

29. Subfamily Tremicinae

Diagnostic combination

Both sexes of Tremicinae are recognized by the metatibia with one spur, the hind wing without anal cell (single male of *Teredon latitarsus* with cell – this may be an aberration), and the fore wing with junction of veins 1 cu-a and Cu clearly closer to junction of veins M and M+Cu (except in *Teredon*).

Diversity and Hosts

There are six genera and 58 extant species in the world, and three genera and 3 native species in the Western Hemisphere. Taeger *et al.* (2010) recognized 4 genera, but we consider that there are six genera because we transferred *Siricosoma* and *Xeris* from the Siricinae to the Tremicinae in this work. Reared specimens (only three genera with known hosts) in this subfamily were from flowering or coniferous trees.



C30.1: *A. hyalinatus* ♀

30. Genus *Afrotremex* Pasteels

Fig. C30. 1 (female habitus)

Afrotremex Pasteels, 1951: 195. Type species: *Tremex hyalinatus* Mocsáry, 1891: 158, by original designation. Smith 1978: 90.

Description

We studied two females, we assumed that following character states, unless specified otherwise, apply to both sexes.

Head. Minimum distance between inner edges of eyes 1.2 times as long as maximum eye height (Fig. C30.2, in red), distance between inner edges of antennal sockets 6.0 times distance between outer edge of antennal socket and nearest inner edge of eye (Fig. C30.2, in white),

distance between inner edges of lateral ocelli 1.5–2.0 times as long as distance between outer edge of lateral ocellus and nearest edge of eye (Fig. C30.2, in black). Head with setae, except those on occiput, clubbed at apex (Fig. B1.37). Antenna with 12–14 flagellomeres, the flagellomeres flattened dorsoventrally, and flagellomere 1 0.5 times as long as flagellomere 2 (Fig. B1.33).

Thorax. Pronotum in dorsal view finely pitted with numerous prominent shiny teeth (Fig. C30.3). Mesoscutum sublaterally with smooth longitudinal band, anterolateral corner with large pits, (submedially on inner side of smooth longitudinal band) with coarse and irregular pits, with numerous prominent shiny teeth, and medially with fine pits (Fig. C30.3). Fore wing without vein 2r–m, with vein 1cu–a aligned or almost aligned with vein M, with cell 2R1 0.6 times as long as cell 3R1, with vein 2r–rs joining stigma in apical third, with stigma before junction with vein 2r–rs parallel and beyond junction abruptly attenuated (Fig. C30.4), with vein 2A at or near posterior margin of wing only near vein a (Fig. C30.4), and with vein 3A extending along wing margin. Hind wing without anal cell 1A, with hamuli present only apical to junction of veins R1 and C (as in Fig. B1.12), with vein 1r–m clearly shorter than vein M, and with vein M moderately curved.

Abdomen. Female. Tergum 9 with median basin clearly

longer than wide and flat, without setae or pits but with many small tubercles (Fig. C30.5). Cornus about 0.5 times as long as median basin length, triangular with large tooth-like projection laterally at base, and without cercus on lateroventral surface (Figs. C30.6 & C30.7). Sculpticells on surface of most abdominal terga extremely deeply pitted especially in pits of tergum 9 (Fig. A3.13). **Sheath.** Length of basal section 1.6–1.7 times as long as apical section, and total length 0.75 times as long as fore wing length, with few teeth subdorsally in apical 0.25 of apical section (Fig. C30.8). **Ovipositor.** Lancet annuli starting at base, and each annulus edge with one pit and without deep trough (Fig. 30.9).

Notes

Two sub-Saharan African species are known, *A. hyalinatus* (Mocsáry) from Gabon, Uganda, and Zaire [Democratic Republic of Congo] and *A. violaceus* Pasteels, 1951, from the Congo [Democratic Republic of Congo] (Smith 1978, Taeger and Blank 2011, Taeger *et al.* 2010). There are no keys, but the species are characterized by Pasteels (1951). We examined two females from Uganda, and Congo (USNM) representing two species near *A. hyalinatus*.



C31.1: *E. formosanus* ♀

31. Genus *Eriotrema* Benson

Fig. C31.1 (live female)

Eriotrema Benson, 1943: 42. Type species: *Tremex smithi* Cameron, by original designation.

Diagnostic combination

Among specimens with no fore wing vein 2r-m [species of *Tremex* and *Afrotremex*], **both sexes** of *Eriotrema* are recognized by the fore wing cell 2R1 about 0.5 times as long as cell 3R1, the dense and long pubescence covering the body, and the antenna with at least 12 flagellomeres. **Female** also have deep pits on the basin of tergum 9 and a thumb-like cercus.

Description

Color. Variable generally body mostly or entirely black and wings black tinted, but wasps-like color patterns with less darkly tinted wings known in a few species.

Head. Antennal sockets with distance between their

inner edges 4.0–5.0 times distance between inner edge of eye and outer edge of socket. Distance between inner edges of lateral ocelli 1.7–2.2 times as long as distance between outer edge of lateral ocellus and nearest edge of eye. Maximum distance between outer edges of eyes clearly 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 as long as maximum eye height. Gena without ridge behind eye and without white spot, with large pits, each elevated along posterior edge as low tooth. Head with setae sharp at apex. Flagellum with 16–19 flagellomeres, and middle flagellomeres in dorsal view 0.8–0.9 times as long as wide (Fig. B1.23); middle flagellomeres with sensory pits over ventral and most of dorsal surface (part of outer lateral surface without sensilla) and ventral surface separated from dorsal surface by a sharp fold especially on inner side.

Thorax. Pronotum smooth or pitted over less than 0.5 of anterior vertical surface. Mesoscutum entirely densely pitted. Metatibia with one apical spur, and in **male**, metatibia in lateral view about 5.0 times as long as

maximum width, and in cross section rather compressed. In **both sexes** metatarsomere 1 in lateral view 0.8–0.9 times as long as maximum length of metatibia, in **female**, 0.7 times and in **male** 1.0 times as wide as maximum width of metatibia. In **female**, metatarsomere 2 in lateral view 2.0–3.0 times as long as maximum height. Metatarsomere 5 shorter than metatarsomeres 2 + 3. Fore wing with apex acutely and angularly rounded, without vein 2 r-m, with cell 3R1 3.0–3.8 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, and with stigma gradually attenuated even distal to junction with vein 2r-rs (Fig. B1.25), without vein Cu1, with vein 1cu-a joining vein Cu close to or at vein M, with vein SC scarcely outlined in basal 0.15, with vein 2A extending along posterior edge of wing for 0.5 times length of cell 1A, and with vein 3A present and clearly extending along posterior margin of wing (Fig. B1.25). Hind wing without anal cell (as in Figs. B1.15 & B1.16); hamuli present apical to junction of veins R1 and C (as in Fig. B1.12).

Abdomen. Female. Cornus in dorsal view very short and lateral edges not angular, markedly convergent, but not constricted (Fig. B1.29). Tergum 1 laterally and medially and terga 2–6 laterally deeply pitted, each pit with long setae (Figs. C31.1 & C31.2). Tergum 9 with median basin deeply pitted, the pits scattered to dense, with surface markedly convex, about as long as wide, and lateral edges round and clearly outlined for 0.75 of median length of basin (Fig. B1.29). Sterna 2–7 pitted at side, more finely so toward middle. Cercus present, quite small, and thumb-like. **Sheath.** Basal and apical sections clearly separated by a membrane; basal section more than 2.0 times as long as apical section (Fig. C1.40); apical section with teeth

dorsomedially; median margin of basal section on ventral surface of sheath at very base without transverse ridges, but with setigerous pits in basal 0.3 each clearly raised as a forward directed tooth. **Ovipositor.** Lancet with 13 annuli, but annuli not outlined at base for a distance equal or greater than length of basal section of sheath; posterior portion of apical annuli with single pit and edge without tooth; last two annuli before teeth annuli without pit, preceding two annuli with a pit, each pit sharply outlined on most of ventral edge, anterior annuli following above two pits with similar sized pits, and each pit midway between dorsal and ventral edges of the lancet; edge of last 3–4 annuli before teeth annuli not sinuate, extending toward ventral margin but not reaching it, and edge of annulus not developed as tooth (Fig. C31.3).

Diversity and distribution

This genus with 12 species (we studied eight species) is moderately diverse in southeastern Asia (from Japan, southern China including Taiwan to eastern India and Papua New Guinea) (Taeger and Blank 2011, Taeger *et al.* 2010), but in North America the genus consists of a single introduced species, *Eriotremex formosanus*. The species is reported from southeastern United States. It is common and still spreading (Smith 1996). Benson (1943) gave a key to 7 species, Maa (1956) to 8 species based on females, and Smith (2010) to 12 species based on females. Males are known only for three species, *E. formosanus* (Matsumura), *E. malayanus* Benson and *E. viridiceps* Cameron.

C31.2: *E. formosanus* ♀C31.3: *E. formosanus* ♀

32. *Eriotremex formosanus* (Matsumura)

Fig. C1.40, Schiff *et al.* 2006: 10, 11 (female habitus)

Fig. C32.1, Schiff *et al.* 2006: 9 (male habitus)

Fig. C32.2 (live female)

Fig. C32.3 (map)

Tremex formosanus Matsumura, 1912: 21. Holotype female (EIHU), examined by DRS. Type locality: "Formosa".

Eriotremex formosanus; Benson, 1943: 44 (change in combination). Smith 1978: 91.

Diagnostic combination

In North America, **both sexes** of *E. formosanus* are recognized by the black head with dark metallic reflections. **Females** also have a light reddish brown pronotum, transverse yellow transverse bands on terga 2, 3, 7, and 8 segments, and long and dense golden pubescence. **Males** also have reddish brown transverse bands on abdominal segments 2–6 and a very long flagellum (middle flagellomeres about 2.5–3.0 times as long as wide).

FEMALE. Description

Body. Setae over surface clearly long and golden (Fig.

C31.2); meshes of microsculpture over terga 1–8 present between pits and mostly consisting of pit-like sculpticells (surface rather matt), and meshes absent between pits on head, thorax, sterna, and terga 9 and 10.

Color. Head black with dark red purple metallic reflections. Antenna, maxillary palp and most of mandible black. Thorax black, but light reddish brown on pronotum. Fore wing lightly to darkly tinted yellowish brown (Fig. B1.25). Coxae, trochanter, femora and tarsomeres 2–5 black; tibiae and tarsomeres 1 light reddish brown in basal 0.3–0.7. Abdomen generally black, but with yellow transverse band on terga 2 and 3 along most of base and extending posteriorly to spiracle, with small yellow spot on terga 4 and 6 posterolateral to spiracle, with wide yellow transverse band on terga 7 and 8 in basal 0.5 and extending laterally posterior to spiracle (Fig. C1.40), and sterna 2–6 yellow medially. Sheath mainly dark brown to black (Fig. C1.40).

Head. Pits mostly touching but less dense on gena behind eye as a narrow transverse band, coarse over much of surface (diameter about 0.3 posterior ocellus diameter) but finer on frons and between posterior ocelli, near eye and posterior margin of vertex. Postocellar region in frontal view scarcely elevated. Antenna length clearly shorter than length of coastal cell of fore wing; flagellum widened centrally with middle flagellomeres about 1.25 times as wide as long; flagellum with 17–

19 flagellomeres (Fig. B1.23), with dorsal surface of flagellomeres 1 and 2 with isodiametric meshes and flat sculpticells (thus, surface bright), with bright outer surface becoming gradually narrow from flagellomeres 3 to about 7, with pegged pits on inner and dorsal surfaces from flagellomeres 3 to apex, on ventral surface from flagellomeres 1 to apex, and with setae restricted to apical margin of flagellomeres except for few setae on smooth outer surface.

Thorax. Pronotum with fine to coarse teeth over dorsal surface. Mesepisternum densely pitted (pits 0.5–1.0 pit diameter apart) and surface between pits shiny. Metatarsomere 2 with dorsal margin in lateral view straight, and about 2.0 times as long as high; tarsal pad about 0.8 times as long as ventral length of tarsomere.

Abdomen. Median basin of tergum 9 at base (length between two lateral impressions) about 0.8 times as wide as median length (Fig. B1.29). Terga 7–9 including basin densely and deeply pitted (Fig. B1.29). Tergum 10 in dorsal view about 0.7 times as long as median length of basin, with teeth over most of surface and along lateral edges (Fig. B1.29). **Sheath.** Apical section of sheath about 0.3 times as long as fore wing length. **Ovipositor.** Lancet with about 13 annuli, with visible annuli outlined only under apical section of sheath; annulus 1 weakly outlined and without pit, annuli 2–8 with pits, each pit about 0.5–0.7 times height of lancet, and about 0.3 as long as length of annulus, edge of last two annuli before teeth annuli with a wide and very shallow concavity outlined with short and sharp fold ventrally.

MALE. Description

Color. Pronotum black. Legs black, but reddish brown on profemur and protibia, and on mesotibia and mesotarsus. Tergum 1 black, terga 2–6 or 2–7 black at base and apex but broadly reddish brown in between, terga 7 and 8 or 8 black; sternum 2–7 mainly black but yellow medially, terga 8 and 9 black.

Head. Antenna thread-like and much longer than costal cell of fore wing (Fig. C32.1); middle flagellomeres 2.5–3.0 times as long as wide.

Thorax. Metatibia in lateral view about 5.0 times as long as maximum width (Fig. C32.1), and in cross section about 1.5 times as high as maximum ventral width. Metatarsomere 1 in lateral view about 4.0 times as long

as high (Fig. C32.1).

Abdomen. Sterna 2–9 completely and quite densely pitted. Apical edge of sternum 8 widely and deeply indented.

Hosts and phenology

The main hosts of *Eriotremex formosanus* are *Quercus alba*, *Q. laurifolia* and *Q. nigra* (Fagaceae) and various species of *Carya* (Juglandaceae). Other hosts include: *Liquidambar styraciflua* (Hamamelidaceae), *Pinus palustris*, *P. taeda*, and *P. elliotii* (Pinaceae) (Smith 1996).

