein 2A extending along wing posterior edge for about 0.4 times cell length (Fig. B1.71), and with vein 3A absent (Fig. B1.71). Hind wing with anal cell 1A (Fig. B1.44); hamuli clearly present both basal and apical to junction of veins R1 and C (as in Fig. B1.11).

Abdomen. Female. Cornus in dorsal view long, narrow, and lateral edges usually constricted at base or (in a few Asiatic species) not constricted (Fig. B1.75). Tergum 9 with median basin with lateral edges markedly divergent and straight then rounded near lateral angle and sharply outlined for about 0.5 times median length of basin, and with basin base (outlined by black furrows laterally) 1.1–1.5 times as wide as median length (Fig. B1.75). Cercus present but very small and wart-like. **Sheath.** Length

of basal section 0.6–0.8 times as long as apical section; apical section without longitudinal lateral ridge, with teeth (absent in a few species of *Urocerus* from China) in apical third of dorsal margin and each tooth with bristle near apex (as in Fig. C1.19). **Ovipositor.** Lancet with any of annuli 3–9 aligned with junction of basal and apical sections of sheath; first tooth annulus without pit; annuli anterior to first annulus before teeth annuli with small pit, and edge of last and preceding annuli above pit and before teeth annuli obtusely produced or sometimes straight (Fig. C20.2).

Diversity and distribution

Urocerus is very diverse, with 33 species restricted to the Northern Hemisphere. Taeger and Blank (2011) and Taeger *et al.* (2010) recorded 32, but we raised *U. flavicornis* to species level. There are 28 known Palaearctic species mostly in Asia (Taeger and Blank 2011, Taeger *et al.* 2010) but only 7 New World species. One introduced species is recorded from Chile; the remaining species (one introduced and five native) are recorded from Mexico north to the tree line in North America. Because we studied only 11 Palaearctic species in addition to the Nearctic ones our generic concept may be incomplete and one should expect that some Asiatic species may not fit one or more character states described above.



C20.2: *U. californicus* ♀

21. *Urocerus albicornis* (Fabricius)

- Fig. C21.1, Schiff *et al.* 2006: 60, 61 (female habitus)
 Fig. C21.2, Schiff *et al.* 2006: 59 (male habitus)
 Fig. C20.1 (live female)
 Fig. C21.3 (live male)
 Fig. C21.4 (map)

Sirex albicornis Fabricius, 1781: 419. Type female (HMUG), not examined; Fitch 1858a: 45. Type locality: “America boreali”.

Sirex abdominalis T.W. Harris, 1833: 586. Not available. Nomen nudum.

Sirex magus; Stephens, 1835: 116 (not Fabricius 1787:257). Specimen probably intercepted.

Urocerus abdominalis T. W. Harris, 1841: 392. Holotype male (MCZC), images from MCZ type database examined by HG. Synonymy by Konow 1898: 77; accepted by Ries 1951: 84, Smith 1979: 128. Type locality: Massachusetts.

Urocerus albicornis; T. W. Harris, 1841: 391 (change in combination); accepted by Walker 1873: 78, Townsend 1878: 93, Bradley 1913: 19, Ries 1951: 84, Middlekauff 1960: 66, Smith 1979: 128. Harrington 1882a.

Sirex latifasciatus Westwood, 1874: 114, pl. XXI, fig. 2. Holotype male (OXUM), images prepared by James E. Hogan and examined by HG. NEW SYNONYM. Type locality: “America Septentrionalis”.

Urocerus latifasciatus; Cresson, 1880: 50 (change in combination).

Sirex Stephensii Kirby, 1882: 375, pl. XVI, fig. 6. According to S. M. Blank (pers. comm.), this name is not a replacement name but a name given for a misinterpretation of *S. magus* Fabricius, *sensu* Stephens (1835). Therefore, it is an original description by Kirby (1882). Accordingly, material identified as *S. magus* in the Stephen’s collection should be regarded as the type or syntypes). Synonym by Konow 1898: 77; accepted by Bradley 1913: 19, Ries 1951: 84, Smith 1979: 128.

Sirex stephensi; Bradley, 1913: 18 (misspelling); Ries, 1951: 84.

Diagnostic combination

Among **females** with a completely or almost completely black abdomen, including the cornus [*californicus*], those of *U. albicornis* are recognized by the wide white central portion of the flagellum with black or brown flagellomeres at the base and apex. Among **males** with black abdominal segments 7–9 and with head mainly black [*flavicornis* and *gigas*], almost all those of *U. albicornis* are recognized by the gena partly reddish brown near the mandible, and the anterolateral angle of the pronotum, and metatarsomere 1 relatively short (4.0–5.2 times as long as high).

FEMALE. Description

Color. Head black except for white spot behind eye. Maxillary palp and mandible black. Scape and pedicel black; flagellomere 1 usually 2 in part, rarely 3 and 4 in part black or mainly so, apical flagellomeres 3–8 brown to black, and central flagellomeres white or yellowish (Fig. B4.30). Thorax black. Legs black but white on basal 0.25–0.6 of tibiae and tarsomeres 1 (Fig. B4.5). Fore and hind wings darkly tinted (Fig. B4.32). Abdomen black, or many specimens black with a white spot laterally on tergum 8 (Fig. B4.19).

Head. Vertex densely pitted between the white genal spots (as in Fig. B4.47).

Thorax. Metatarsomere 2 in lateral view about 2.5 times as long as high (Fig. B4.34), and its tarsal pad about 0.8 times as long as ventral length of tarsomere.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 1.7 times as wide as median length, with maximum width of basin 1.6–1.8 times as wide as median length, and with median length 0.35 times cornus length. Cornus in dorsal view constricted near base, and minimum width of constriction 0.7 times maximum width subapically. Tergum 8 with microsculpture of sublateral surface (between spiracle and pitted sculpticells on central area) with clearly impressed meshes, and sculpticells flat and hardly elevated posteriorly (Fig. B4.36); tergum 9 with dorsal surface lateral to median basin smooth and without meshes, and ventral surface with meshes and sculpticells flat and hardly elevated posteriorly. **Sheath.** Length 0.7–0.9 times length of fore wing, apical section 1.18–1.67 times as long as basal section. **Ovipositor.** Lancet with 24–30 annuli (annuli in basal half of lancet outlined but difficult to see); junction of basal and apical section of sheath aligned between 5th and 6th or 6th and 7th annuli; apical part of lancet with 8–14 pits. Pits 0.12–0.15 times as long as an annulus, becoming gradually very small, and disappearing in basal 0.5 of apical section of sheath. Edge of last 6–9 annuli before teeth annuli extending as ridge to ventral margin of lancet.

MALE. Description

Color. Head capsule in ventral third reddish brown or paler at least above mandible to as much as above mandible and clypeus combined, rarely completely black (Fig. B4.50). Scape and pedicel black; flagellum usually pale in basal half, gradually shifting to brown in apical half (Fig. B4.52), occasionally all brown (Fig. B4.53), and rarely completely yellowish. Pronotum light reddish brown at least near anterolateral angle to as much as most of dorsal surface, rarely completely black.

Meso- and metathorax black. Coxae, femora, part of pro- and mesotibia in many specimens, apical 0.25–0.3 of metatibia, and most of metatarsomeres 1–3 black; pro- and mesotibia, pro- and mesotarsus, and metatarsomeres 4 and 5 light reddish brown to reddish brown (Fig. B4.63, hind leg). Fore and hind wings clear and slightly dark tinted in apical half of fore wing. Abdomen with terga 3–6 reddish brown, terga 1, 2, 7 and 8 black, side of terga 3–6 often black, and sterna 2–9 mainly black or brown (Fig. B4.66).

Head. Vertex densely pitted between the white genal spots.

Thorax. Metatibia 5.5–7.0 times as long as maximum width (Fig. B4.44). Metatarsomere 1 in lateral view 4.0–5.2 as long as maximum height (Fig. B4.63).

Taxonomic notes

The types of *S. albicornis* and *S. magus* were not examined, but the descriptions (especially those of the antenna and abdomen) match our concept of this species.

Biological notes

Adults of *U. albicornis* are evidently strong fliers; specimens have been caught in the alpine zone of Mount Washington, NH (Slosson 1895). Damage by larvae was described by Thomas (1881) and Champlain (1922). Females prefer to attack recently killed or weakened trees (Blackman and Stage 1918).

Hosts and phenology

The host range of *U. albicornis* is very wide (T. W. Harris 1841, Thomas 1881, Felt 1906, Blackman and Stage 1918, Essig 1926, Bedard 1938, Reeks and Smith 1945, Belyea 1952, Stillwell 1960, Middlekauff 1960, Morris 1967, Smith, 1979: 128). Based on 131 reared and confirmed specimens, all but one host records are Pinaceae: *Abies amabilis* (1), *A. balsamea* (14), *A. grandis* (1), *A. fraseri*, *A. lasiocarpa* (1) (Morris 1967), *A. nobilis* (Benson, 1945), *Larix laricina* (18), *L. occidentalis* (11), *Picea* sp. (1), *Picea engelmannii*, *P. glauca* (33), *P. mariana* (11), *P. sitchensis*, *Pinus banksiana* (2), *P. contorta* (2), *P. resinosa* (3), *P. strobus* (12), *Pseudotsuga menziesii* (6) (Morris 1967), *Tsuga heterophylla* (14), and *Tsuga canadensis* (Felt 1906). One specimen was

recorded from *Thuja plicata* (Cupressaceae).

Based on 356 field-collected specimens, the earliest and latest capture dates are June 7 and October 4. The main flight period is from the second half of June to the first half of September with a peak from early July to late August.

Range

CANADA: AB, BC, MB, NB, NF, NS, ON, PI, QC, SK. **USA:** CA (Middlekauff 1960), DC, GA(?), ID, IL, IN, LA, MA, ME, MI, MO, MT, NC, NJ, NY, OR, PA, RI, VA, VT, WA, WV. *Urocerus albicornis*, a widespread species in forested regions, occurs from southern boreal regions of Canada south to California, New Mexico, Missouri, and North Carolina (Lintner 1898, Blackman and Stage 1918, Rohwer 1928, Smith 1979) (Fig. C21.4). It has been reported as an interception in the United Kingdom (Lintner 1898, Cameron 1890, Benson 1945).

Specimens studied and included for the distribution map: 763 females and 242 males from BYUC, CASS, CFIA, CNC, CUCC, CUIC, DEBU, EDUM, FRLC, GFLC, LECQ, LEMQ, MNRQ, NFRC, NFRN, OSAC, PFRC, USFS–GA, and USNM.

Specimens for molecular studies: 39 specimens. See Fig. E2.4a.

CANADA. British Columbia: 2006, *CBHR 451*, 658; 2006, *CBHR 452*, 658; 2006, *CBHR 454*, 658; 2006, *CBHR 455*, 658; 2006, *CBHR 456*, 658; 2006, *CBHR 457*, 658; 2006, *CBHR 458*, 658; 2006, *CBHR 459*, 658; 2006, *CBHR 461*, 658; 2006, *CBHR 463*, 658; 2006, *CBHR 464*, 658; 2006, *CBHR 465*, 658; 2006, *CBHR 467*, 658; 2006, *CBHR 468*, 658; 2006, *CBHR 469*, 658; 2006, *CBHR 470*, 658; 2006, *CBHR 471*, 658; 2006, *CBHR 472*, 658; 2009, *SIRCA 087*, 595. **Nova Scotia:** 2006, *CBHR 295*, 658; 2006, *CBHR 298*, 658. **Ontario:** 2009, *CNCS 1072*, 608; 2009, *CNCS 1073*, 591; 2009, *SIRCA 029*, 616; 2009, *SIRCA 030*, 614; 2009, *SIRCA 031*, 615; 2009, *SIRCA 032*, 619; 2009, *SIRCA 033*, 615. **USA. Minnesota:** 2008, *CBHR 1372*, 658; 2008, *CBHR 1463*, 658; 2008, *CBHR 1472*, 658; 2008, *CBHR 1473*, 658. **Montana:** 2006, *CBHR 327*, 658; 2006, *CBHR 328*, 658; 2006, *CBHR 329*, 658. **New York:** 2005, *CBHR 199*, 658; 2005, *CBHR 202*, 658. **Washington:** 2005, *CBHR 240*, 658; 2005, *CBHR 251*, 658.



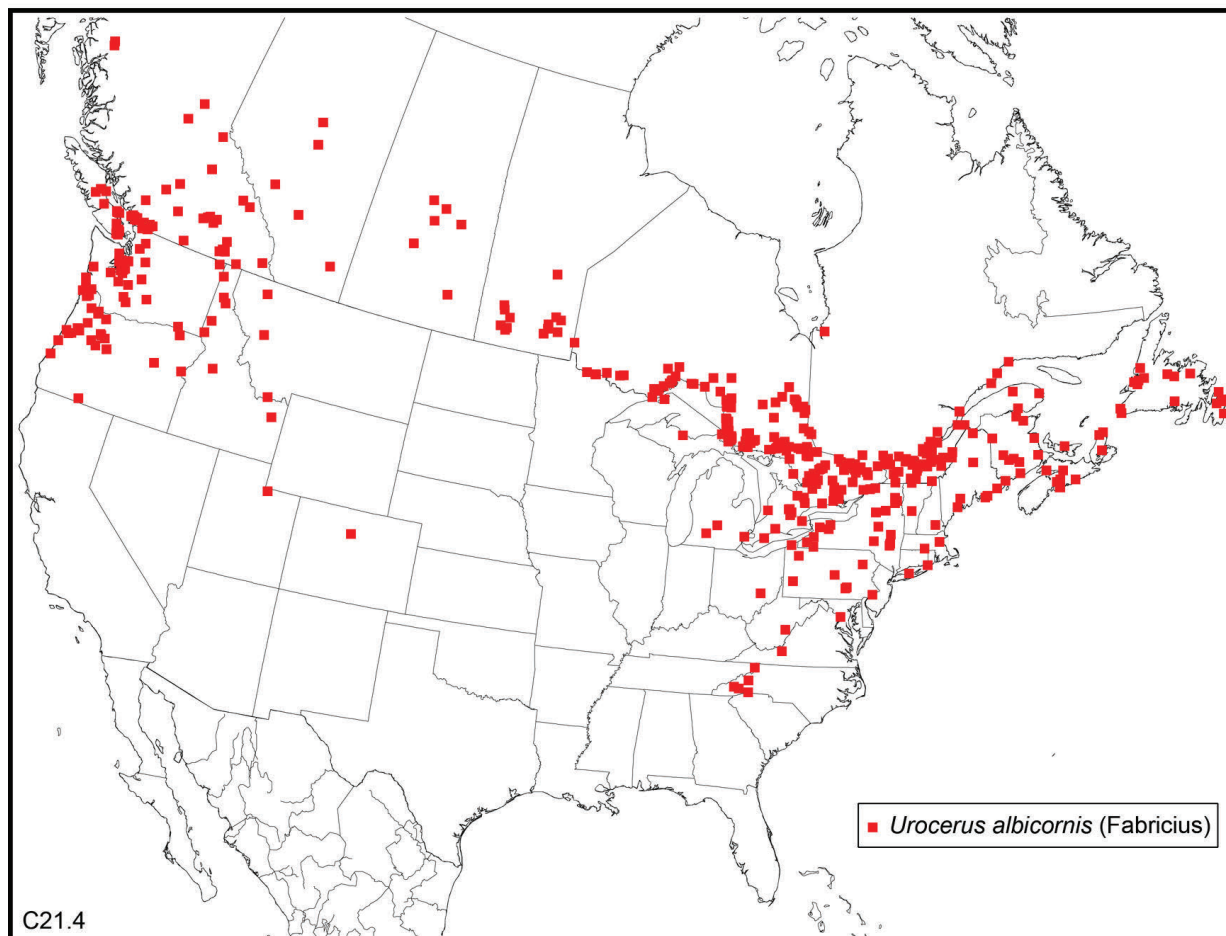
C21.1: *U. albicornis* ♀



C21.2: *U. albicornis* ♂



C21.3: *U. albicornis* ♂



C21.4

22. *Urocerus californicus* Norton

Fig. C22.1, Schiff *et al.* 2006: 64, 65 (female habitus)

Fig. C22.2, Schiff *et al.* 2006: 63 (male habitus)

Fig. C22.6 (map)

Urocerus albicornis var. *californicus* Norton, 1869: 360, Ries 1951: 84, Smith 1979: 128. Norton described a female as this variety of *U. albicornis*, but gives no locality or number of specimens. California is not listed in the distribution of *U. albicornis* and no specimens were located (the name is not mentioned in Cresson 1928: 10, 11). Type locality: perhaps California. There is no evidence that the name was either subspecific or infraspecific in the original text. The name, *californicus*, suggests a geographical variant of the species. The description is also clearly diagnostic. Therefore, we consider this name as subspecific and valid.

Urocerus fulvus Cresson, 1880: 35. Lectotype male (ANSP) designated by Cresson 1916, seen by DRS; Cresson, 1916: 10. Synonym by Bradley 1913: 20; accepted by Ries 1951: 84, Smith 1979: 128, Smith 1988: 242. Type locality: Colorado.

Sirex flavipennis Kirby, 1882: 380, pl. XV, fig. 10. Holotype female (BMNH), not examined. Synonym by Bradley 1913: 20; accepted by Ries 1951: 84, Smith 1979: 128, Smith 1988: 242. Type locality: "Vancouver's Island".

Sirex fulvus; Kirby, 1882: 379 (change in combination).

Urocerus californicus; Bradley, 1913: 20 (change in rank); accepted by Ries 1951: 84, Smith 1979: 128, Smith 1988: 242.

Diagnostic combination

Among **females** with a completely or almost completely black abdomen, including cornus [*albicornis*], those of *U. californicus* are recognized by the completely white flagellum and clearly yellow tinted wings. **Males** of *U. californicus* are recognized by the almost completely light reddish brown body and the brown or reddish brown legs.

FEMALE. Description

Color. Head black except for white spot behind eye. Maxillary palp and mandible black. Scape black or brown (rarely as pale as flagellum), and pedicel as pale as flagellum or a little darker; flagellum white or yellowish (Fig. B4.29). Thorax black. Legs black but white on basal 0.25–0.6 of tibiae (usually more on protibia than on metatibia) and on tarsomeres 1. Fore and hind wings clearly yellow tinted (Fig. B4.31). Abdomen black, or a few specimens with a white spot laterally on tergum 8 (as

in Fig. B4.19).

Head. Vertex densely pitted between the white genal spots (as in Fig. B4.47).