Based on many field-collected specimens, adults of *E. formosanus* are recorded basically throughout the year (except March and January) with two main flight periods, one from April to June and again from September to November (Smith 1996).

Range

USA: AL, AR (Warrimer, 2008), FL, GA, LA, MS, NC, SC, TX (Hays Co., Buda), UT, VA. *Eriotremex formosanus* is known from China, Taiwan, Japan (Amami–Oshima), Vietnam, and Laos (Smith, 1981) and was accidentally introduced into southeastern United States where it is still expanding its range (Smith 1975b, Chapin and Oliver 1986, and Smith 1996). There is one record from Utah (Utah Co., Provo 40.29343°N, 111.64922°W, summer 2002, C. R. Nelson; 1 F; BYUC). It is not clear if this record is associated with lumber or represents an established population (Fig. C32.3).

Specimens studied and included for the distribution map: 26 females and 2 males from BYUC, CNC, CUCC, DEBU, FSCA, UCRC, USFS–GA, and USNM.

Specimens for molecular studies: 14 specimens. See Fig. E2.2.

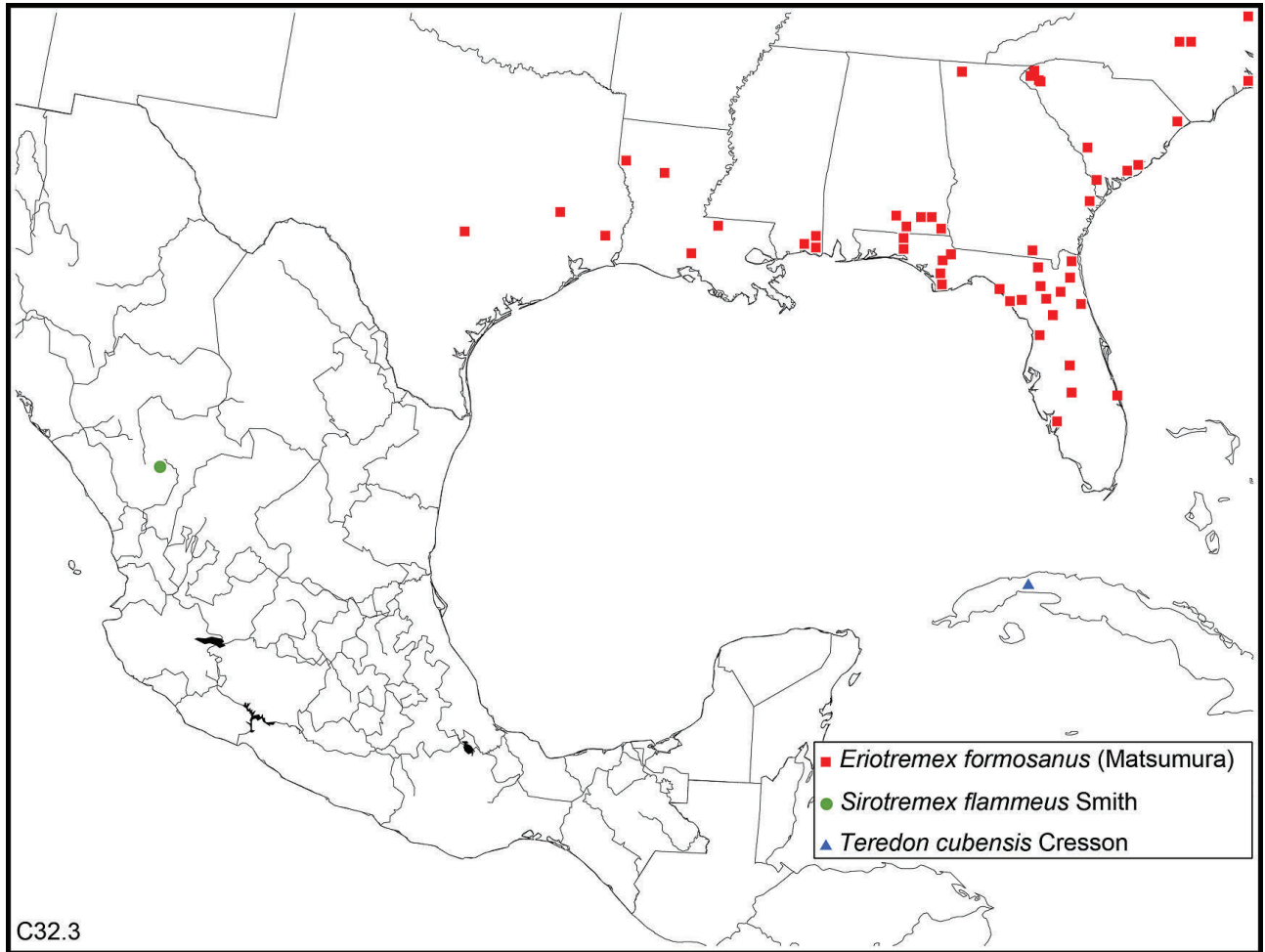
USA. Arkansas: 2009, *CBHR 1490*, 494. **Louisiana:** 2005, *CBHR 85*, 658; 2006, *CNCS 1053*, 658; 2006, *CNCS 1054*, 658; 2006, *CNCS 1056*, 658. **Mississippi:** 1997, *CBHR 4*, 658; 1997, *CBHR 135*, 658; 2007, *CBHR 1120*, 658; 2007, *CBHR 1121*, 658; 2007, *CBHR 1122*, 658; 2007, *CBHR 1123*, 658. **South Carolina:** 2007, *CBHR 1441*, 521. **Unknown State:** year unknown, *CBHR 145*, 658; 2005, *CBHR 895*, 658.



C32.1: *E. formosanus* ♂



C32.2: *E. formosanus* ♀





C33.1: *S. tremecoides* ♀

33. Genus *Siricosoma* Forsius

Fig. C33.1 (female habitus)

Siricosoma Forsius 1933: 173. Type species: *Siricosoma tremecoides* Forsius 1933: 174, by original designation. Smith 1978: 64.

Description

We studied only one female and we assumed that the following character states apply to both sexes except for those sex-specific characters like the ovipositor and its sheath.

Head. Minimum distance between eyes as long as maximum height of eye (Fig. B1.13), distance between inner edges of antennal sockets about 3.7 times as long as distance between outer edge of antennal socket and nearest edge of eye (Fig. B1.13), distance between inner edges of lateral ocelli subequal to distance from outer edge of posterior ocellus to the nearest edge of eye (Fig. B1.13); maximum eye height 1.6 time as high as its maximum length. Head with setae sharp at apex. Antenna flattened dorsoventrally, with 23 flagellomeres; and flagellomere 1 in lateral view 1.2 times as long as flagellomere 2 (Fig. C33.2).

Thorax. Mesoscutum entirely finely pitted (Fig. C33.1). Fore wing with vein 2r-m joined to cell 2M (as in Fig. B1.71), with the vein 2r-m present, with vein 1cu-a closed to vein M (joining vein Cu in the basal 0.2 between veins 1m-cu and M), with vein M markedly curved (Fig. B1.9), with cell 2R1 0.4 times as long as cell 3R1, with vein 2r-rs joining stigma near middle, with stigma gradually attenuated to apex even after junction with vein 2r-rs (as in Fig. B1.25), with vein 2A along the wing posterior edge for 0.6 times cell length (Fig. B1.7), with vein Sc as well as Sc1 and Sc2 in basal 0.4, and without vein 3A. Hind wing without anal cell, with hamuli present equally basal and apical to junction with veins R1 and C, with vein 1r-m slightly longer than vein M, and with vein M curved.

Abdomen. Female. Tergum 9 with median basin with numerous setae, each seta on raised base. Cornus 2.3 times as long as median basin length, parallel sided, not constricted near base (Fig. B1.21), and cercus about as long as 0.5 width of ovipositor sheath (Fig. B1.19).

Sheath. Length of basal section 1.25 times as long as apical section; length of sheath 0.8 times as long as fore wing length, its apical section without teeth dorsoapically, but with teeth on lateral surface in apical 0.25 (Fig. B1.19). **Ovipositor.** Lancet with annuli only in

apical 0.25, and each annulus with wide and prominent ventral tooth along edge, with small pit anteriorly and sharp ridge posteriorly, with small and narrow dorsal tooth attenuating posteriorly, and with a deep trough in between (Fig. B1.19).

Notes

Only one species is known, *S. tremecoides* Forsius from the Malay Peninsula. We have examined one female (AEI) from Pasoh Forest Reserve, Nigri S. [probably the state of Nigri Semiblan], Malaysia, collected on June 26, 1979 in a forest by P. and M. Becker.



C33.2: *S. tremecoides* ♀

C34.1: *T. cubensis* ♀**34. Genus *Teredon* Norton**

Fig. C34.1 (female habitus)

Teredon Norton, 1869: 366. Type species: *Tremex cubensis* Cresson, designated by Rohwer (1911).

Teredonia Kirby, 1882: 386. Unnecessary replacement name for *Teredon* Norton. According to Kirby, *Teredon* is preoccupied, “*nom. praeocc.*”. We did not find the name *Teredon* to be preoccupied. However, Linnaeus (1758: 651) described the genus *Teredo*, a bivalve, which is not a homonym because of one letter difference (Konow 1905a).

Diagnostic combination

Both sexes of *Teredon* are recognized by the

strongly compressed metatarsomere 1 and fewer than 9 flagellomeres.

Description

Head. Antennal sockets with distance between their inner edges of sockets 7–8 times distance between inner edge of eye and outer edge of socket (Fig. B1.14). Distance between edges of posterior ocelli in **female** 1.4 and in **male** 1.9 times as long as distance between outer edge of lateral ocellus and nearest edge of eye (Figs. B1.14 & C34.2). Maximum distance between outer edges of eyes in **female**, clearly, and in **male** slightly, less than maximum width of head (thus, in frontal view, genal edges completely visible and not intersected by outer edges of eyes) (Figs. B1.14, C34.2). Minimum distance between inner edges of eyes about 0.95 times as long as

maximum eye height (Fig. B1.14). Gena without ridge behind eye and without white spot (Fig. C34.3), with large pits near antennal groove, each with posterior edge raised posteriorly as a low tooth. Head with setae sharp at apex. Eye in **female** 2.2 and in **male** 1.6 times as high as long (Figs. C34.4 & C34.3). Antenna in **female** with 7 or 8 and in **male** with 4 antennomeres (Figs. C34.4 & C34.3), and middle antennomeres in dorsal view in **female** 1.1–1.2 and in **male** 3.0 times as long as wide; pitted sensors restricted to ventral surface and sharply separated from dorsal surface by sharp fold on both sides. **Thorax.** Pronotum pitted only in dorsal third of anterior vertical surface. Mesoscutum entirely densely pitted. Metatibia in **female** quite typical in lateral view (Fig. B1.18), but in **male** markedly compressed laterally and enlarged in apical 0.3 (Fig. C1.8). Metatarsomere 1 (including lobe) in **both sexes** 1.1–1.2 times as long as maximum length of metatibia; enlarged in **female** 1.5 times (Fig. B1.18) and in **male** 1.3 times as wide as maximum width of metatibia (Fig. C1.8). Metatarsomere 2 in lateral view about as long as high. Metatarsomere 5 as long as metatarsomeres 2–4 (Figs. B1.18 & C1.8). Fore wing with apex acutely and angularly rounded, with vein 2r–m joined–cell 2M (as in Fig. B1.71), with vein 2r–m present, with cell 1Rs2 clearly wider than long, with cell 2R1 about 0.7 times as long 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), without vein Cu1, with vein 1cu–a joining vein Cu about midway between veins 1m–cu and M, with vein SC present in basal 0.3 (difficult to see), with vein 2A extending along posterior edge of wing for 0.4 times cell 1A length, and with vein 3A very clearly extending along posterior wing margin (Fig. C34.5). Hind wing in **female** without anal cell and in **male** with anal cell; hamuli present equally basal and apical to junction of

veins R1 and C.

Abdomen. Female. Cornus in dorsal view with median length 0.5 times as long as median basin length, lateral edges of cornus markedly convergent and not constricted (Fig. B1.22). Terga 7–9 (except side, but including median basin) not deeply and densely pitted (Fig. B1.22). Tergum 9 with median basin not pitted, with surface concave, about as long as wide, and with lateral edges round and clearly outlined for 0.75 of length of cornus (Fig. B1.22). Cercus present but very small. **Sheath.** Basal and apical sections fused but a small constriction between them still present; basal section more than 2.7 times as long as apical section, and apical section of sheath without teeth dorsomedially (Fig. B1.20); with basal section of median margin at very base without transverse ridges, and each setigerous pit clearly raised as a ventrally directed tooth (Fig. C34.6). **Ovipositor.** Lancet with 18 annuli, all clearly outlined to its base; posterior edge of annuli 6–14 with of a prominent dorsal and ventral tooth fusing into one tooth on annulus 5; edge of annuli 7–14 markedly sinuate; pit developed in sinuation and surface of annulus deeply impressed anterior to pit, forming a longitudinal furrow between annuli 7–14 (Fig. C34.7); edge ventral to sinuation developed ventrally as a sharp and long tooth and dorsally as a low round tooth (Fig. C34.7).

Diversity and distribution

Smith (1978), Taeger and Blank (2011) and Taeger *et al.* (2010) listed two species of *Teredon*. Unfortunately, the two holotypes represent the two sexes. As expected, the male is strikingly different from the female. Therefore, we uphold Konow's (1898) synonymy and treat the two sexes as belonging to one species. Adults are the most modified Siricidae studied.