Thorax. Metatarsomere 2 in lateral view about 4.0 times as long as high (Fig. B4.33), and its tarsal pad about 0.8 as long as ventral length of tarsomere.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 1.7 times as wide as median length, with maximum width 1.6–1.8 times as wide as median length, and with median length 0.3–0.4 times as long as cornus length. Cornus in dorsal view constricted near base, and minimum width of constriction 0.7–0.9 times as wide as maximum width subapically. Tergum 8 with microsculpture of sublateral surface (between spiracle and pitted sculpticells on central area) smooth and without meshes (except near spiracle); tergum 9 with dorsal surface lateral to median basin smooth and without meshes, ventral surface with meshes, and sculpticells flat and hardly elevated posteriorly. **Sheath.** Length 0.8–1.0 time length of fore wing; apical section 1.25–1.67 times as long as basal section. **Ovipositor.** Lancet with 25–32 annuli (annuli in basal 0.5 of lancet outlined but difficult to see (Fig. C22.3)); junction of basal and apical sections of sheath aligned between 5th and 6th or 6th and 7th annuli (Fig. C22.4); apical part of lancet with 13–19 pits. Pits 0.2–0.3 times as long as an annulus, becoming gradually small, and disappearing in basal 0.15–0.4 of apical section of sheath; edge of last 8–12 annuli before teeth annuli extending as ridge to ventral margin of lancet (Fig. C22.5).

MALE. Description

Color. Body mainly light reddish brown (Fig. B4.61 abdomen). Gena from lowest edge of eye to postocellar furrow white (Fig. B4.57). Legs light reddish brown, but brown on coxae, femora, apical 0.7 of mesotibia, metatibia, and most of meso- and metatarsomeres 1–3 (Fig. B4.59, hind leg). Fore and hind wings clearly yellow tinted.

Head. Vertex densely pitted between the white genal spots (Fig. B4.55).

Thorax. Metatibia 4.4–6.2 times as long as maximum width. Metatarsomere 1 in lateral view 4.0–5.0 as long as maximum height (Fig. B4.59).

Taxonomic notes

The types of *Urocerus albicornis* var. *californicus* and *Urocerus flavipennis* were not examined, but their descriptions (especially the fore wing color pattern) match our concept of this species.

The females of this species and *U. albicornis* are

similarly colored, but both species occur sympatrically in southern British Columbia and nearby Washington, without any intermediate specimens. Adults are easily distinguished as outlined in the diagnostic combination.

Hosts and phenology

The host range of *U. californicus* is very wide (Essig 1926, Bedard 1938, Benson 1945, Middlekauff 1960, Cameron 1965, Morris 1967, Kirk 1975, Smith, 1979: 128). Based on 109 reared and confirmed specimens, all hosts are Pinaceae: *Abies balsamea*, *A. concolor* (104), *A. lasiocarpa*, *A. magnifica*, *A. nobilis*, *Larix occidentalis*, *Calocedrus decurrens*, *Picea engelmanni*, *P. sitchensis*, *Pinus sp.* (1), *P. contorta*, *P. lambertiana*, *P. monticola*, *P. ponderosa*, *Pseudotsuga menziesii* (3), and *Tsuga heterophylla* (Morris 1967).

Based on 25 field-collected specimens, the earliest and latest capture dates are April 30 and early November. The main flight period is from the second half of July to the end of September with a peak in August.

Range

CANADA: BC. **MEXICO:** Hidalgo, Parque Nacional El Chico (specimen not seen; data from correspondence

with R. L. Westcott). **USA:** CA (Middlekauff 1960), CO, ID, MT, NV, OR, UT, WA. *Urocerus californicus*, a western North American species, is recorded from southern British Columbia to northwestern Mexico (Fig. C22.6). Cameron (1883) and Middlekauff (1960) also mention Mexico without a specific locality, in addition to the record above. A few specimens were recorded from lumber in eastern North America (Burks 1967). One intercepted specimen was reported from England (Benson 1945), and one female from Port Angeles, WA, was intercepted in Osaka, Japan (Okutani 1965).

Specimens studied and included for the distribution map: 341 females and 75 males from BYUC, CNC, NCSU, NFRC, OSAC, UAMC, UASM, UCRC, USFS-GA, and USNM.

Specimens for molecular studies: 14 specimens. See Fig. E2.4b.

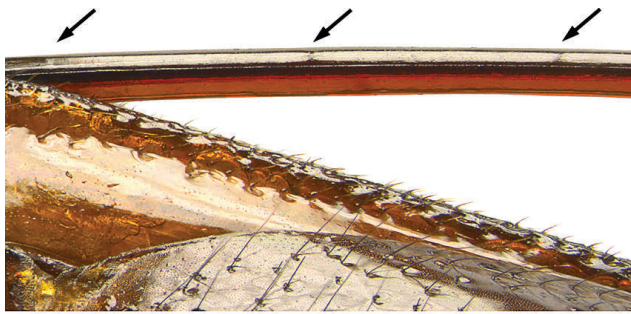
CANADA. British Columbia: 2006, *CBHR 420*, 658. **USA. California:** 2005, *CBHR 97*, 658; 1999, *CBHR 99*, 658; 1999, *CBHR 100*, 658. **Idaho:** 2008, *CBHR 1354*, 493. **Montana:** 2006, *CBHR 371*, 658. **Oregon:** 2003, *CBHR 2*, 658; 2003, *CBHR 10*, 658; 2007, *CNCS 1071*, 649. **Washington:** 2005, *CBHR 212*, 658; 2005, *CBHR 237*, 658; 2005, *CBHR 253*, 573; 2005, *CBHR 257*, 658; 2007, *CNCS 1070*, 596.



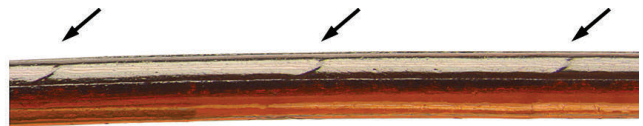
C22.1: *U. californicus* ♀



C22.2: *U. californicus* ♂



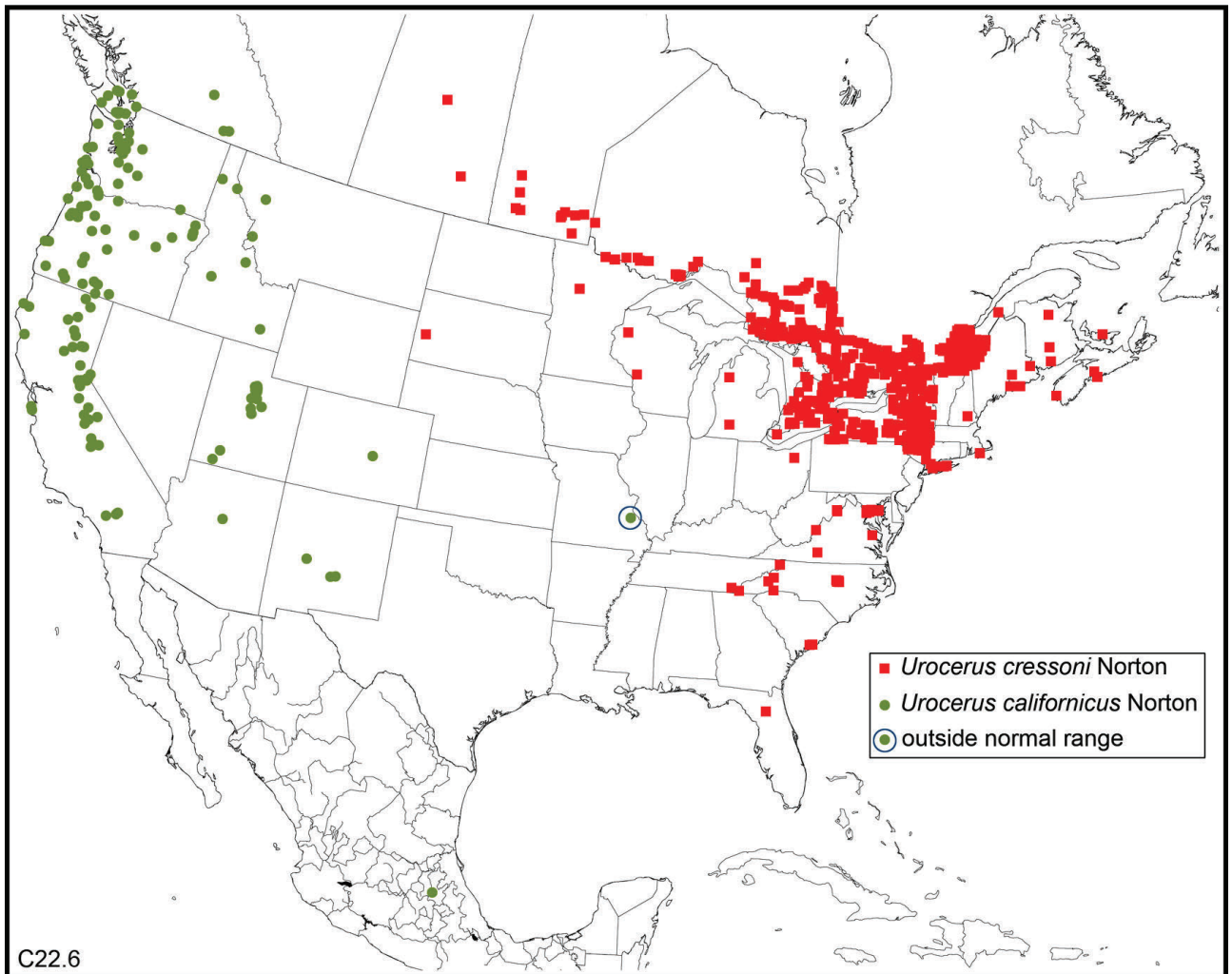
C22.3: *U. californicus* ♀



C22.4: *U. californicus* ♀



C22.5: *U. californicus* ♀



23. *Urocerus cressoni* Norton

Fig. C23.1, Schiff *et al.* 2006: 68, 69 (female habitus)

Fig. C23.2, Schiff *et al.* 2006: 67 (male habitus)

Fig. C22.6 (map)

Urocerus Cressoni Norton, 1864: 16. Holotype female (ANSP), examined by DRS. Cresson 1928: 10, Ries 1951: 84, Marshall 2000 (male photograph). Type locality: "Pennsylvania".

Urocerus tricolor Provancher, 1868: 17. Holotype female (ULQC), examined by DRS (Smith 1975a). Synonymy by Ries 1951: 84; accepted by Smith 1975a: 302, Smith 1979: 128. Type locality: Trois Rivières, QC (Norton, 1869: 362).

Sirex dimidiatus Westwood, 1874: 115, pl. XXI, fig. 5. Holotype female (OXUM), images prepared by James E. Hogan and sent to HG for study. Synonym by Cresson 1880: 67; accepted by Smith 1979: 128. Type locality: "America Septentrionalis".

Sirex tricolor; Kirby, 1882: 382 (change in combination).

Sirex Fiskei Ashmead, 1904: 63. Holotype female (USNM), examined by DRS. Synonymy by Konow, 1905b: 321; accepted by Ries 1951: 84, Smith 1979: 128. Type locality: Tryon, North Carolina.

Sirex cressoni var. *tricolor*; Bradley 1913: 21 (change in rank).

Urocerus cressoni var. *unicolor* Bradley, 1913: 22, fig. 31. Holotype female (ANSP), examined by DRS (Smith, 1975). This name is treated here as infrasubspecific as mentioned clearly by Bradley. Based on the International Code of Zoological nomenclature (1985), article 45(c) stipulates that an infrasubspecific name is excluded from the species group and the provisions of the code do not apply to it. Synonym by Ries 1951: 84; accepted by Smith 1979: 128. Type locality: Joliette, Quebec

Diagnostic combination

Among **both sexes** with the basal 0.3–0.7 of the flagellum black and sharply separated from the white apical section [*taxodii*], **females** are recognized by the reddish brown terga 6–10, and **males** by the black thorax and legs.

FEMALE. Description

Color. Head black except for white spot behind eye (Fig. B1.64). Maxillary palp and mandible black. Scape and pedicel black, flagellum (Fig. B4.16) black in basal 0.3–0.6 (usually flagellomeres 2–10), and white in apical 0.4–0.7 (apex of last flagellomere almost always darkened, rarely completely white or dark brown). Thorax black. Coxae and femora (except apex of profemur in a few

specimens) black. Tibiae and tarsi highly variable in extent of white pattern. **Extreme dark pattern:** pro- and mesotibia, pro- and mesotarsus, apical 0.8 of metatibia and apical 0.9 of metatarsomere 1 black; **extreme pale pattern:** apical half of protibia and mesotarsomeres 3, 4 and apical half of 5, apical 0.2 of mesotibia and apical half of mesotarsomeres 3–5, none of metatibia and none of metatarsus black; **common pattern:** metatibia and metatarsomere 1 black in apical 0.6–0.9, remaining tarsomeres black (Fig. B4.27), mesotibia and mesotarsomere 1 with black more extended than on hind leg, protibia and protarsomere 1 mostly black except at base. Fore and hind wings very darkly tinted with purple reflections. Abdomen reddish brown, or terga 1 up to 1–6 black (tergum 2 usually whitish yellow) (Fig. B4.3).

Head. Vertex densely pitted between the white genal spots (Fig. B4.47).

Thorax. Metatarsomere 2 about 2.0 times as long as high (Fig. B4.27), and its tarsal pad about 0.5 as long as ventral length of tarsomere (Fig. C23.3).

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 2.0 times as wide as median length, with maximum width 2.2–2.5 times as wide as median length, and with median length 0.25–0.30 times as long as cornus length (Fig. B1.75). Cornus in dorsal view constricted near base, and minimum width of constriction 0.7–0.8 times maximum width of cornus subapically. Tergum 8 with microsculpture of sublateral surface (between spiracle and pitted sculpticells on central area) with clearly impressed meshes, and sculpticells raised and scale-like (thus, surface matt) (Fig. A3.14); tergum 9 with dorsal surface lateral to median basin smooth and without meshes (Fig. B4.25), and ventral surface with meshes, and sculpticells scale-like and slightly elevated posteriorly. **Sheath.** Length 0.85–0.95 times length of fore wing, apical section 1.18–1.54 times as long as basal section. **Ovipositor.** Lancet with 26–32 annuli (annuli in basal 0.5 of lancet outlined but difficult to see); junction of basal and apical sections of sheath aligned between 5th and 6th, 6th and 7th, or 7th and 8th ovipositor annuli; apical part of lancet with 17–22 pits. Pits 0.25–0.3 times as long as annulus, becoming gradually small, and disappearing at the base of apical sheath section or on subapex of basal section; edge of last 8–10 annuli before teeth annuli extending as ridge to ventral margin of lancet.

MALE. Description

Color. Head capsule (except white genal spot, and in many specimens reddish brown surface of capsule below eye often including clypeus) black. Scape and pedicel black; flagellum black in basal 0.3–0.6 and white in apical 0.4–0.7 except for darkened last flagellomere (Fig.

B4.37). Gena from middle of eye almost to postocellar furrow white. Fore and hind wings very darkly tinted. Thorax and legs (apical articles maybe reddish brown in some specimens) black (Figs. B4.45 & B4.47). Abdomen mostly light reddish brown (Fig. B4.41), the following black or brown: tergum 1, tergum 1 and 2, side of terga 3–7, posterior margin of terga 3–6, median area of tergum 8, sterna 1 to 1–6.

Head. Vertex densely pitted between the white genal spots (Fig. B4.47).

Thorax. Metatibia 5.0–6.5 times as long as maximum width. Metatarsomere 1 in lateral view 4.0–5.0 as long as maximum height (Fig. B4.45).

Taxonomic notes

Many of the above synonyms are due to great color variation in females. However, when numerous females are available from the same region and even the same locality the leg and abdominal color variation is great. No geographical pattern is associated with this color variation.

Hosts and phenology

The host range of *U. cressoni* is rather wide (Craighead 1950, Smith, 1979: 128). All published host records are Pinaceae, and only 2 reared and confirmed specimens were examined: *Abies balsamea*, *A. fraseri*, *Larix occidentalis* (2), *Picea sitchensis*, *Pinus contorta*, *P. rigida*, *P. taeda*, *P. virginiana*, and *Pseudotsuga*

menziesii.

Based on 846 field-collected specimens, the earliest and latest capture dates are June 26 and September 27. The main flight period is from the second half of July to the first half of September, with a peak in August.

Range

CANADA: MB, NS, NB, ON, PI, QU, SK. **USA:** CO, CT, DC, FL, GA, IA, IN, MA, MD, MN, NC, NE, NJ, NY, OH, PA, SC, TN, VA, WV, WI. *Urocerus cressoni*, an eastern species, is known from southern Saskatchewan to Nova Scotia, and south to Florida (Lintner 1898, Rohwer 1928, Craighead 1950, Burks 1958, Burks 1967, Smith 1979) (Fig. C22.6).

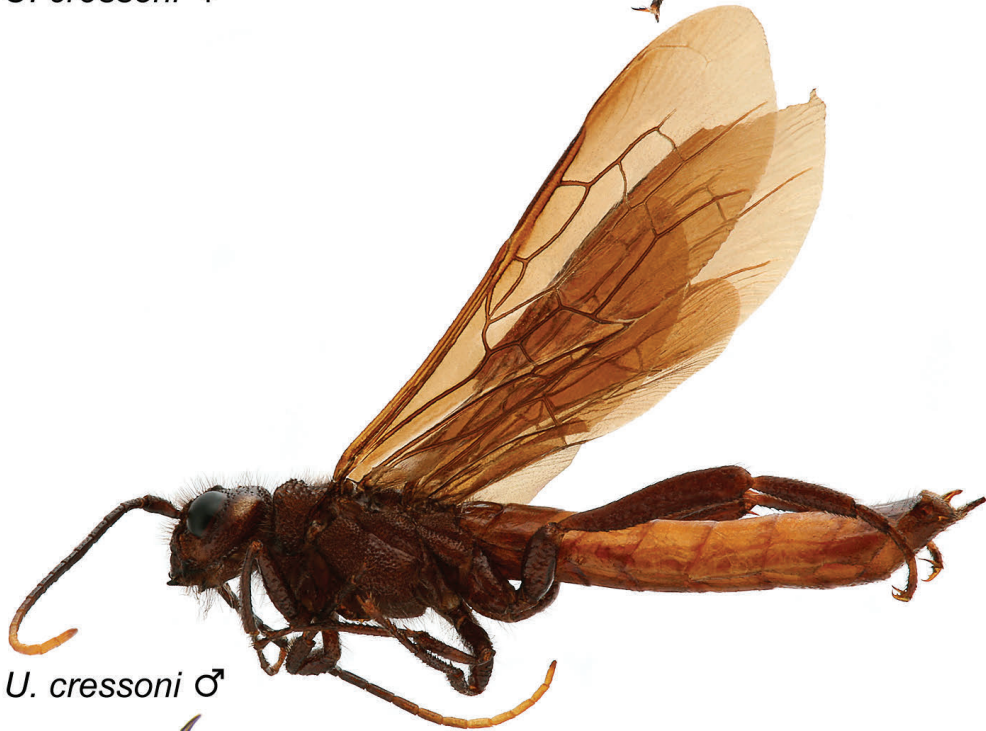
Specimens studied and included for the distribution map: 1493 females and 44 males from BYUC, CNC, CUCC, CUIIC, DEBU, EDUM, FRLC, GLFC, LECQ, LEMQ, MNRQ, NCSU, NFRC, UCRC, USFS–GA, and USNM.