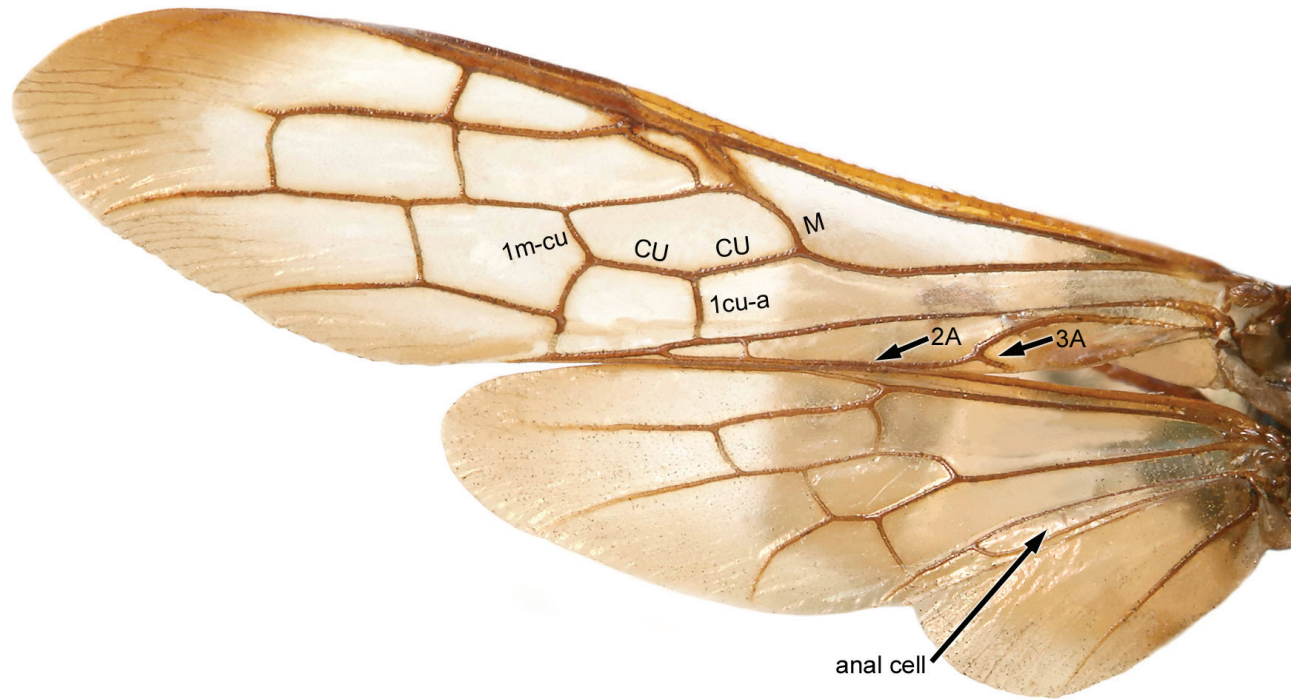
C34.2: *T. cubensis* ♂



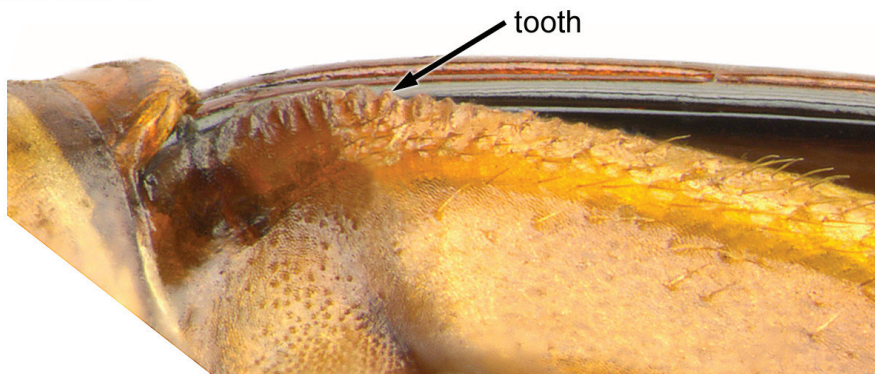
C34.3: *T. cubensis* ♂



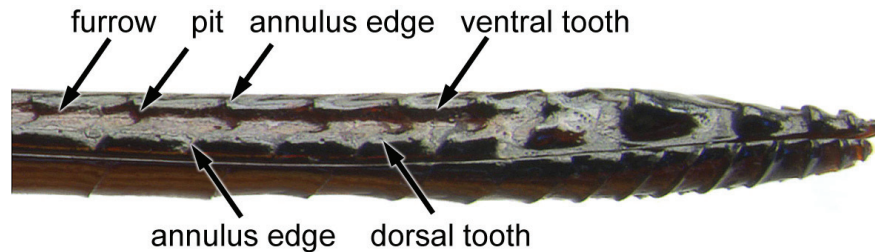
C34.4: *T. cubensis* ♀



C34.5: *T. cubensis* ♂



C34.6: *T. cubensis* ♀



C34.7: *T. cubensis* ♀

35. *Teredon cubensis* (Cresson)

Fig. C34.1 (female lateral habitus)

Fig. C35.1 (female dorsal habitus)

Fig. C35.2 (male dorsal habitus)

Fig. C32.3 (map)

Tremex cubensis Cresson, 1865a: 2. Holotype female (ANSP), examined by DRS. Cresson 1916: 10. Type locality: Cuba.

Tremex latitarsus Cresson, 1865a: 3. Holotype male (ANSP), examined by DRS and HG. Cresson 1916: 10. Synonymy by Konow 1898: 83, 90. Type locality: Cuba.

Teredon cubensis; Norton, 1869: 366. Dalla Torre, 1894: 380 (change in combination); Bradley 1913: 27, Pl. 4, Fig. 13, Hedicke 1938: 31, Smith 1969: 543, Smith 1978: 92.

Teredon latitarsus; Norton, 1869: 367. Dalla Torre, 1894: 380 (change in combination); Bradley 1913: 27, Pl. 4, Figs. 10, 12, Hedicke 1938: 31, Smith 1969: 543, Smith 1978: 92.

Teredonia cubensis; Kirby, 1882: 386 (unnecessary combination, see *Teredonia*, above). Konow, 1905a: 9, Konow, 1905b: 124 (misspelling as *Treodonia*).

Teredonia latitarsus; Kirby, 1882: 386 (unnecessary combination, see *Teredonia*, above).

Diagnostic combination

The single species of *Teredon*, *T. cubensis*, is diagnosed under the genus. **Both sexes** have metatarsomere 1 extremely compressed laterally and fewer than 9 antennomeres.

FEMALE. Description

Body. Pubescence short on abdomen, moderately short on frons, vertex and nota, and long on occiput and lateral surface of head and thorax.

Color. Head, palps and antenna reddish brown. Median half and posterolateral areas of mesoscutum, mesoscutellum (Fig. C35.1), and pro- and mesofemur reddish brown. Propleuron, pronotum ventrolaterally

(Fig. C34.1), most of mesonotum except medially and posterolaterally (Fig. C35.1), mesopleuron except upper 0.7 (Fig. C34.1), metanotum except central part of scutum and scutellum (Fig. 35.1), metepisternum and ventral section of metepimeron, coxae, and most of metafemur (Fig. C34.1) black or brown. Tergum 1 at extreme apex, terga 2 and 3 in apical 0.4 and most of side, terga 4 in apical 0.2 and widely at side, terga 5–7 in apical 0.7, terga 8 in apical 0.5–0.6, terga 9 basolaterally, extreme base of sheath, and sterna 2–7 in posterolateral area (Figs. C34.1 & C35.1) black or brown.

Head. Flagellomeres clearly constricted at base, and each of middle flagellomeres about 2.7 times as long as minimum width (Fig. C35.3). Capsule with most pits adjacent, most pits large (diameter of pit about 0.3 times lateral ocellus diameter) on vertex, and very large behind eye on gena (diameter of pits about 0.5 times lateral ocellus diameter), and surface between pits smooth. Microsculpture generally lacking, or meshes shallow and sculpticells slightly convex.

Thorax. Pronotum with medium teeth over dorsal surface and quite finely pitted laterally (diameter of pits about 0.15 times lateral ocellus diameter) and smooth between pits (Fig. C35.4). Mesoscutum with net-like pits over median area, and quite finely pitted in lateral 0.3 (Fig. C35.4). Meso- and metepisternum with moderately fine (upper half) to fine pits, and pits 0.5–1.5 pit diameter apart.

Abdomen. Median basin at base (length between two lateral impressions) about 0.7 times as wide as median length (Fig. B1.22). Tergum 10 in dorsal view about 0.6 times as long as median length of median basin (Fig. B1.22). Terga with shallow and fine pits, pits on terga 1–8 restricted laterally and present on most of terga 9 except dorsomedially. Tergum 10 with teeth over most of surface (teeth largest laterally in dorsal view). Sterna 2–7 with shallow and fine pits in lateral half. Microsculpture of terga 2–8 with pitted sculpticells in posterior 0.5 of each tergum, and extending laterally to level of dorsal margin of spiracle; terga 1, 2–8 laterally, 9 (including median basin) and 10 with isodiametric meshes and sculpticells slightly convex or scale-like. **Sheath.** Apical section about 0.13 times as long as that of fore wing.

Ovipositor. Lancet with 17 annuli outlined to base; annuli 6–14 with bisinuate edge, with a tooth above and below on annulus edge, and with a deep furrow between (Fig. C34.7). annuli 1–14 with pits; annuli 4–5 with narrow and broad pit (about 0.5 width of lancet), annuli 6–14 with small pit associated with ventral tooth, annuli 6 and 7 with very small pit associated with dorsal tooth, and both pits fused on annuli 2–5; pits from annulus 5 becoming small toward annulus 2; ventral edge of annuli 13–14 with ridge extended to ventral edge of lancet, on annuli 6–12 ridge present but not extending to ventral edge of lancet (Fig. C35.5); annuli 2–5 without ridge ventral to pit.

MALE Description

Color. Head black or brownish black with dark blue metallic reflections (surface behind head and posterior half of gena brown) (Fig. C35.2). Mesothorax, coxae, femora, metatibia, metatarsus 1 and tergum 2 medially as narrow longitudinal band and posteriorly as narrow transverse band black or dark brown with dark blue metallic reflections, pronotum dorsally except medially, middle of scutellum, central area on both sides of mesoscutum brown (Fig. C35.2); antenna, pro- and mesotibiae and tarsi brown (Fig. C1.8). Wings clear but darkened near stigma and in apical 0.25 (Fig. C34.5). Abdomen reddish brown except for black spot on tergum 2 (Fig. C35.2).

Head. Antenna with only 3 or 4 flagellomeres (Fig. C34.3). Flagellomere 1 about 0.5 times as long as length of 2 (Fig. C34.3). Maximum height of eye 1.3 times as long as minimum distance between eyes (Fig. C34.2); distance between inner edges of lateral ocelli 2.3 times as long as minimum distance from outer edge of lateral ocellus to nearest edge of eye (Fig. C34.2); eye high but very wide, thus 1.6 times as high as long (thus gena about 0.4 times as long as eye length) (Fig. C34.3). Vertex with pits about 0.3 times as large as diameter of lateral ocellus and dense (Fig. C35.6), and gena with pits about 0.5 times as large as diameter of lateral ocellus and dense (Fig. C34.3). Distance between inner edges of antennal sockets about 10 times distance from outer edge of antennal socket to nearest edge of eye (Fig. C34.2).

Thorax. Mesoscutum coarsely pitted (pits about 0.3

times of lateral ocellus diameter) in median half, but fine in lateral half (pits 0.1–0.2 times of lateral ocellus diameter). Metatibia and metatarsomere 1 laterally compressed and lobed at apex; metatibia 3.0 times as long as wide; metatarsomere 1 in lateral view (with lobe) 2.8 times as long as high; metatarsomere 1 1.3 times as high as maximum width of metatibia, and maximum length (excluding lobe) 0.9 times as long as metatibial length (Fig. C1.8). Fore wing with vein Rs between veins 1r and M clearly sinuate (Fig. C34.5).

Taxonomic notes

The male is unusual in two features. The eye is very large, as high as in the female but remarkably longer. Eye length affects gena width, so the gena is narrow. The hind wing anal cell is complete in the only male studied. In the female, hind wing vein 2A is much longer than in other genera [*Sirex*, *Sirotemex*, *Urocerus*, and *Xoanon*] with an open anal cell. Because of the unusual variability of wing veins in Siricidae, we do not know how significant this closed cell is in the male. The male and female are very different in color pattern, as in most species of Siricidae. The hind leg of the male is remarkable, but is similar to the hind leg differences one would expect to see between the sexes of other Siricidae. In other features (except for flagellomere number and the hind wing anal cell development), the male matches the female. Therefore, we agree with Konow (1898) and consider *T. latitarsus* as a synonym of *T. cubensis*.

Host and phenology

The host is unknown. The single adult with a capture date was on March 31.

Range

CUBA. La Habana Province. *Teredon cubensis* is known only from Cuba (Fig. C32.3) and has very rarely been collected.

Specimens studied and included for the distribution map: 2 females and 1 male from ANSP and IES.



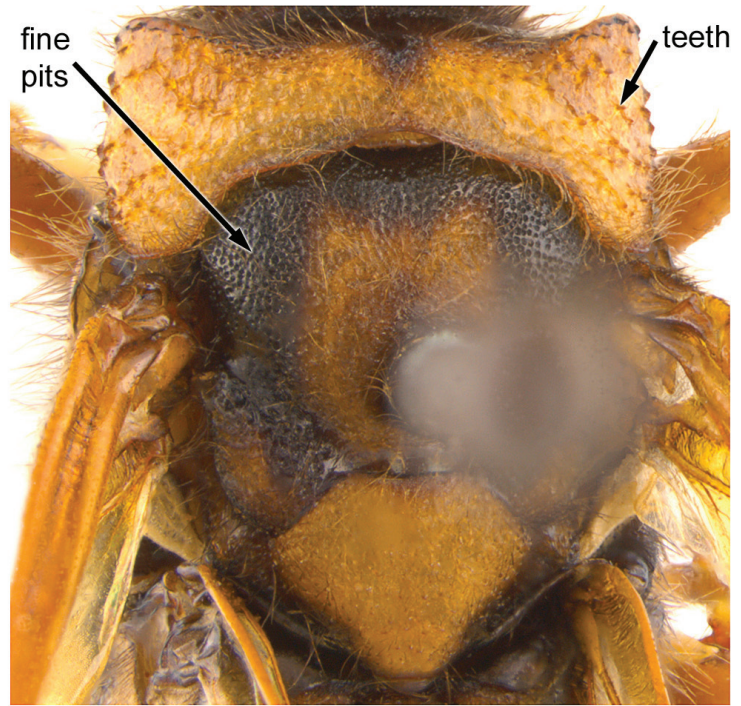
C35.1: *T. cubensis* ♀



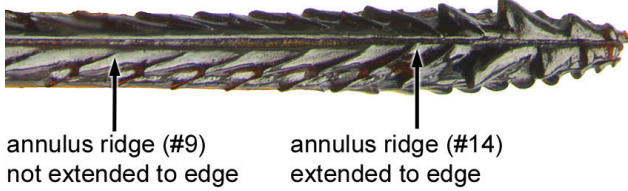
C35.2: *T. cubensis* ♂



C35.3: *T. cubensis* ♀



C35.4: *T. cubensis* ♀



C35.5: *T. cubensis* ♀



C35.6: *T. cubensis* ♂

C36.1: *T. columba* ♀

36. Genus *Tremex* Jurine

Fig. C36.1 (live female)

Tremex Jurine, 1807: 80. Type species: *Sirex fuscicornis* Fabricius, designated by Latreille, 1810: 436.