Specimens for molecular studies: 12 specimens. See Fig. E2.4b.

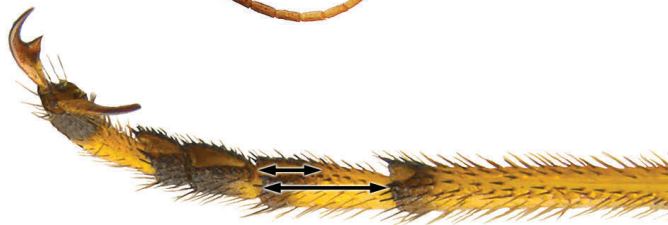
CANADA. Nova Scotia: 2006, *CBHR* 299, 658. **Ontario:** 2007, *SIRCA* 034, 639; 2007, *SIRCA* 038, 639. **USA. Colorado:** 2005, *CBHR* 192, 658; 2005, *CBHR* 559, 658. **Georgia:** 200, *CBHR* 517, 658. **Illinois:** 2006, *CBHR* 169, 658. **Indiana:** 2005, *CBHR* 176, 658. **New York:** 2005, *CBHR* 196, 658; 2005, *CBHR* 200, 658; 2005, *CBHR* 204, 658. **South Carolina:** 2006, *CBHR* 893, 658.



C23.1: *U. cressoni* ♀



C23.2: *U. cressoni* ♂



C23.3: *U. cressoni* ♀

24. *Urocerus flavicornis* (Fabricius), n. stat.

Fig. C24.1, Schiff *et al.* 2006: 72, 73 (female habitus)

Fig. C24.2, Schiff *et al.* 2006: 71 (male habitus)

Fig. C24.3 (map)

Sirex flavicornis [recte: *flavicornis*] Fabricius, 1781: 418. Type female (HMUG), not examined. The spelling *flavicornis*, introduced by Gmelin (1790), is in prevailing use. Type locality: "Labrador Americae".

Sirex bizonatus Stephens, 1829: 342 (nomen nudum).

Sirex bizonatus Stephens 1835: 114, pl. 36, fig. 2. Holotype female (BMNH), not examined. Synonymy by Cresson 1865b: 247; accepted by Smith 1979: 128, Harrington 1882a. Type locality: "near London".

Urocerus riparius MacGillivray, 1893: 244. Lectotype male (INHS, Webb 1980), designated by Frison (1927), not examined. Synonymy by Bradley 1913: 18; accepted by Smith 1979: 128. Type locality: Skokomish River, Washington. Described from "2 males."

Urocerus flavicornis; Bradley 1913: 18 (change in combination); Fitch 1858a: 45, under *U. abdominalis*; Burks 1958: 16.

Sirex latifasciatus Konow, 1898: 77 (not Westwood, 1874: 114, pl. XXI, fig. 2).

Urocerus gigas flavicornis, Benson, 1943: 39 (change in rank); accepted by Middlekauff 1960, Smith 1979: 128.

Diagnostic combination

Among **females** with light reddish brown protarsomeres 2–5 [*gigas* and *sah*], those of *U. flavicornis* are recognized by the black pronotum and tergum 9. **Males** are recognized by a black head and pronotum, black abdominal segments 7–9, and, in North American specimens, by the narrow metatarsomere 1 (5.5–8.0 times as long as high).

FEMALE. Description

Color. Head black except for white spot behind eye, spot extending from ventral edge of eye almost to postocellar furrow (Fig. B4.12). Maxillary palp and mandible black. Scape, pedicel, and flagellum light reddish brown, and apex of last flagellomere not darkened. Thorax black (Fig. B4.8). Coxae, basal 0.5–0.7 of pro- (Fig. B4.4) and mesofemur, and metafemur (except extreme apex) (Fig. B4.10) black; tibiae and tarsi light reddish brown (in most specimens, metatibia with brown cloud in apical 0.3 on inner surface) (Fig. B4.10). Fore and hind wings basically clear. Abdomen black, but light reddish brown on terga 1 (some specimens), 2, 7, 8 (basal half of almost all specimens) and 10 (cornus only) (Fig. B4.1).

Head. Vertex densely pitted between the white genal spots. Surface below genal white spot widely pitted.

Thorax. Metatarsomere 2 in lateral view about 2.0 times as long as high, and its tarsal pad about 0.8 as long as ventral length of tarsomere.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) about 1.6 times as wide as median length, with maximum width about 1.7 times as wide as median length, and with median length about 0.4 times as long as cornus length. Cornus in dorsal view constricted near base, and minimum width of constriction about 0.8 times maximum width subapically. Tergum 8 with microsculpture of sublateral surface (between spiracle and pitted sculpticells on central area) with clearly impressed meshes, and sculpticells flat; tergum 9 with dorsal surface lateral to median basin smooth and without meshes, and ventral surface with meshes and flat sculpticells. **Sheath.** Length 0.7–0.9 times length of fore wing; apical section 1.1–1.5 times as long as basal section. **Ovipositor.** Lancet with 24–32 annuli (annuli in basal 0.5 of lancet outlined but difficult to see); junction of basal and apical sections of sheaths aligned between 5th and 6th, or 6th and 7th annuli; apical part of lancet with 14–20 pits. Pits 0.2–0.3 as long as an annulus, becoming gradually small, and disappearing at base of apical sheath section. Edge of last 7–9 annuli before teeth annuli extending as ridge to ventral margin of lancet.

MALE. Description

Color. Head capsule black, except for white spot behind eye extending from ventral edge of eye almost to postocellar furrow. Flagellum black or brown to light reddish brown in basal half. Thorax black. Legs black but pro- and mesotarsus, and pro- and mesotibia (brown dorsally in a few specimens) reddish brown; basal 0.25 of metatibia and basal 0.25 and extreme apex of metatarsomeres 1 light reddish brown (Figs. B4.64 & B4.62 hind leg). Fore and hind wings clear. Abdomen black, but light reddish brown on most of terga 3–6.

Head. Vertex densely pitted between the white genal spots. Surface below genal white spot widely pitted.

Thorax. Metatibia 6.8–9.0 times as long as maximum width (Fig. 4.64). Metatarsomere 1 in lateral view 5.5–8.0 times as long as maximum height (Fig. B4.62).

Taxonomic notes

The types of *S. flavicornis*, *S. bizonatus* and *U. riparius* were not examined, but the descriptions match our concept of *U. flavicornis*.

Urocerus flavicornis has long been regarded as a subspecies of *U. gigas*. We have seen specimens of *U. gigas* from Kamchatka and Alaska. They show no evidence of gene flow. Moreover, the information from

morphology and DNA barcoding shows a clear difference between the two populations. Therefore, we consider them specifically distinct.

Females are easily distinguished from other species of *Urocerus* in the Western Hemisphere but males have been commonly mixed in collections with those of *U. albicornis* despite a paper by Peck (1937) distinguishing them by the proportion of the length and height of metatarsomere 2. Males of *U. flavicornis* are quite similar to those of *U. gigas*, but are distinguished on color pattern and, for most specimens, by the proportions of metatarsomere 1 and metatibia.

Biological notes

Males of *U. flavicornis* have been observed aggregating at the highest spot of a mountain top where they wait to intercept females (Chapman 1954).

Hosts and phenology

The host range of *U. flavicornis* is wide (Felt 1906 [under *U. abdominalis*], Essig 1926, Burks 1958: 16, Middlekauff 1960, Cameron 1965, Morris 1967, Kirk 1975, Smith, 1979: 128). Based on 51 reared and confirmed specimens, all but one host are Pinaceae: *Abies concolor* (13), *A. lasiocarpa* (4), *Larix occidentalis* (2), *Picea engelmannii* (3), *P. glauca* (19), *P. sitchensis*, *P. sp.* (1), *Pinus banksiana* (3), *P. contorta* (1), *P. strobus* (4), and *Pseudotsuga menziesii*. One specimen has been reared from *Thuja occidentalis* (Cupressaceae).

Based on 338 field-collected specimens, the earliest and latest capture dates are June 25 and November 17. The main flight period is from early June to the first half of September with a peak in the second half of July and the first half of August. Twenty-seven males were caught at hill top in Montana from late June till early September (Chapman 1954).

Range

CANADA: AB, BC, MB, ON, PI, NB, NF, NS, NT, NU, QC, SK, YT. **MEXICO.** Uncertain record mentioned by Cameron (1883) without a specific locality. **USA:** AK, CA (Middlekauff 1960), ID, CO, ME, MT, NH, NY, OR, PA, UT, WA, WY.

Urocerus flavicornis is known from all forested regions of Canada and the United States (Harrington 1882a, Rohwer 1928, Weber 1950, Burks 1958: 16, Cameron 1965, Smith 1979) (Fig. C24.3). It was recorded as an interception in Réunion Island (Bordage 1914) and England (Cameron 1890, Benson 1943).

Specimens studied and included for the distribution map: 914 females 122 males from BYUC, CASS, CNC, DEBU, EDUM, GFLC, LECQ, LEMQ, MNRQ, NCSU, NFRC, OSAC, PFRC, UAM, UASM, UCRC, USBD, USFS-AK, and USNM.