Sirex (*Xyloterus*) Hartig, 1837: 385. Type species: *Sirex fuscicornis* Fabricius, designated by Rohwer, 1911: 92. Name preoccupied by *Xyloterus* Erichson, 1836.

Xyloecematium Heyden, 1868: 227. Replacement name for *Xyloterus* Hartig.

Diagnostic combination

Both sexes of *Tremex* are easily distinguished from other genera with antennal sockets far apart [all Tremecinae genera except *Xeris*] by cell 2R1 about as long as or longer than cell 3R1, and fewer than 15 flagellomeres. **Females** also have a mainly smooth median basin and no cercus.

Description

Head. Antennal sockets with distance between their inner edges 4.0–5.0 times distance between inner edge of eye and outer edge of socket (Fig. B1.3). Distance between inner edges of lateral ocelli 1.6–2.2 times as long as distance between outer edge of lateral ocellus and nearest

edge of eye (Fig. B1.1). Maximum distance between outer edges of eyes clearly less than maximum width of head (thus, in frontal view, genal edges completely visible and not intersected by outer edge of eyes) (Fig. B1.1). Minimum distance between inner edges of eyes about as long as maximum height of eye (Fig. B1.1). Gena without ridge behind eye and without white spot (Fig. B3.1), with large pits, each with posterior edge raised as low tooth (Fig. C36.2). Head with setae sharp at apex. Antenna with 11–14 antennomeres, and middle flagellomeres in dorsal view 0.8–0.9 times as long as wide (Fig. B1.24); middle flagellomeres with sensory pits over ventral and most of dorsal surface (part of outer lateral surface without sensilla) and ventral surface not sharply separated from dorsal surface by a fold, especially on inner side.

Thorax. Pronotum smooth or pitted over less than 0.5 of anterior vertical surface. Mesoscutum densely pitted over median 0.5–0.7 only. Metatibia in **male** in lateral view metatibia about 5.0 times as long as maximum width, and in cross section about 1.5 times as high as maximum ventral width. Metatarsomere 1 0.8–0.9 times as long as maximum length of metatibia, and about as wide as maximum width of metatibia. In **female**, metatarsomere 2 in lateral view 2.0–3.0 times as long as maximum height. Metatarsomere 5 as long as metatarsomere 2 or, in **male of some species**, as long as metatarsomeres 2 +

3. Fore wing with apex acutely and angularly rounded, without vein 2 r-m, with cell 3R1 0.7–1.1 times as long as length of cell 2R1, with vein 2r-rs joining stigma in apical 0.2–0.3, with stigma parallel before junction but abruptly attenuated after junction with vein 2r-rs (Fig. B1.26), without vein Cu1, with 1cu-a joining vein Cu close to or at vein M, with vein SC scarcely outlined in basal 0.15, with vein 2A extending along posterior edge of wing for 0.5 times length of cell 1A, and with vein 3A present, long and clearly extending along posterior margin of wing (Fig. B1.26). Hind wing without anal cell (Fig. C1.26); hamuli present apical to junction of veins R1 and C (Fig. B1.12).

Abdomen. Female. Cornus in dorsal view short and lateral edges markedly convergent, but not constricted (Fig. B1.30). Terga 7, 8 and 9 (except laterally and ventrally, but including median basin) not pitted. Tergum 9 with median basin clearly wider than long, round, and sharply outlined for about 0.75 of median basin length (Fig. B1.30). Cercus absent. **Sheath.** Basal and apical sections clearly separated by membrane; basal section 1.1–1.2 times as long as apical section; apical section slightly convex for most of its length, and with teeth dorsomedially in apical 0.2; median margin of basal section of sheath at very base without transverse ridges, but with setigerous pits in basal 0.3, each clearly raised as a forward directed tooth. **Ovipositor.** Lancet with 10–40 visible annuli; annuli outlined or not outlined at base (then present only under apical section of sheath); last annulus and first tooth annulus without pits or pits large and not sharply outlined on most of ventral edge, the preceding annuli with pits (Fig. C36.3); edge of last 3 annuli before teeth annuli and first tooth annulus extending as ridge toward ventral margin but not reaching it; edge of annuli

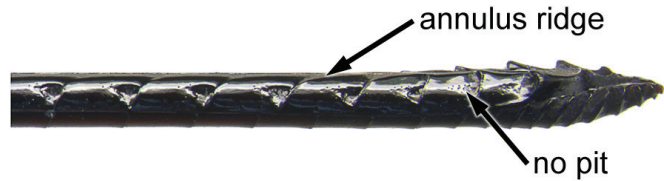
before teeth annuli not sinuate (Fig. C36.3); each annular pit midway between dorsal and ventral edges of lancet not otherwise impressed; its edge sharp but not developed as tooth.

Taxonomic Notes

The genera *Tremex* and *Afrotremex* are very similar. The similar width of fore wing cell 2R1 equal to as much as 1.5 times as long as cell 3R1, the lack of a large tooth-like projection at the base of the cornus in females, the uniform pitted surface of the mesoscutum, the dense pits on the frons, the sharp setae of the frons and vertex, and the moderately deep pit sculpticells on the abdominal terga differentiate *Tremex* from *Afrotremex*. The size of cell 2R1 relative to cell 3R1 is the only character state supporting *Tremex* as a natural lineage distinct from *Afrotremex*.

Diversity and distribution

This genus is found over the Holarctic region and is especially diverse in eastern Asia. There are 33 known species (Taeger and Blank 2011, Taeger *et al.* 2010). Thirty two of these species are restricted to the Old World (Taeger and Blank 2011, Taeger *et al.* 2010). The New World diversity is very small. Only one indigenous species, *T. columba* (Linnaeus), and one introduced species, *T. fuscicornis* (Fabricius) are recorded. Because we studied only six additional species of this diverse Asiatic genus, our generic concept may be incomplete and one should expect that some Asiatic species may not fit one or more character states in the above description.

C36.2: *T. columba* ♀C36.3: *T. columba* ♀

37. *Tremex columba* (Linnaeus)

Fig. C37.1, Schiff *et al.* 2006: 14, 15 (female with black wings and mainly black banded abdomen, habitus)

Fig. C37.2 (female with yellowish brown wings and mainly black banded abdomen, habitus)

Fig. C37.3 (female with black wings and almost completely reddish brown abdomen, habitus)

Fig. C37.4 (female with yellow wings and mainly yellow banded abdomen, habitus)

Fig. C37.5, Schiff *et al.* 2006: 13 (male habitus)

Fig. C36.1 (live female with yellowish brown wings and mainly black banded abdomen)

Fig. C37.6 (live male)

Figs. C37.8, C37.9 & C37.10 (maps)

Sirex columba Linnaeus, 1763: 29. Syntype female (LSUK), images of type studied. Malaise and Benson 1934: 12, T. W. Harris 1827: 211. Type locality: "America".

Sirex pensylvanicus DeGeer, 1773: 593, pl. 30, fig. 13. Syntype female (depository unknown), not examined. Synonymy by Fabricius 1781: 418, Fabricius 1793: 124; accepted by Say 1825: [page not numbered], plate 32, Bradley, 1913: 26, Ries 1951: 84, Smith 1978: 96, Smith 1979: 130. Type locality: "Pensylvanie".

Sirex Cinctus Drury, 1773: 72, [2] of "Index to the second volume", pl. XXXVIII, fig. 2. Syntype female (depository unknown, indicated as "in the possession of Dr. Fothergill"), not examined. Synonymy by Norton

1869: 364; accepted by Bradley 1913: 26, Ries 1951: 84, Smith 1978: 96, Smith 1979: 130. Type locality: "New York".

Sirex americana Christ, 1791: 412. Indication on "Drury Tom. 2. Tab 38. f. 2," which is the illustration of *Sirex cinctus* Drury, 1773. Objective synonym of *S. cinctus* due to identical type specimen; Konow 1898: 91, Bradley 1913: 26, Ries 1951: 85, Smith 1978: 96, Smith 1979: 130. Type locality: "Neuyork".

Tremex columba; Say, 1825: [pages not numbered – on 73rd page], plate 32 (change in combination); accepted by T. W. Harris 1827: 211, Hedicke 1938, Benson 1943, Ross 1937, Ries 1951: 84, Middlekauff 1960: 70–71, Smith 1979: 129, Harris 1827: 211, Walker 1873, Riley 1888 (illustration of larva, pupa and adult male and female), Bradley 1913: 26, Yuasa 1922 (larva), Smith 1943: 387, White and Salisbury 2000, (photograph), Marshall, 2006 (photographs of female, male and larva).

Tremex obsoletus Say, 1823: 73. Holotype male (type probably lost), not examined. Synonymy by Norton 1869: 364; accepted by Cresson 1880: 67, Bradley 1913: 26, Ries 1951: 85, Smith 1978: 96, Smith 1979: 130. Type locality: Missouri.

Tremex sericeus Say, 1823: 73. Holotype female (type probably lost), not examined. Synonymy by Cresson 1880: 67; accepted by Bradley 1913: 26, Ries 1951: 85, Smith 1978: 96, Smith 1979: 130. Type locality: Missouri.

Tremex Servillei Brullé, 1846: 645, pl. 45, fig. 2. Syntype female (probably MNHN), not examined. Synonymy by Norton 1869: 366; accepted by Cresson 1880: 67, Konow 1905b: 123, Bradley 1913: 26, Ries 1951: 85, Smith 1978: 96, Smith 1979: 130. Type locality: “l’Amérique septentrionale”.

Tremex maurus Westwood, 1874: 116, pl. XXI, fig. 3. Syntype male (OXUM), images of male prepared by James E. Hogan and sent to HG for study. Synonymy by Cresson 1880: 67; accepted by Bradley 1913: 26, Ries 1951: 85, Smith 1978: 96, Smith 1979: 130. Type locality: “America Septentrionalis”.

Tremex columba race *sericeus*; Bradley 1913: 26 (change in rank).

Tremex hospes Cockerell, 1889: 37. *Nomen nudum*.

Tremex columba race *aureus* Bradley, 1913: 26. Syntype females [the types of this taxon should be in the CUI collection, but the last catalogue of Hymenoptera types (Hoebeker 1980) does not list this taxon, thus the type depository remains unknown], and number of specimens not given. The word “race” is interpreted as a subspecific name based on Bradley’s comments. Synonymy by Ries 1951: 85; accepted by Smith 1978: 96, Smith 1979: 130. Type localities: Colorado, Clear Creek, Sept. 5, 1898; Berkeley, Sept. 11, 1898; Denver, Sept. 13, 1898; Oct. 15, 1899; Ft. Collins, Sept. 6, 1899; New Mexico (Albuquerque); Arizona.

Tremex obsoletus Bradley, 1913: 26, Smith 1979: 130 (misspelling of *T. obsoletus* Say).

Common name: This species is known as the “pigeon tremex” from the species name “*columba*” meaning “pigeon”.

Diagnostic combination

Both sexes of *Tremex columba* have short setae covering the body, e.g., setae of frons about 0.5 times as long as distance between inner edges of the lateral ocelli.

Females have the cornus angular in lateral view along its ventral edge near the base. **Males** have metatarsomere 5 as long as metatarsomere 2.

FEMALE. Description

Color. Head mainly reddish brown. Surface around ocelli, often behind dorsal margin of eye, and medially behind ocelli black; antenna light reddish brown, but sometimes blackened in middle (Fig. B1.24); maxillary palp black to reddish brown; mandible mainly black. Pronotum reddish brown and ventrolaterally black; propleuron black; mesonotum mainly reddish brown, black in lateral half of mesoscutum; mesepisternum black and reddish brown over 0.5 to entire lateral surface;

metathorax black. Coxae and trochanters black; pro- and mesofemur mostly reddish brown, and metafemur mostly black; tibiae and tarsi pale yellow. Wings almost black, lightly to darkly yellowish brown, or yellow tinted. Tergum 1 or 1 and 2 mostly, terga 2–8 or 3–8 at side, narrowly or broadly across base, tergum 9 from a small lateral spot to most of surface, and tergum 10 completely to mainly reddish brown (Fig. A3.3), remaining surfaces black, or completely reddish brown. Sterna 2–7 black in basal 0.5 and reddish brown in apical 0.5, or completely light reddish brown. Sheath mainly reddish brown.

Head. Frons in lateral view with setae about 0.5 times as long as distance between lateral ocelli (Fig. B3.1), and with mostly contiguous and large pits (diameter about 0.4–0.5 times lateral ocellus diameter), but as a narrow band less dense on gena behind eye (Fig. B3.1). Postocellar region in frontal view scarcely elevated. Antenna clearly shorter than coastal cell length of fore wing; flagellum widened at middle, and with 11–14 flagellomeres (Fig. B1.24).

Thorax. Pronotum in dorsal view with numerous coarse teeth over surface. Mesonotum densely (pits 0.5–1.0 pit diameter apart) and coarsely pitted. Metatarsomere 2 in lateral view with dorsal margin clearly convex, about 3.0 times as long as high (Fig. B3.7), and tarsal pad 0.3 times as long as its ventral length. Fore wing with length of cell 2R1 subequal to cell 3R1 length.

Abdomen. Setae short and present on median region of terga 1, 5 and 6, more widespread on posterior half of terga 7 and 8 and laterally on terga 1–9, dense only medially on tergum 1, scattered elsewhere (distance about as far apart as length of setae). Tergum 9 laterally with surface anterior to each seta slightly raised and smooth (pits not clearly outlined), and distant from other raised surfaces (Fig. B3.5). Median basin of tergum 9 flat, 1.5–1.7 as wide as long, with base (delimited by small longitudinal furrows) 0.8–0.9 times as long as median length, with small teeth present posterolaterally, each tooth with small seta (Fig. B1.30). Tergum 10 in dorsal view about 1.2 times as long as median length of median basin, with teeth over dorsal surface and along lateral edges in apical half, and with round angular projection in basal 0.3 laterally (also visible in lateral view) (Figs. B1.30 & B3.3). **Sheath.** Basal section 1.15–1.25 times as long as apical section. Apical section about 0.4 times as long as fore wing length. **Ovipositor.** Lancet with 18–22 annuli, and with annuli outlined only under apical section of sheath (Fig. C37.7). Pitted section about as long as length of apical section of sheath (Fig. C37.7); annulus 1 outlined and without or with a very small pit, last annulus before teeth annuli with small pit (Fig. C36.3), preceding annuli each with a well defined pit, and each pit about 0.4 times as long as annulus length; first tooth annulus with sensilla grouped together in a slight impression.

MALE. Description

Color. Tibiae and tarsi color pattern variable. In **dark specimens**, tibiae light reddish brown in basal 0.5 (protibia) to 0.25 (metatibia), and tarsi black dorsally on tarsomeres 1 and 2 of protarsus, completely black on tarsomeres 1–3 of mesotarsus, and on tarsomeres 1–4 of metatarsus; in **pale specimens**, tibiae and tarsi reddish brown or paler. Abdomen color pattern mainly black to completely reddish brown. In **dark specimens**, tergum 1 and most of 2 black, terga 3 and 4 black with reddish-brown transverse band, terga 5–7 black, but pale at side, tergum 8 light reddish brown and reddish brown medially, and sterna 2–8 mainly black; in **pale specimens**, terga 1–8 and sterna 1–9 completely reddish brown.

Head. Antenna almost thread-like and clearly shorter than costal cell length of fore wing, and middle flagellomeres in lateral view about 1.5 times as long as wide.

Thorax. Metatibia in lateral view about 5.0 times as long as its maximum width and in cross section about 1.5 times as high as its maximum ventral width. Metatarsomere 1 in lateral view about 4.0 times as long as high. Metatarsomere 5 as long as metatarsomere 2 (Fig. B3.9).

Abdomen. Sterna completely and quite densely pitted. Sternum 8 with apical widely (about 0.5 times width of apical edge) and deeply indented.

Taxonomic notes

Except for *T. maurus*, we did not examine the type specimens of the other nominal species of *T. columba*. To determine the synonymy, we referred to the species descriptions, the type localities, and the available illustrations. All descriptions match our concept of *T. columba* and each name can be assigned to one of the color forms discussed below.

Geographical variation

Bradley (1913) recognized three color forms based mainly on abdominal color patterns. We agree with his concept. The palest form (body reddish brown and wings dark brown) is found mainly in the southeastern states north to southern New York and Illinois (Fig. C37.3). The names *T. sericeus* and *T. servillei* match this form (Bradley 1913). The darkest form (abdomen mainly black with yellow markings and wings dark brown to yellowish brown) is widespread in eastern North America and is recorded from Saskatchewan to the Atlantic coast and south to Georgia. Dark-winged specimens are found south of southern New York (Fig. C37.1) but become uncommon northward where they are replaced by specimens with yellowish brown wings (Fig. C37.2). The names *S. columba*, *S. pensylvanicus*, *S. cinctus*, *S.*

americana, *T. obsoletus* and *T. maurus* are associated with this form (Bradley, 1913). The moderately dark form (abdomen mainly pale reddish brown with black transverse bands and wings yellow tinted) is found in the prairie region north to the extreme southern portion of the Canadian prairies and as far east as Illinois and southernmost Ontario near Lake Erie, and in the Rocky Mountain region south into northern Mexico (Fig. C37.4). The name *T. columba aureus* applies to this form (Bradley 1913). Specimens with intermediate color pattern are known only from the bordering prairie regions in Saskatchewan and Manitoba. The latter specimens are similar to the eastern form with dark abdomen, but the wings are yellow and the apex of the abdomen in females is often more widely pale. The two forms found in the southern half of eastern United States are sympatric and are part of two discrete color forms. We found one female with the abdomen showing the pattern of the two forms, one on each side of the abdomen. Despite some evidence of gene flow in the northernmost part of its range (in the Canadian prairies), females of the western form remain sharply distinct in central Illinois where all three forms occur. Females probably mimic a common vespid species with a matching body and wing color pattern in each of the regions that are present during the main *T. columba* flight period. The most likely models commonly flying at the time that females of *T. columba* are ovipositing probably belong to the genus *Polistes* (Vespidae). *Tremex columba* females of the reddish abdomen form are similar to *P. perplexus* Cresson, *P. bellicosus* Cresson or *P. carolinus* (Linnaeus), females of the dark form with black wings are similar to *P. annularis* (Linnaeus), *P. metricus* Say, or dark winged (southern) specimens of *P. fuscatus fuscatus* (Fabricius), females of the dark abdomen form with reddish-brown wings are similar to the pale winged *P. fuscatus laurentianus* Bequaert, and females of the moderately dark form with yellow wings are similar to *P. aurifer* Saussure and probably other similarly colored western species. Information from morphology and DNA barcoding shows no difference between the three color forms. Therefore, we treat them as discrete color forms of one species.

Biological notes

Early summaries of the biology of *T. columba* were given by T. W. Harris (1827, 1857), Thomas (1876), Harrington (1882a, 1882b), Saunders 1883, Harrington (1893), Riley (1888), Packard (1890), Ashmead (1900), Felt (1905 – damage and life history), and Herrick (1935). Smith and Schiff (2002) provided a recent synthesis, much of it derived from Stillwell (1964, 1967). They also published the emergence times for both *T. columba* and one of its parasitoid *Ibalia anceps*. Females attack dead

or weaken limbs of deciduous trees. Oviposition starts in mid August and lasts till late September. Females lay 2–7 eggs in each oviposition hole. The oviposition holes are at about a right angle with the bark and go to a depth of 2–15 mm in the sapwood. Eggs either hatch within 15–30 days or over winter and hatch the following spring.

Newly hatched larvae make their tunnels roughly parallel to the bark at a depth less than 4 cm. Larvae go through at most 11 instar stages. Larval development lasts two or more years in cold temperate regions. Larvae cannot develop without the presence of the wood fungus *Cerrena (Daedalea) unicolor* Bull. Murr. This fungus is associated with females in all stages of development. Females adults carry the fungal spores in mycangia located in the abdomen anterior to the ovipositor. Eggs pick up the fungus as they pass down the ovipositor and the fungus is also injected into the wood at oviposition and starts developing immediately, so by the time a larva hatches there is plenty of fungus to eat. Female larvae have special hypopleural organs to carry the fungal oidia (Stillwell 1965). This organ is found between the first and second abdominal segments below the level of the spiracle (it is also seen in some specimens between the metathorax and the first abdominal segment). At molting, the fungus in the hypopleural organ is not transferred to the later instar larva, but must be picked up again.

In the prepupa, a wax-like substance covers the oidia held in the hypopleural organ. After molting, the spores are introduced into the mycangia of the newly emerged female. Galleries are filled with sawdust and frass and may extend for 1–3 m. Pupae are found in the sapwood to as deep as 30 cm in the heartwood. It takes 3–5 weeks for the pupa to complete its development.

In Canada, emergence of new adults starts in mid August, reaches a peak in early September, and ends in early October. Males start their emergence about one week before females. Females may have to tunnel up to 1 m to emerge. Under such condition a female may lay several hundreds eggs on the way out. These unfertilized eggs will become males. Mated females produce offspring of both sexes. An amazing density of 162 specimens in a small 20" by 10" (50 cm by 25 cm) portion trunk was reported by Laurent (1931). Damage by larvae was described by Thomas (1881).

The main parasitoids are Ichneumonidae (*Megarhyssa atrata* (Fabricius), *M. greeni* Viereck and *M. macrura* (Linnaeus)) and Ibalidae (*Ibalia anceps* Say). Species of *Megarhyssa* are keyed in Townes and Townes (1960), and those of *Ibalia* in Smith and Schiff (2002).

Hosts and phenology

Tremex columba has been reared from a wide variety of angiosperm trees (T. W. Harris 1827, T. W. Harris

1841, Fitch 1858a, 1857, 1859, Clementi 1868, Walsh and Riley 1868, Riley 1870, Thomas 1876, Thomas 1881, Harrington 1882a, Harrington 1882b, Saunders 1883, Dimmock 1885, 1887, Packard 1881, Packard 1890, Lintner 1897, Fyles 1917, Blackman and Stage 1924, Essig 1926, Davis 1932, Herrick 1935, Smith 1943, Beal and Massey 1945, Middlekauff 1960, Smith 1979: 129, Smith and Schiff 2002). The main hosts are hickories, maples and, elms (83% of records). Based on 218 reared and confirmed specimens, hosts are: *Acer* sp. (16), *Acer negundo* (1), *A. rubrum* (31), *A. saccharum* (3), *Betula* sp. (Herrick 1935), *Carpinus* sp., *Carya* sp. (86), *C. illinoensis* (1), *Castanea dentata* (1), *Celtis* sp. (3), *C. laevigata* (4), *C. occidentalis* (1), *Fagus grandifolia* (4), *Fraxinus* sp. (1), *Juglans cineria* (1), *Malus* sp., *Nyssa sylvatica* (2), *Platanus* sp. (1), *Populus* sp. (8), *Pyrus* sp., *Quercus* sp. (8), *Robinia* sp. (3), *Salix* sp. (1), *Ulmus* sp. (35), *U. americanus* (6), *U. glabra* (1). Three host records gymnosperms are unlikely: *Picea abies* (1), *Pinus resinosa* (1) (Pinaceae), and *Helianthus* (2) (Asteraceae).

Based on 126 field-collected specimens, the earliest and latest capture dates are June 3 and October 10. The main flight period is from the second half of July to the first half of October with a peak in the first half of August Stillwell (1964, 1967). Adults of *T. columba* were not captured at hill tops, but we observed several hundreds specimens swarming around an old dying sugar maple tree. Most specimens were out of reach, above 4–5 m.

Range

CANADA: AB, NB, NS, ON, QC, SK. **USA:** AL, AR, CA (probably adventive), CO, CT, DC, FL, GA, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NV, NY, OH, PA, RI, TN, TX, UT, VA, VT, WI, WV, WY. *Tremex columba* is recorded in southern Canada from Alberta to Nova Scotia south to Arizona and Florida (Bradley 1913, Rohwer 1928, Ries 1951, Middlekauff 1960, Stange 1996, Smith 1979) (Figs. C37.8, C37.9 & C37.10). Specimens originating from Mexico were intercepted at entry ports along the United States and Mexico border.

Specimens studied and included for the distribution maps: 955 females and 323 males from BYUC, CASS, CNC, CUCC, CUIC, DEBU, EDUM, FRLC, FSCA, GLFC, LEMQ, MNRQ, NCSU, NFRC, OSAC, UASM, UCRC, USGFS-GA, and USNM.

Specimens for molecular studies: 21 specimens. See Fig. E2.2.

CANADA. Ontario: 2007, *SIRCA* 023, 604; 2007, *SIRCA* 025, 618; 2007, *SIRCA* 026, 619; 2007, *SIRCA* 027, 624; 2007, *SIRCA* 028, 624. **USA. Arkansas:** 1999, *CBHR* 110, 658. **Georgia:** 2006, *CBHR* 573, 658. **Illinois:** 2006, *CBHR* 373, 658. **Michigan:** 2007, *CNCS*

1047, 616; 2007, *CNCS 1048*, 557; 2007, *CNCS 1050*, 596; 2007, *CNCS 1051*, 628; 2007, *CNCS 1052*, 609. **Minnesota:** 2008, *CBHR 1464*, 597. **Mississippi:** 1997, *CBHR 5*, 658; 2002, *CBHR 131*, 658; 2002, *CBHR 132*,

658. **Montana:** 2006, *CBHR 370*, 658. **New York:** 2005, *CBHR 201*, 658. **Oregon:** 2008, *CBHR 400*, 658. **South Carolina:** 2006, *CBHR 892*, 508.