Specimens for molecular studies: 32 specimens. See Fig. E2.4c.

CANADA. Ontario: 2007, *SIRCA 039*, 620; 2007, *SIRCA 040*, 619.

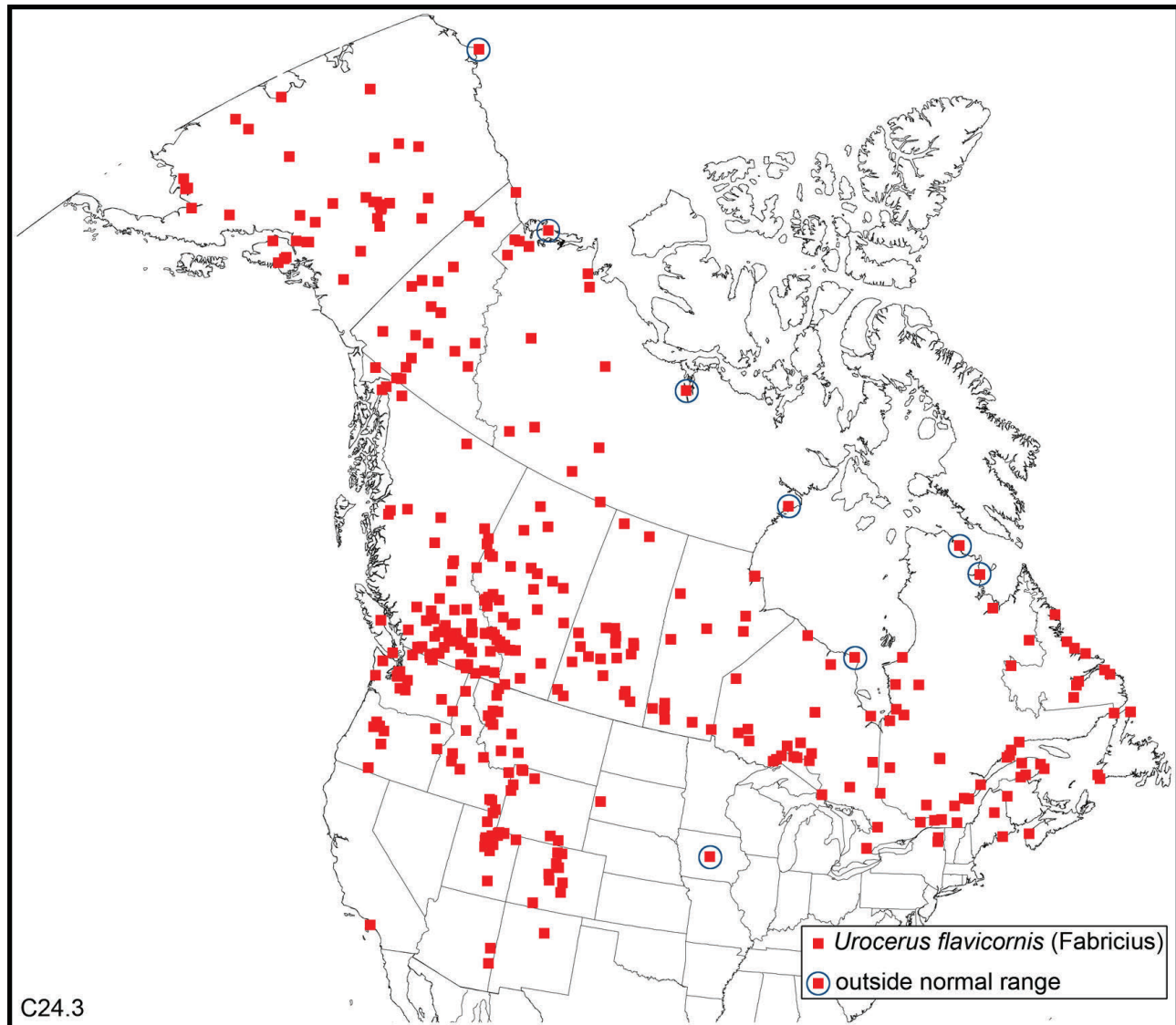
USA. Alaska: 2005, *CBHR 231*, 658. **Colorado:** 2005, *CBHR 560*, 658; 2005, *CBHR 561*, 658; 2005, *CBHR 562*, 658; 2005, *CBHR 563*, 658; 2005, *CBHR 564*, 658; 2005, *CBHR 565*, 658; 2005, *CBHR 566*, 658; 2005, *CBHR 567*, 658; 2005, *CBHR 568*, 658; 2005, *CBHR 569*, 658. **Montana:** 2006, *CBHR 324*, 658; 2006, *CBHR 325*, 658; 2006, *CBHR 326*, 658; 2006, *CBHR 330*, 658; 2006, *CBHR 332*, 658; 2006, *CBHR 333*, 658; 2006, *CBHR 335*, 658; 2006, *CBHR 336*, 658; 2006, *CBHR 337*, 658; 2006, *CBHR 338*, 658. **Oregon:** 1999, *CBHR 12*, 658; 1999, *CBHR 105*, 658; 1999, *CBHR 106*, 658; 1999, *CBHR 107*, 658. **Utah:** 2008, *CBHR 1950*, 658. **Washington:** 2005, *CBHR 208*, 625; 2005, *CBHR 224*, 658; 2005, *CBHR 234*, 658; 2005, *CBHR 250*, 658.



C24.1: *U. flavicornis* ♀



C24.2: *U. flavicornis* ♂



25. *Urocerus gigas* (Linnaeus)

Fig. C25.1 (female habitus)

Fig. C25.2 (male habitus)

Ichneumon gigas Linnaeus, 1758: 418. Holotype female (LSUK) images of type seen by HG. Thomson 1871: 328, Malaise and Benson, 1934: 12. Type locality: "Suecia".

Sirex marisca Linnaeus, 1758: 560. Taeger *et al.* 2010.

Sirex hungaricus Christ, 1791: 414–415. Taeger *et al.* 2010.

Sirex psyllius Fabricius, 1793: 124–125. Taeger *et al.* 2010.

Urocerus Lefebvre Guérin, 1833: 68. Taeger *et al.* 2010.

Sirex Faustus Costa, 1894: 258. Taeger *et al.* 2010.

Urocerus gigas taiganus Benson, 1943: 39–41. Taeger *et al.* 2010.

Urocerus gigas var. *luteigaster* Berland, 1947: 77. Taeger

et al. 2010.

Sirex gigas var. *montana* Ermolenko, 1957: 85.

Sirex gigas var. *montanus* Ermolenko, 1957: 6, not available. Nomen nudum. Taeger *et al.* 2010.

Diagnostic combination

Among **females** with light reddish brown protarsomeres 2–5 [*flavicornis* and *sah*], those of *U. gigas* are recognized by the black pronotum and light reddish brown tergum 9. **Males** of *U. gigas* are recognized by the black head, the reddish brown terga 2–8 or 3–8 (rarely 3–7) and usually the less narrow metatarsomere 1 (4.5–6.3 times as long as high).

FEMALE. Description

Color. Head black except for white spot behind eye extending from ventral edge of eye almost to postocellar furrow. Maxillary palp and mandible black. Scape, pedicel, and flagellum light reddish brown, and apex of last flagellomere not darkened. Thorax black. Coxae, basal 0.5–0.7 of pro- and mesofemur, and metafemur (except extreme apex) black; tibiae and tarsi light reddish brown. Fore and hind wings lightly yellow tinted. Abdomen black, but terga 1 (at least apical half), 2, 7, 8–10 (except side in most specimens) light reddish brown (Fig. B4.14).

Head. Vertex densely pitted between the white genal spots. Surface below white genal spot narrowly pitted.

Thorax. Metatarsomere 2 in lateral view about 2.0 times as long as high, and its tarsal pad about 0.8 as long as ventral length of tarsomere.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) about 1.7 times as wide as median length, with maximum width about 1.8 times as wide as median length, and with median length about 0.4 times as long as cornus length. Cornus in dorsal view constricted near base, and minimum width of constriction about 0.8 times maximum width subapically. Microsculpture of sublateral surface of tergum 8 (between spiracle and pitted sculpticells on central area) with meshes outlined and sculpticells flat; tergum 9 with dorsal surface lateral to median basin smooth and without meshes, and ventral surface with meshes and flat sculpticells. **Sheath.** Length 0.85–0.95 times length of fore wing; apical section 1.31–1.48 times as long as basal section. **Ovipositor.** Lancet with 24–32 annuli (annuli in basal 0.5 of lancet outlined but difficult to see); junction of basal and apical sections of sheath aligned between 6th and 7th annuli; apical part of lancet with 14–22 pits. Pits 0.2–0.3 times as long as an annulus, becoming gradually small, and disappearing at base of apical sheath section. Edge of last 8–11 annuli before teeth annuli extending as ridge to ventral margin of lancet.

MALE. Description

Color. Head capsule black (below antennal sockets with one or more light reddish brown spots in a few specimens), except white genal spot behind eye extending from ventral edge of eye almost to postocellar furrow. Flagellum mostly white or light reddish brown, rarely darkened in apical 0.25. Thorax black. Legs black, but light reddish brown on pro- and mesotibia, white in basal 0.3 of metatibia, and reddish brown in basal 0.15 and on apex of metatarsomeres 1 (Fig. B4.69 hind leg). Wings clear. Abdomen black except light reddish brown on most of terga 2–8, or rarely on terga 3–8 or 3–7 (Fig. B4.67).

Head. Vertex densely pitted between the white genal

spots. Surface ventral to genal white spot narrowly pitted.