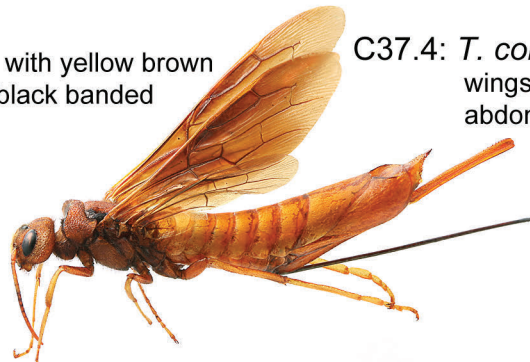
C37.1: *T. columba* ♀ with black wings & mainly black banded abdomen



C37.2: *T. columba* ♀ with yellow brown wings & mainly black banded abdomen



C37.4: *T. columba* ♀ with yellow wings & mainly yellow banded abdomen



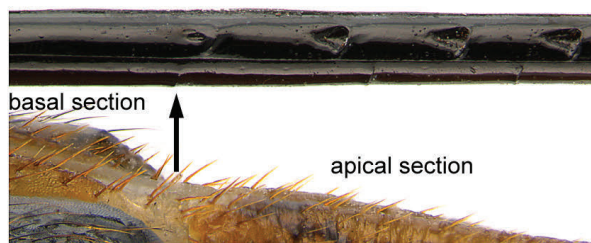
C37.3: *T. columba* ♀ with black wings & reddish brown abdomen



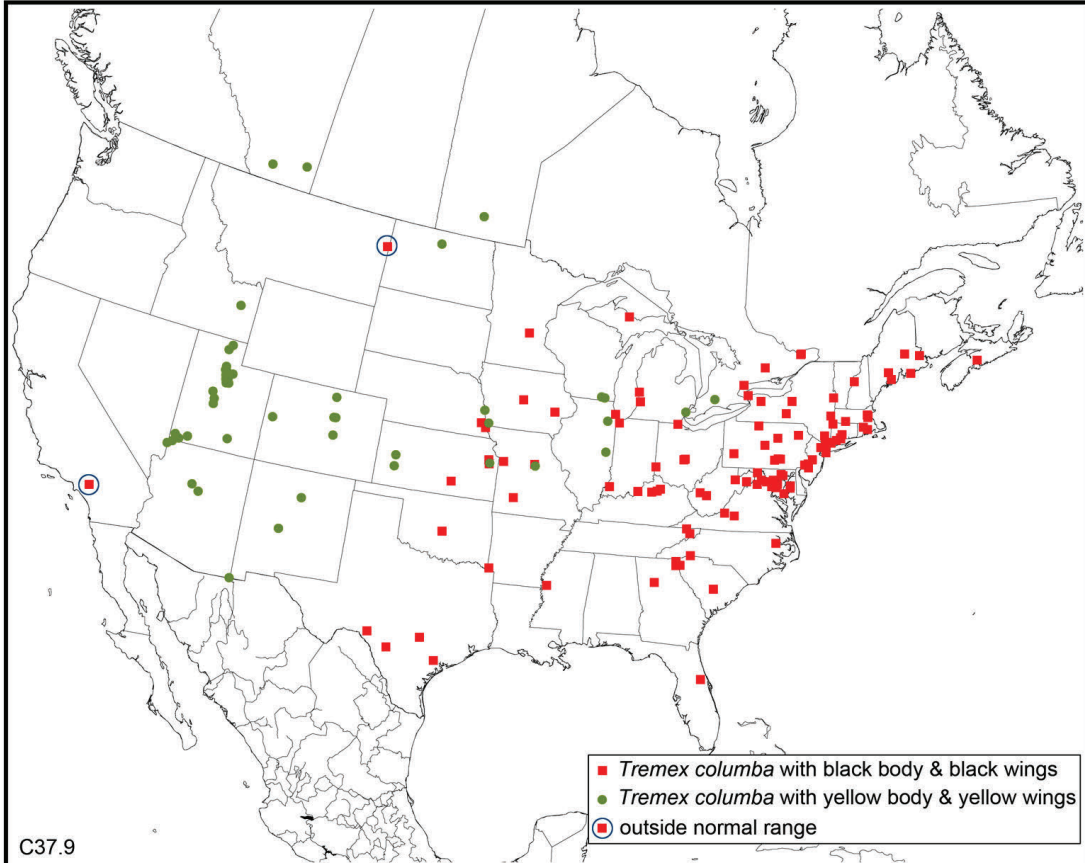
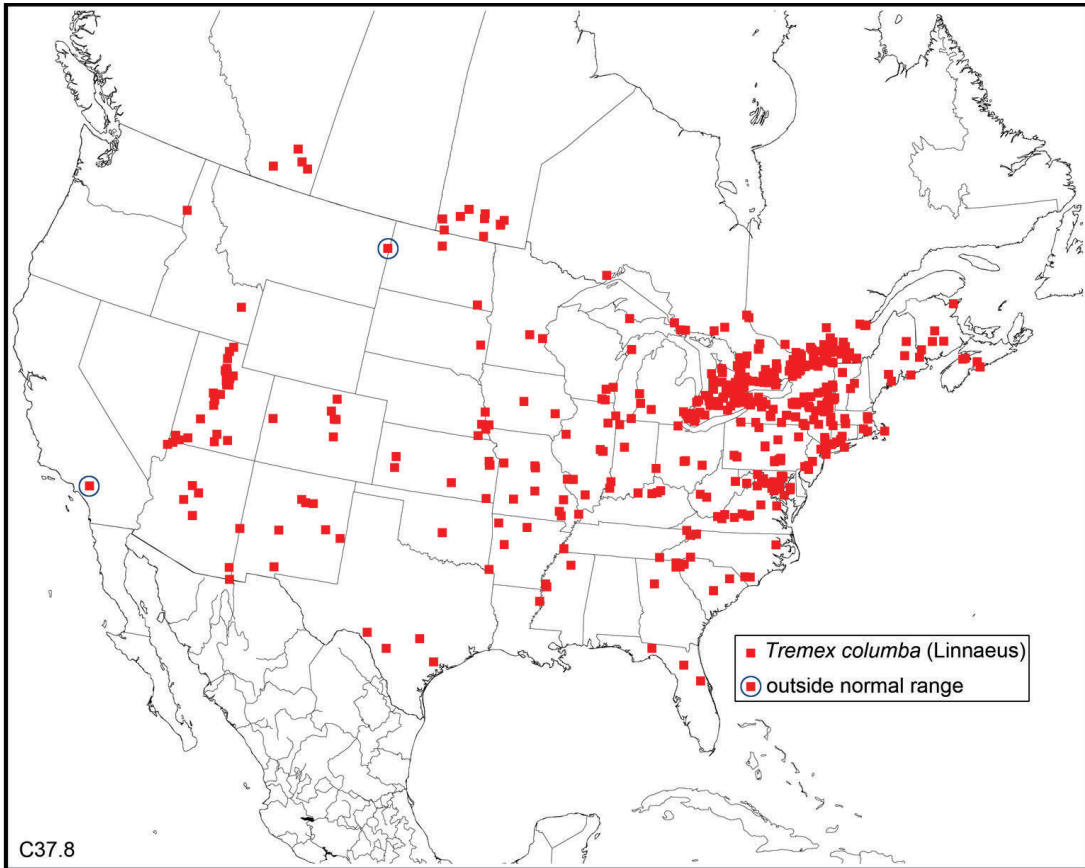
C37.5: *T. columba* ♂

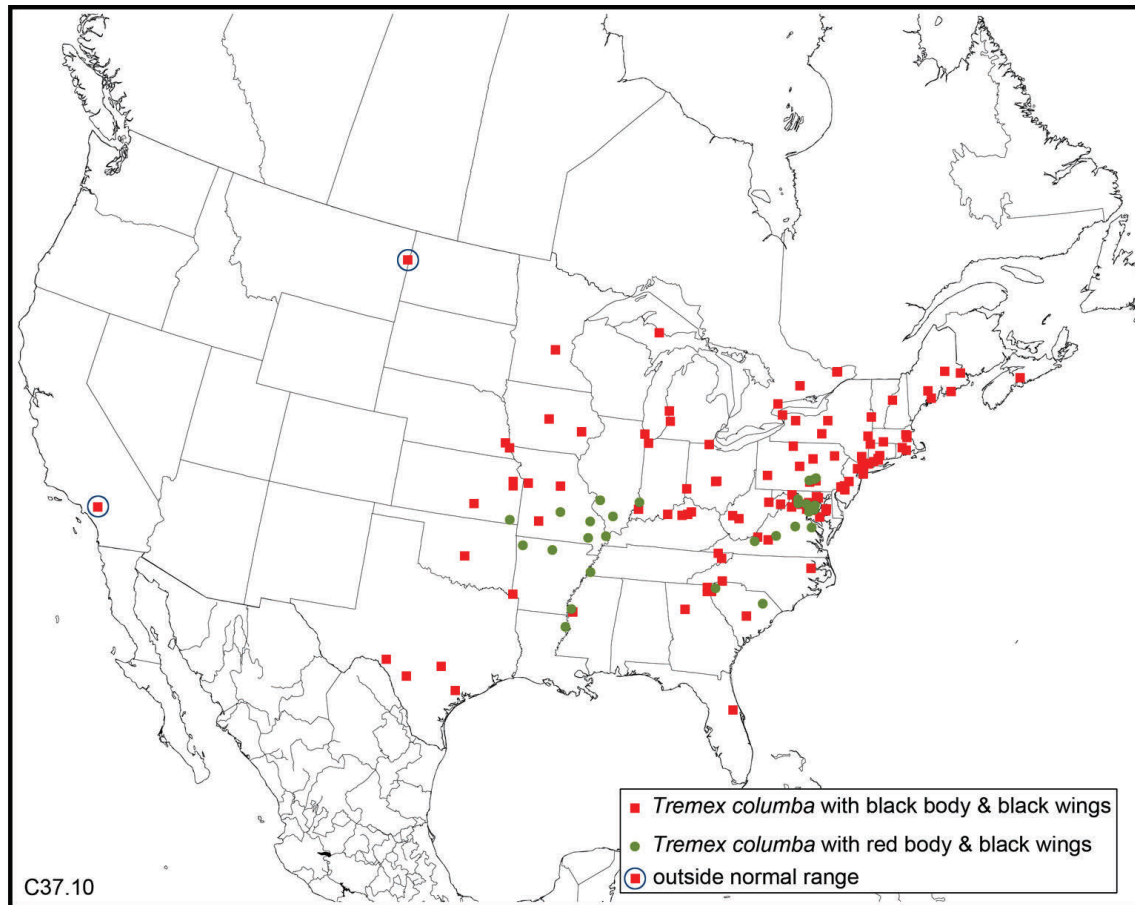


C37.6: *T. columba* ♂



C37.7: *T. columba* ♀





38. *Tremex fuscicornis* (Fabricius)

- Fig. C38.1 (female dorsal habitus)
Fig. C38.2 (female lateral habitus)
Fig. C38.3 (male dorsal habitus)
Fig. C38.4 (male lateral habitus)
Fig. C38.5 (map)

Sirex fuscicornis Fabricius, 1787: 257. Type female (ZMUC), not examined. Thomson, 1871: 326. Type locality: "Halae Saxonum".

Sirex Struthiocamelus Villers, 1789: 132–133. Taeger *et al.* 2010.

Sirex Camelogigas Christ, 1791: 411. Taeger *et al.* 2010.

Diagnostic combination

Both sexes of *Tremex fuscicornis* have long setae covering the body, e.g., setae of frons in lateral view are about as long as or longer than the distance between the inner edges of the lateral ocelli. **Females** have the cornus in lateral view not protruded and angular along the ventral edge near its base. **Males** have metatarsomere 5 as long as length of metatarsomere 2 + 3.

FEMALE. Description

Color. Head brown or black. Antenna light reddish brown or black on middle antennomeres; maxillary palp black to reddish brown; mandible mainly black. Pronotum mainly reddish brown and black at side; propleuron black (Fig. C38.2); mesonotum black to partly black and reddish brown; mesepisternum black; metathorax black. Coxae and trochanters black; pro- and mesofemur mostly reddish brown, and metafemur mostly black; tibiae and tarsi pale yellow. Wings lightly tinted yellowish brown. Tergum 1 black, tergum 2 or 2 and 3 mostly, terga 3–8 or 4–8 at side, narrowly or broadly across base, tergum 9 across middle, and tergum 10 completely to mainly yellow, remaining surfaces black. Sterna 2–7 in black in basal 0.5 and reddish brown in apical 0.5, or completely light reddish brown. Sheath mainly reddish brown.

Head. Frons in lateral view with setae on frons as long as or longer than distance between lateral ocelli (Fig. B3.2), and with mostly contiguous and small pits (diameter about 0.3 times lateral ocellus diameter), but as a narrow band less dense on gena behind eye (Fig. B3.2). Postocellar region in frontal view scarcely elevated. Antenna clearly shorter than coastal cell length of fore wing; flagellum slightly widened centrally, and with 10–13 flagellomeres.

Thorax. Pronotum in dorsal view with numerous coarse teeth over surface. Mesonotum densely (pits 0.3–0.5 pit diameter apart) and moderately pitted on central portion. Metatarsomere 2 in lateral view with dorsal margin almost straight, about 3.0 times as long as high (Fig. B3.8), and tarsal pad 0.8 as long as its ventral length. Fore wing with length of cell 2R1 1.2–1.5 times as long as length of cell 3R1.

Abdomen. Setae long and few on median region of terga 1, 5 and 6, more widespread on posterior half of tergum 7 and posterior 0.7 of tergum 8 and laterally on terga 1–9, dense only medially on tergum 1, scattered elsewhere (distance about as far apart as length of setae). Tergum 9 laterally with surface anterior to each seta markedly elevated as a tooth (pit coarsely outlined), and very close or fused to tooth (Fig. B3.6). Median basin of tergum 9 flat, 1.4–1.6 as wide as long, base (delimited by small longitudinal furrows) about 0.9 times as long as median length, with small teeth present posterolaterally, each tooth with small seta. Tergum 10 in dorsal view 1.1–1.2 times as long as median length of median basin, with few teeth over dorsal surface and along lateral edges in apical half, and without round angular projection in basal 0.3 laterally (best seen in lateral view) (Fig. B3.4). **Sheath.** Basal section 1.3–1.4 times as long as apical section. Apical section about 0.5 times as long as fore wing length. **Ovipositor.** Lancet with about 12 annuli, and with annuli outline only under apical section of sheath. Pitted section 0.5–0.6 times as long as length of apical section of sheath; annulus 1 outlined and without pit, last annulus before teeth annuli without pit, preceding 6 annuli each with a clearly defined pit, and each pit about 0.25 times as long as annulus length; first tooth annulus with a long narrow impression with a double row of sensilla.

MALE. Description

Color. Coxae and metafemur (except extreme base) black, tibiae, and tarsi of fore and middle legs reddish brown. Abdomen mainly black

Head. Antenna almost thread-like and clearly shorter than costal cell of fore wing, and middle flagellomeres about 2.0 times as long as wide.

Thorax. Metatibia in lateral view about 4.5 times as long as its maximum width and in cross section about 1.5 times as high as its maximum ventral width. Metatarsomere 1 in lateral view about 3.5 times as long as high. Metatarsomere 5 as long as length of metatarsomeres 2 + 3 (Fig. B3.10).

Abdomen. Sterna completely and quite densely pitted. Sternum 8 with apical edge widely (about half of the

width of apical edge) deeply indented.

Taxonomic notes

Illustrations of the holotype were examined and match closely our specimens from Europe. We have seen two specimens from Chile and they seem to match closely the European specimens we examined. Although a large number of *Tremex* species exist in China, it is possible that the European species may be different in China (Stephan Blank, personal communication). For the purposes of this paper we accept the identity of Chilean specimens as the Palaearctic *T. fuscicornis*.

Biological notes

Information on the biology of *Tremex fuscicornis* and its associated fungus were published by Palma *et al.* (2005), Parra (2007), and Pažoutová and Šrutka (2007).

Hosts

In Chile, *Tremex fuscicornis* is most destructive to poplar (*Populus nigra*), but it is also recorded from *Robinia pseudoacacia* and *Acer negundo* (Baldini 2002; Palma *et al.* 2005; Parra 2007).

Range

CHILE: Near Santiago: Provincia de Aconcagua, V Región (Palma *et al.* 2007); Región Metropolitana (Baldini 2002); Región Valparaíso (Parra 2007), Región: R. M., Communa: NOS, Col., César Hernández, Fecha: 17/03.01 (1 F, 1 M; OSAC). *Tremex fuscicornis* is a Palaearctic species known from Europe to Japan. It was accidentally introduced into central Chile (Fig. C38.5) and was first reported by Baldini (2002). It apparently entered the country in wooden crates infested with larvae from China (Baldini 2002; Pažoutová and Šrutka 2007).

Specimens studied (two specimens from Chile and a few specimens from Europe and Asia) are included for the distribution maps: 11 females and 4 males from CNC, OSAC and USNM.

Specimens for molecular studies: 7 specimens. See Fig. E2.2.

CHINA: 2006, *CBHR* 387, 658; 2006, *CBHR* 391, 658; 2006, *CBHR* 392, 658; 2006, [associated pre-adult], *CBHR* 394, 658, 2006, [associated pre-adult], *CBHR* 395, 658; 2007, *CBHR* 1201, 658; 2007, *CBHR* 1202, 658.



C38.1: *T. fuscicornis* ♀



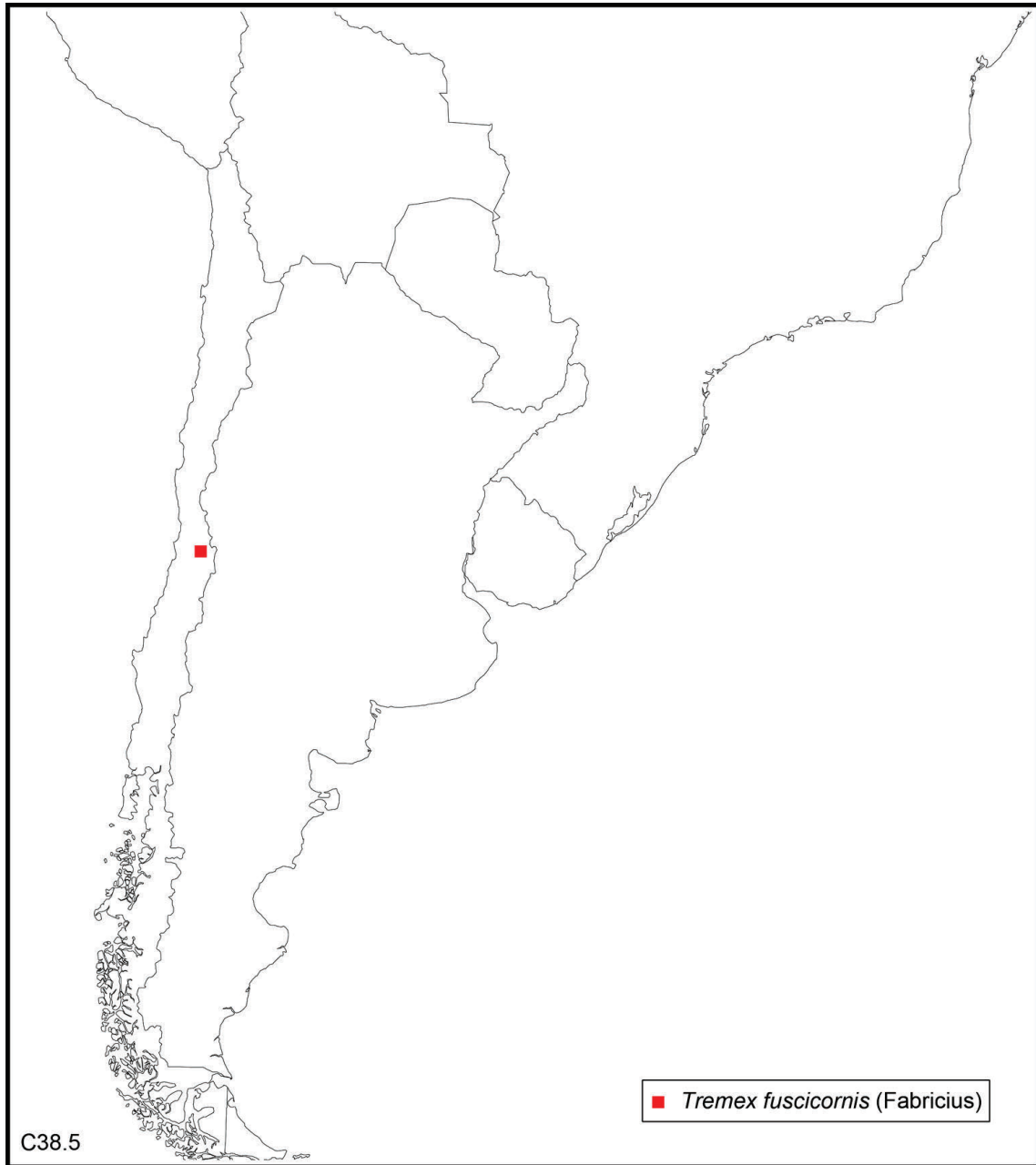
C38.2: *T. fuscicornis* ♀



C38.3: *T. fuscicornis* ♂



C38.4: *T. fuscicornis* ♂



C39.1: *X. indecisus* ♀

39. Genus *Xeris* A. Costa

Fig. C39.1 (live female)

Xeris A. Costa, 1894: 259. Type species: *Ichneumon spectrum* Linnaeus; monotypic.

Neoxeris M.S. Saini and D. Singh, 1987: 177. Type species: *Neoxeris melanocephala* M.S. Saini and D. Singh; monotypic. NEW SYNONYM.

Diagnostic combination

Both sexes of *Xeris* are easily recognized by the small vertical ridge on the gena posterior to the eye, and the hind wing without an anal cell.

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 outer edge of socket and nearest edge of eye (Fig. B5.4). Distance between inner edges of lateral ocelli 0.5–1.2 times as long as distance between outer edge of lateral ocellus and nearest inner edge of eye (Figs. B5.3 & B5.4). Maximum distance between outer edges of eyes either less than maximum width of head (thus, in frontal view, genal edges completely visible and not intersected by outer edges of eyes) (Fig. B5.4) or as long as maximum width of head (thus, in frontal view, genal edges intersected by outer edges of eyes) (Fig. B5.3). Minimum distance between inner edges of eyes about 1.6 times as long as maximum eye height (Fig. B5.4). Gena with ridge behind eye, with white spot almost always in dorsal half (Fig. B1.41), and in lower 0.5 with posterior edge of pits not elevated. Head with setae sharp at apex. Antenna with 14 or more flagellomeres (smallest specimens have the lowest number), and middle flagellomeres in dorsal view 3.0–4.0 times as long as high; in **female** apical

5–10 flagellomeres with sensory oval impressions on dorsal and ventral surfaces, in **male** only with ventral sensory oval impressions; in **female** middle and apical flagellomeres with sensory pits over most surfaces except outer surface, in **male** sensory pits present over inner surface and a small section of outer surface.

Thorax. Pronotum smooth on anterior vertical surface. Mesoscutum densely pitted only over median 0.5–0.7. Mesotarsomere 1 in lateral view not enlarged, its dorsal and ventral edges almost parallel, and base of tarsomere 0.7 or less its maximum width. Metatibia in **male** in lateral view 5.5–9.0 times as long as maximum width. In **female** metatarsomere 2 in lateral view with dorsal edge 4.0–6.0 times as long as maximum height. Metatarsomere 5 0.5–0.7 as long as metatarsomere 2 (Fig. B5.51). Fore wing with apex acutely and angularly rounded, with vein 2r–m present and joined to cell 2M (as in Fig. B1.71), with cell 1Rs2 clearly wider than long, with cell 3R1 3.5–4.5 times as wide as long, 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), without vein Cu1, with vein 1cu–a joining vein Cu close to M, and with vein 3A well developed, stump-like or absent. Hind wing with hamuli clearly present basal and apical to junction of veins R1 and C (as in Fig. B1.11), and without anal cell.

Abdomen. Female. Cornus in dorsal view long, narrow, and lateral edges either not constricted or constricted near middle (Fig. C39.2). Tergum 9 with median basin with lateral edges markedly divergent, straight then rounded near lateral angle, and sharply outlined for about 0.5 times median length of basin, and with base (outlined by black furrows laterally) 0.5–0.9 times as wide as median length of basin (Fig. C39.2). Cercus present but very small. **Sheath.** Length of basal section 0.2–0.5 as long as apical section (Figs. B5.11, B5.13 & B5.13); apical section with lateral surface sharply folded except at very base and apex (Fig. B5.13, insert), or not folded (in one

species, *X. tarsalis*), and without teeth in apical third of dorsal margin (Fig. B 5.11, insert). **Ovipositor.** Lancet with any of annuli 3–10 aligned with junction of basal and apical sections of sheath; first tooth annulus with ridge on ventral edge with shallow, long and open ended pit (Fig. B5.15); for most species annuli 4–6 anterior to teeth annuli with medium pit and pits decreasing in size anteriorly in following 3–5 annuli, and following annuli without pit or with very small pit present from anterior annulus to as many annuli as starting at annulus 2, or in one species, *X. tarsalis*, with many large pits starting at annulus 2 up to teeth annuli (Fig. B5.14); edge of last 5 to 7 annuli before teeth annuli ventral to pit sharply and acutely produced, and edge of last 7 to 14 annuli before teeth annuli extended as a sharp ridge to ventral edge of lancet.

Taxonomic notes

Neoxeris melanocephala M.S. Saini and D. Singh, based on three females, is a typical species of *Xeris*. The eye proportions (1.25 as high as long) are the same as for all *Xeris* specimens we examined (range 1.18–1.63, based on 62 specimens and 5 species). The lack of a white spot on the gena in females is not a good criterion for a genus level classification. For example, 30 females examined of *X. himalayensis* (Bradley) from India and Pakistan showed a complete range from a large white spot to no spot on the gena, and we have seen a few specimens of *Xeris melancholicus* and *X. spectrum* with a completely black head. The ovipositor of *N. melanocephala* near the apex is typical of almost all *Xeris*, except *X. tarsalis*. Other described character states are typical of females of most *Xeris* species. We suspect that *N. melanocephala* is simply a dark color form of *X. himalayensis*. The only significant difference in the description is the reddish brown apical section of the flagellum. This color pattern is seen occasionally in specimens with a black flagellum. The Indian species is therefore transferred to *Xeris* as *X. melanocephalus* (M.S. Saini and D. Singh), **new combination**.

The gender of *Xeris* is questionable. The name of its type species, *Ichneumon spectrum*, is a noun. In the latest catalog (Taeger *et al.* 2010) it is treated as masculine in *X. morrisoni indecisus*, and as feminine in *X. indiana*, the latter being an inadvertent misspelling of Saini *et al.* (2006). (Stephen Blank, pers. comm.). *Xeris* as a classical name means a kind of plant (Bradley 1913). This name does not make sense. Costa (1894) does not give the origin of the generic epithet, but very likely it is an palindrome of the name *Sirex*. We follow Maa (1949) and consider *Xeris* as masculine.

Biological notes

Not much has been published on the biology of *Xeris* species. The European *X. spectrum* (and the Japanese population of this species) is clearly distinct from the North American *X. caudatus*. Because we have no information about on *X. caudatus*, we present biological information under the genus heading.

The most interesting feature of *X. spectrum* and also *X. caudatus* is that females do not carry symbiotic fungus in their mycangia (Francke-Grosmann 1939, Fukuda and Hijii 1997, confirmed by NMS). The question is therefore what do larvae eat during their development? Females of most species of Siricidae carry arthrospores of *Amylostereum*, a genus of basidiomycete fungi. During oviposition the fungus is deposited on each egg placed in the sap wood. The fungus produces an enzyme to decompose the wood cellulose or lignin, changing it into a form that can be assimilated by the larvae and making larval development possible. Fukuda and Hijii (1997) clearly showed that larvae of *X. spectrum* in Japan develop only if *A. chailletii* or *A. areolatum* are present at the oviposition site. Both species of fungi are equally accepted by *Xeris* larvae. Fukuda and Hijii's observations confirm earlier observations in Europe that *X. spectrum* females often deposit their eggs in trees already infested with *Sirex* and *Urocerus* spp. (Francke-Grosmann 1954). Moreover, the emergence holes of *X. spectrum* in Japan are in close proximity to those of other horntails. This suggests that females of *Xeris* are attracted by odors emitted by *Amylostereum* fungi inoculated by other fungus carrying horntails.

Xeris spectrum in Japan shows two periods of emergences, one in spring and one in summer (Fukuda and Hijii 1997). We have no evidence of a similar pattern in the Nearctic *X. caudatus*. The spring oviposition cycle offers *X. spectrum* larvae a very viable fungus but more competition with other horntail larvae, whereas a summer oviposition cycle offers the *Xeris* larvae a less viable fungus with less competition from other horntail larvae.