Thorax. Metatibia 5.7–8.5 times as long as maximum width. Metatarsomere 1 in lateral view 4.5–6.3 times as long as maximum height (Fig. B4.69).

Taxonomic notes

Females of *U. gigas* are distinguished from *U. flavicornis* females by abdominal color pattern. Males are very similar but are distinguished on abdominal color pattern and, in most specimens, on proportions of metatarsomere 1 and metatibia.

Biological notes

The life cycle extends over three or more years. The biology was treated by Hanson (1939).

Hosts and phenology

The host range of *U. gigas* is wide (Allard, 2008). All but one hosts are Pinaceae: *Abies* sp., *A. alba*, *Cedrus* sp., *Larix* sp., *Picea* sp., *P. abies*, *P. sitchensis*, *Pinus* sp., *P. radiata*, *P. sylvestris*, and *Pseudotsuga menziesii*. One specimen was recorded from *Chamaecyparis* (Cupressaceae).

Based on 7 field-collected specimens from the southern Hemisphere, the earliest and latest capture dates are October 31 to May 18, with peak flight in November and December.

Range

ARGENTINA: first discovered in the provinces of Chubut, Rio Negro and Neuquén in 1993 (Klasmer, 2002, Allard, 2008). **BRAZIL:** Matto Grosso, Itumana River (an earlier record in 1880 (Ries, 1946: 218)). **CHILE:** Arauco (Contulmo, Pino), Temuco (Tronco), Bio-Bio, Italia, Malleco (Angel, Conguillio Nat. Park), Mulchen (Caledonia), and Nuble. First found after 1970 in North American conifer plantations (Allard, 2008). *Urocera gigas* is an adventive species in temperate regions of South America. The species was commonly intercepted at United States ports and even in central Alberta. It was also often intercepted in New Zealand (FRNZ, NZAC and PANZ).

Specimens studied and included for the distribution map: 18 females and 11 males from AEI, AMNH, ANSP, CNC, NFRC, and USNM.

Specimens for molecular studies: 18 specimens. See Fig. E2.4c.

ARGENTINA: 2004, *CBHR* 51, 658. **FINLAND:** 2005, *CBHR* 840, 658; 2005, *CBHR* 841, 658; 2005, *CBHR* 842, 658; 2005, *CBHR* 843, 658; 2005, *CBHR*

844, 658; 2005, *CBHR* 845, 658; 2005, *CBHR* 846, 658; 2005, *CBHR* 847, 658; 2005, *CBHR* 848, 658; 2005, *CBHR* 849, 658; 2006, *CBHR* 851, 658; 2006, *CBHR* 853, 658; 2006, *CBHR* 856, 658; 2006, *CBHR* 857, 658; 2006, *CBHR* 860, 658; 2006, *CBHR* 861, 658; 2006,

CBHR 865, 658; 2006, *CBHR* 866, 658; 2006, *CBHR* 870, 658; 2006, *CBHR* 871, 658; 2006, *CBHR* 872, 658. **FRANCE:** 1973, *CBHR* 158, 658. **GREECE:** *CBHR* 581, year unknown, 658.



C25.1: *U. gigas* ♀



C25.2: *U. gigas* ♂

26. *Urocerus sah* (Mocsáry)

Fig. C26.1, Schiff *et al.* 2006: 75, 76 (female habitus)
 Fig. C26.2 (male habitus)
 Fig. C26.3 (map)

Sirex Sah Mocsáry, 1881: 36. Holotype female (HNHM), not examined. Type locality: "Persia".

Sirex Shach; Mocsáry, 1881 (misspelling).

Urocerus augur sah; Benson, 1943: 41 (change in combination and rank).

Urocerus sah; Smith 1978: 81 (change in combination).

Diagnostic combination

Both sexes of *U. sah* are recognized by very few pits on the vertex (without pits except narrowly behind edge of eye, and along postocellar and median furrows). **Females** also have light reddish brown protarsomeres 2–5, a reddish brown pronotum, and a light reddish brown apical 0.5 of tergum 9. **Males** also have a large genal spot extending from the ventral margin of eye to the postocellar furrow.

FEMALE. Description

Color. Head capsule almost completely reddish brown except for white spot behind eye extending from ventral edge of eye almost to median furrow of postocellar surface (Fig. B4.13). Maxillary palp and mandible brown or black. Scape and pedicel more or less brown; flagellum light reddish brown and apex of last flagellomere not darkened. Thorax black or brown, but reddish brown on most of dorsal surface of pronotum (Fig. B4.9) and dorsal half of mesepisternum. Coxae black; profemur reddish brown on posterior surface, mesofemur brown at base and gradually shifting to light reddish brown toward apex; and metafemur almost completely black except at extreme apex (Fig. B4.11, hind leg); pro- and mesotibia and tarsi light reddish brown; metatibia in apical 0.7 black and light yellow in basal 0.3 (Fig. B4.11, hind leg); metatarsomere 1 light reddish brown in basal 0.5 and brown in apical 0.5, otherwise tarsomeres 1–5 reddish brown. Fore and hind wings clearly yellow tinted. Abdomen black, but light reddish brown on terga 1, 2 (at least basal 0.5), 8 (basal 0.5), 9 (apical 0.5 dorsally), and 10 (including cornus) (Fig. B4.7).

Head. Vertex not pitted except narrowly behind eye and along postocellar and median furrows, but densely pitted (diameter of pits about 0.2 times that of ocelli) on frons to posterior ocelli (Fig. B4.13).

Thorax. Metatibia about 2.0 times as long as high, and its tarsal pad about 0.8 as long as ventral length of tarsomere.

Abdomen. Median basin of tergum 9 with base (outlined

by two lateral black longitudinal furrows) about 1.7 times as wide as median length, with maximum width about 1.9 times as wide as median length, and with median length about 0.4 times cornus length. Cornus in dorsal view constricted near base, and minimum width of constriction about 0.75 times maximum width subapically. Tergum 8 with microsculpture of sublateral surface (between spiracle and pitted sculpticells on central area) with meshes and sculpticells flat; tergum 9 with dorsal surface lateral to median basin smooth and without meshes, and ventral surface with meshes and flat sculpticells. **Sheath.** Length as long as fore wing length, apical section about 1.5 times as long as basal section. **Ovipositor.** Lancet with about 34 annuli (annuli in basal 0.5 of lancet outlined but difficult to see); junction of basal and apical section of sheath aligned between 6th and 7th annuli; lancet with about 30 pits. Pits 0.2–0.3 times as long as an annulus, becoming gradually small, and disappearing at base of basal sheath section (lacking on annuli 2–4). Edge of about last 11 annuli before teeth annuli extending as ridge to ventral margin of lancet.

MALE. Description

Color. Head capsule black, except white genal spot extending from about ventral edge of eye to postocellar furrow (Figs. B4.54 & B4.56). Flagellum black to light reddish brown (usually paler in basal half). Thorax black except for small pale spot at anterodorsal angle. Coxae black; profemur reddish brown on posterior surface, mesofemur brown at base and gradually shifting to light reddish brown toward apex; and metafemur mainly black except in apical 0.25 (Fig. B4.58, hind leg); pro- and mesotibia and tarsi light reddish brown; metatibia and metatarsomere 1 brown or black and narrowly reddish brown at base and apex; metatarsomere 2–5 light reddish brown (Fig. B4.58, hind leg). Abdomen light reddish brown except black on terga 1 (partly or completely), 6–8 or 7 and 8, sterna 2, 6–9 or 7–9 (Fig. B4.60).

Head. Vertex not pitted except narrowly behind edge of eye, and along postocellar and median furrows (Fig. B4.54). Surface ventral to genal white spot scarcely pitted (Fig. B4.56).

Thorax. Metatibia about 6.0 times as long as maximum width. Metatarsomere 1 in lateral view about 5.0 times as long as maximum height (Fig. B4.58).

Taxonomic notes

Smith (1987) was the first to recognize this adventive species, known from North Africa, Asia Minor, and as far east as Afghanistan. The species has been treated as *U. augur sah*. More recently, this subspecies has been regarded as specifically distinct from *U. augur*. Smith

(1978) accepted this, especially because *U. sah* and *U. augur* are sympatric, at least in Asia Minor. Two subspecies cannot be sympatric, therefore, *U. augur* and *U. sah* are specifically distinct.

Biological notes

Over the years males of *U. sah* were observed aggregating at the highest spot of Mount Rigaud, Quebec (about 220 m above the plain). On June 15, 2011, 200 to 300 specimens were observed. Although no female were captured, we assume that both sexes mate there.

Hosts and phenology

Urocerus sah was reared from Pinaceae (*Abies* sp.,

Picea sp., and *Pinus* sp.). No specimens have been reared in North America.

Based on 15 field-collected specimens, the capture dates are June 15, June 22, July 11, August 22 and September 7.

Range

CANADA: QC (Rigaud). **USA:** NH (Smith 1987: Rocking Co, Newmarket 1 female; Durham). *Urocerus sah*, an adventive species, is known from very few localities in eastern North America (Fig. C26.3).

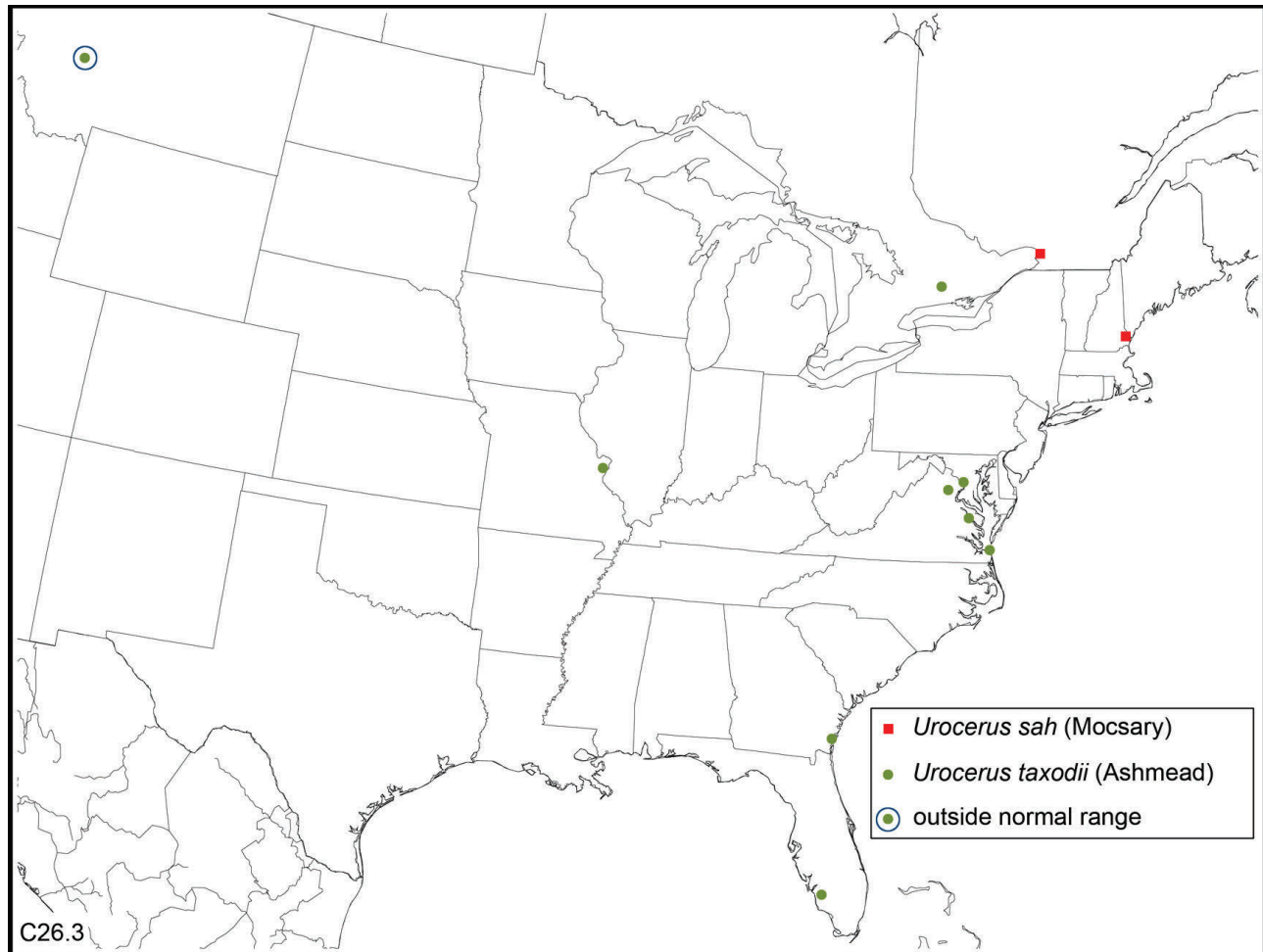
Specimens studied and included for the distribution map: 3 females and 15 males from CNC, DENH, and USNM.



C26.1: *U. sah* ♀



C26.2: *U. sah* ♂



27. *Urocerus taxodii* (Ashmead)

Fig. C27.1, Schiff *et al.* 2006: 78, 79 (female habitus)

Fig. C27.2, Schiff *et al.* 2006: 77 (male habitus)

Fig. C26.3 (map)

Sirex taxodii Ashmead, 1904: 63. Lectotype female (USNM), here designated and examined by DRS, and labeled “1611b Hopk. U.S.,” “Fiske Colr., Brunswick, GA.,” “Taxodium distichum,” “female Type No. 7681, U.S.N.M.,” “*Sirex taxodii* Ashm [handwritten]”.

Paralectotypes: 1 female and 1 male. All three types are from “Brunswick, Ga.,” not Tryon, N.C. as mistakenly stated by Ashmead. The rest of the label data was correctly given by Ashmead: “No. 1611; bred by Mr. W. F. Fiske from the Cypress (*Taxodium distichum*, L).” We have no specimens of *U. taxodii* from Tryon, though other species mentioned in Ashmead’s paper are from Tryon, N.C. Type locality: Brunswick, Ga.

Urocerus taxodii; Bradley, 1913: 17, 20 (change in combination); accepted by Burks 1958: 17; Smith 1979: 129.

Diagnostic combination

Among adults of *U. taxodii* with the basal 0.3–0.7 of the flagellum black and sharply separated from the white apical section [*cresoni*], **females** are recognized by the black abdominal segments 1–9 and a light reddish brown cornus, and **males** by the metatibia with white in basal 0.25, and reddish brown pro- and mesotibia and pro- and mesotarsus.

FEMALE. Description

Color. Head black except for white spot behind eye. Maxillary palp and mandible black. Scape, pedicel, and flagellum (basal 0.3–0.6) black; flagellum white in apical 0.4–0.7, and apex of last flagellomere clearly darkened. Thorax black. Legs black but white basal 0.25 of metatibia and metatarsomere 1. Fore and hind wings very darkly tinted. Abdomen black, but light reddish brown in apical 0.7 of cornus (Fig. B4.24).

Head. Vertex densely pitted median to the white genal spots.

Thorax. Metatarsomere 2 in lateral view about 3.0 times

as long as high (Fig. B4.28), and with tarsal pad about 0.7 as long as ventral length of tarsomere (Fig. C27.3).

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 2.0 times as wide as median length, with maximum width about 2.2 times as wide as median length, and with median length about 0.25 times cornus length. Cornus in dorsal view constricted near base, and minimum width of constriction 0.6–0.9 times maximum width subapically. Tergum 8 with microsculpture of sublateral surface (between spiracle and pitted sculpticells on central area) with meshes, and sculpticells raised and scale-like (thus, surface matt); tergum 9 with dorsal surface lateral to median basin with meshes and scale-like sculpticells, smooth and without meshes near anterior portion of median basin (Fig. B4.26), and ventral surface with meshes and scale-like and slightly elevated sculpticells. **Sheath.** Length 0.87–1.0 time length of fore wing, apical section 1.25–2.0 times as long as basal section. **Ovipositor.** Lancet with 24–29 annuli (annuli in basal 0.5 of lancet outlined but difficult to see); junction of basal and apical section of sheath aligned between 4th and 5th annuli; apical part of lancet with 9–10 pits. Pits 0.05–0.1 times as long as an annulus, becoming gradually small, and disappearing in basal 0.4 of apical sheath section. Edge of last 6–8 annuli before teeth annuli extending as ridge to ventral margin of lancet.

MALE. Description

Color. Head black except for white genal spot extending from level of lower eye margin to top of eye, and light reddish brown in ventral third (Fig. B4.48). Scape, pedicel, and flagellum (basal 0.3–0.6) black; flagellum white in apical 0.4–0.7, and apex of last flagellomere clearly darkened. Thorax mainly black but reddish brown over most of dorsal surface of pronotum (Fig. B4.48), mesoscutellum and metanotum. Legs black but reddish brown on pro- and mesotibia, pro and mesotarsus, and

metatarsomeres 3–5; light reddish brown basal 0.25 of metatibia and metatarsomere 1 (Fig. B4.46 hind leg). Fore and hind wings darkly tinted. Abdomen light reddish brown.

Head. Vertex densely pitted medial to the white genal spots.

Thorax. Metatibia 4.7 times as long as maximum width. Metatarsomere 1 in lateral view 5.6 as long as maximum width (Fig. B4.46).

Host and phenology

Based on published records and 2 reared and confirmed specimens studied, *Urocerus taxodii* has been reared from *Taxodium distichum*, (Cupressaceae) (Bradley 1913, Cameron 1965, Smith, 1979: 129). The Ontario and Virginia specimens suggest that *Juniperus virginiana*, the only unusual Cupressaceae in the area, might also be a host.

Based on 7 field-collected specimens, the earliest and latest capture dates are from late May to late September.

Range

CANADA: ON. **USA:** DC, FL, GA, MO, MT (mislabelled or associated with lumber from southeastern United States), NY (Rohwer 1928), VA. *Urocerus taxodii* is basically in southeastern United States, but the Ontario and Virginia records suggest an eastern North American range (Fig. C26.3).

Specimens studied and included for the distribution map: 12 females and 1 male from CNC, FSCA, and USNM.

Specimens for molecular studies: 5 specimens. See Fig. E2.4a.

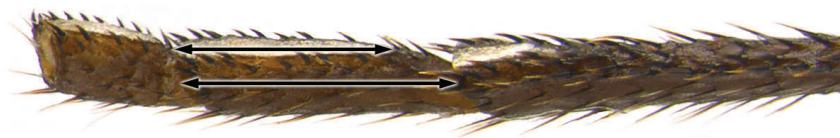
USA. Mississippi: 2006, *CBHR 31*, 658; 2003, *CBHR 141*, 658; 2002, *CBHR 142*, 658; 2002, *CBHR 143*, 658; 2002, *CBHR 144*, 658.



C27.1: *U. taxodii* ♀



C27.2: *U. taxodii* ♂



C27.3: *U. taxodii* ♀