Diversity and distribution

Xeris is a moderate sized genus with 10 species and subspecies. Three species are recorded from Eurasia (Taeger and Blank 2011, Taeger *et al.* 2010). All are in the northern hemisphere. In the New World, seven endemic species are known. They are recorded from southern Mexico to boreal regions of Canada and Alaska. The greatest diversity is in western North America.



C39.2: *X. melancholicus* ♀

40. *Xeris caudatus* (Cresson), sp. rev.

Fig. C40.1 (female habitus)

Fig. C40.2 (male habitus)

Fig. C40.6 (map)

Urocerus caudatus Cresson, 1865b: 247. Holotype female (ANSP), examined by DRS. Cresson 1916: 10. Type locality: "Colorado Territory".

Sirex caudata; Kirby, 1882: 382 (combination).

Xeris caudata; Ashmead, 1898: 180 (combination).

Xeris spectrum race *caudata*; Bradley 1913: 23 (change in combination and rank).

Xeris spectrum; Maa, 1949: 86 (not Linnaeus, 1758: 560). Burks 1958: 17, Smith and Schiff 2002: 185.

Xeris spectrum spectrum; Maa, 1949: 86 (status); accepted by Burks 1958: 17, Middlekauff 1960: 70 (in part), Burks 1958: 17, Smith 1979: 129.

Diagnostic combination

Among specimens with a marginal longitudinal band on the pronotum and with short setae on the head [*melancholicus*], **both sexes** of *X. caudatus* are recognized by the very small pits (pit diameter 0.05–0.15 times lateral ocellus diameter) on the gena between the upper and lower limits of the genal ridge, and the small white spot that usually does not extend to the genal ridge. **Females** also have completely light reddish brown coxae (except the black anterior and posterior dorsal edges) and generally longer apical section of the sheath (basal section/apical section ratio less than 0.25 for most specimens). **Males** of *caudatus* cannot be separated from males of *melancholicus*.

FEMALE. Description

Color. Head black except for small white spot on gena

dorsal to middle of eye; white spot usually not extending down to genal ridge (as in Fig. B5.41); antenna black. Thorax black except for white longitudinal band extending from posterolateral to anterolateral angles including vertical portion of anterior angle (as in Fig. C43.3). Legs including coxae light reddish brown (coxae black on anterior and posterior dorsal edges) (Fig. C40.1). Fore wing clear except for lightly tinted band before stigma, in apical 0.25, and in cell 2CU; costal cell brown and most of area ventral to anal cells yellowish brown; veins black (including veins C, R and stigma on both sides of junction with vein 1r-rs) (as in Fig. B5.17). Abdomen black. Sheath with apical section black and basal section reddish brown.

Head. Eye in lateral view (20 specimens measured) with maximum height 1.37–1.64 times as long as maximum length (as in Fig. B5.43), and maximum height of eye 0.42–0.51 times as long as maximum height of head (from transverse ridge on gena above mandible to top of head) (as in Fig. B5.7). Gena in dorsal view with maximum distance between outer edges clearly wider than maximum distance between outer edges of eyes (in frontal view outer edges of eyes clearly not intersecting gena) (as in Fig. B5.4), and in lateral view distance between outer edge of eye and genal ridge 0.48–0.61 times as long as maximum length of eye (as in Fig. B5.27). Transverse ridge above mandible narrow, sharp and mainly smooth (as in Fig. B5.21). Head in dorsal view with pits restricted to vertex (scarcely pitted from dorsoposterior edge of eye to occiput) and postocellar area (scattered or absent on most of median furrow, but a little more widespread near lateral ocelli) (as in Fig. B5.2), in lateral view almost absent on gena ventral to genal ridge, and few and small (diameter of pit 0.1–0.2 times lateral ocellus diameter) between outer edge of eye and genal ridge (mainly near eye) (as in Fig. B5.43).

Thorax. Fore wing vein 3A absent (58%), reduced to a

stump (37%), rarely extending slightly as a nebulous vein (5%), but not extending along posterior margin of wing. **Abdomen.** Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 0.8 times as wide as median length, with maximum width of basin 1.6 times as wide as median length and basin about 0.5 times as long medially as median length of cornus (as in Fig. C39.2). Cornus constricted in dorsal view, its minimum width (at constriction) 0.8 times as wide as maximum width subapically (as in Fig. C39.2). **Sheath.** Length 1.2–1.4 times as long as fore wing length; basal section 0.20–0.27 times as long as apical section (Fig. C40.3); lateral surface of apical section with well defined ridge (as in Fig. B5.13, insert). **Ovipositor.** Lancet with 22–32 annuli (first 15 annuli hard to see, but still outlined; N = 9) (as in Fig. B5.15); junction of basal and apical sections of sheath aligned between 2nd and 3rd, or occasionally at 3rd annuli; medium pits present on last 4–5 apical annuli before teeth annuli, and very small pit on 7–15 preceding annuli (as in Fig. B5.15).

MALE. Description

Color. Coxae, tibiae (except very base) and tarsomeres 1–5 black (apical articles sometimes brown or reddish brown in old or teneral specimens); femora completely or mainly, and extreme base of tibiae (not sharply outlined but gradual shift) reddish brown (as in Fig. B5.51).

Thorax. Metatibia with shallow notch on dorsal edge in basal 0.25.

Taxonomic notes

In the Old World, five species and subspecies of *Xeris* are recorded (Taeger and Blank 2011, Taeger *et al.* 2010): *X. spectrum cobosi* Viedma and Suarez (1961), *X. himalayensis* Bradley 1934, *X. indianus* Vasu and Saini (1999), *X. spectrum* (Linnaeus 1758) and *X. spectrum malaisei* Maa (1949). We also include *X. melanocephalus* (Saini and Singh 1987, Taeger *et al.* 2010). In previous works, *X. caudatus* was known as *Xeris spectrum spectrum* (Maa 1949, Smith 1978 & 1979, Smith & Schiff 2002, Schiff *et al.* 2006). We have seen the types of all the above taxa except *X. indianus* and *X. melanocephalus*. The North American specimens of *X. caudatus* are rather similar in many character states to many specimens of the European *Xeris spectrum* and to the types of the Asiatic *X. spectrum malaisei*. *Xeris spectrum malaisei* differs in many character states from American specimens and from *X. spectrum spectrum*. We recognize *X. caudatus* as specifically distinct from both subspecies of *X. spectrum*. All studied specimens of the *X. spectrum* complex consists of the subspecies of *X. spectrum*, *X. caudatus*, and *X. melancholicus*; the complex is recognized by

the well developed longitudinal band on each side of the pronotum in dorsal view and the low density of pits on each side of the postocellar area. However, there are differences between the Eurasian species of the complex and the North American specimens. A revision of *Xeris* is ongoing, so we discuss here only the currently described taxa of the complex.

Based on color pattern, females of the transpalaeartic *X. spectrum* with dark coxae and males with reddish brown apical 0.15–0.2 of metatarsomere 1 are easily distinguished from females and males of *X. caudatus*. We studied 135 specimens of *X. spectrum* and the females match the Linnean type of *X. spectrum* (Linnaeus).

X. caudatus:

Gena between eye and ridge with very few small to very small pits (0.05–0.2 times lateral ocellus diameter) (as in Fig. B5.43). In **both sexes**, genal spot near upper eye margin small (rarely absent) and usually not extending to genal ridge (as in Fig. B5.43); fore wing veins C and R brown to black (paler only in old specimens), vein R at junction with vein 1r–rs brown to black, and membrane between veins C and R tinted yellowish brown (paler only in old specimens) (as in Fig. B5.17). In **female**, coxae light reddish brown (as in Fig. B5.37). In **male**, tibiae completely to almost completely black, with reddish brown spot at base, when present, narrow and diffusely outlined, and tarsi black (teneral specimens may be paler) (as in Fig. 5.51).

Xeris spectrum spectrum:

Gena between eye and ridge with few medium size pits (0.2–0.25 times that of the lateral ocellus). In **female**, genal spot near upper eye margin brownish yellow and ill-defined but sometimes extending over both sides of genal ridge. In **male**, spot usually large and not sharply outlined, quite white, and extending over both sides of the genal ridge (Fig. C40.4); fore wing vein C and R mainly reddish brown to brown but whitish at extreme base, vein R at junction with vein 1r–rs whitish, and membrane between veins C and R clear to light whitish yellow tinted (paler only in old specimens). In **female**, coxae at least black or mostly black on outer surface, ventral and inner surfaces black, brown or reddish brown (metacoxa sometimes the palest) (Fig. C40.5). In **male**, protibia reddish brown, usually with narrow black longitudinal band along outer margin, and protarsus light reddish brown; mesotibia light reddish brown but black in apical half, mesotarsus light reddish brown, metatibia with sharply outlined white spot in basal 0.1–0.2, metatarsomere 1 black but white at extreme base and reddish brown in apical 0.15–0.2, metatarsomeres 2–5 light reddish brown.

The holotype female of *Xeris spectrum malaisei* Maa is distinguished from females of *X. caudatus* by a narrow head, black coxae and femora, and reddish brown

flagellum in apical 0.2–0.3.

***X. caudatus*:**

In **female**, coxae light reddish brown and flagellum black. Gena between eye and ridge with very few small to very small pits (0.05–0.2 times lateral ocellus) (as in Fig. B5.43). Maximum distance between outer edges of genae, in frontal view, clearly greater than maximum distance between outer edges of eyes. Fore wing veins 1A and 2A of cell 1A not parallel in apical half of cell. Vein 2A not close to posterior wing edge and more curved, and vein 1A quite clearly curved (as in Fig. A3.30).

***Xeris spectrum malaisei*:**

In **female**, coxae black and flagellum black becoming reddish brown in apical third. Gena between eye and ridge with few medium size pits (0.2–0.25 times that of the lateral ocellus diameter). Maximum distance between outer edges of genae in frontal view slightly greater than maximum distance between outer edges of eyes. Fore wing veins 1A and 2A of cell 1A subparallel in apical half of cell. Vein 2A close to posterior wing edge and vein 1A almost straight.

Xeris himalayensis and *X. cobosi*, the third and fourth Euroasiatic species studied by us (38 specimens seen), are not particularly close to *X. caudatus*. In these two species, the pronotum has no white longitudinal band, pits are more abundant (denser) and larger on the vertex and the space between the genal ridge and the eye (quite similar to those of *X. indecisus* or *X. morrisoni*), in **females** the genal spot is small to absent, and in **males** (only known for *X. himalayensis*) the spot is very large and tarsomeres 3–5 are reddish brown.

In summary, the North American *X. caudatus* is distinct from all named Old World *Xeris* on structure and color pattern in both sexes. We have not seen specimens of *X. caudatus* from temperate and boreal Asia. The nearest Asiatic populations studied are from Japan and China and the Russian Far East. They are also very distinctive in color pattern from *X. caudatus* (including specimens from Alaska). Thus, there is no evidence that *X. caudatus* has a Holarctic range. Our morphological data supports our decision to classify *X. caudatus* as specifically distinct from any of the Eurasian *X. spectrum* species complex. Our DNA barcoding results support this conclusion.

Despite the above clarifications, there is still a problem associated with *X. caudatus*. The barcodes of specimens from eastern North America differ by 3.5% from the barcodes of specimens from western Washington (three specimens only). More specimens studied for these two forms confirmed the above difference. A study based on females from the western states and provinces (western Alberta and central and southern British Columbia) and samples from eastern Alberta to Nova Scotia show a different trend in the ratio of the length of the

basal and apical sections of the sheath. In the western population, the apical section of the sheath is generally longer relative to the basal section. For 73 females from the western states and provinces, the relation between the basal section and the apical section shows a lower mean = 0.237 (one standard deviation = 0.015) and for 42 females in the East (e.g., Saskatchewan to Nova Scotia), the relation between the basal section and the apical section shows a higher mean = 0.296 (one standard deviation = 0.030). The differences between the means of the two samples are 1.25 standard deviations apart. Basically, 75% of specimens could be distinguished if the ratio is smaller than 0.25 for the western unit (specimens from Alaska, British Columbia, Alberta and southward including western South Dakota) or greater than 0.27 for the transcontinental unit (specimens from Alberta and eastward). Specimens with values between 0.25 and 0.27 are of uncertain status. Moreover, in Alberta both populations exist sympatrically. Therefore, we consider the two units as specifically distinct.

Two names apply to the North American units, *Sirex melancholicus* Westwood and *Urocerus caudatus* Cresson. The female holotype of *U. caudatus* is from Colorado and matches the western species. It is the oldest name.

Hosts and phenology

Xeris caudatus has a wide host range within Pinaceae (Middlekauff 1960, Cameron 1965, Morris 1967, Kirk 1975). The main hosts are firs. Based on 340 reared and confirmed specimens, the hosts are: *Abies concolor* (298, Kirk, 1975), *Picea engelmannii*, and *Pinus ponderosa*. Other hosts are *Abies balsamea* (15), *A. concolor*, *A. lasiocarpa* (3, Morris 1967), *Picea engelmannii*, *P. glauca* (4), *P. pungens* (11), *P. contorta* (7), *P. ponderosa*, and *Pseudotsuga menziesii* (2) (Morris 1967).

Based on 213 field-collected specimens, the earliest and latest capture dates are June 12 and August 18. The main flight period is from the second half of June to the first half of August with a peak in the second half of July.

Range

CANADA: AB, BC (Cascades eastern slope and eastward), SK. **USA:** AK, CA, CO, ID, MT, OR, SD, UT, WA, WY. *Xeris caudatus*, a western species, is known from Alaska, British Columbia, and Alberta south to California and New Mexico (Cameron 1965) (Fig. C40.6).

Specimens studied and included for the distribution map: 237 females and 13 males from, BYUC, CNC, MTEC, OSAC, UAIC, UAM, UCRC, USFS–GA, USFS–MS, and USNM.

Specimens for molecular studies: 14 specimens. See Fig. E2.3.

CANADA. Alberta: CNCS 1090, 2008, 587. **USA. Colorado:** CBHR 2008, 2010, 658. **Montana:** 2007, CNCS 1084, 654. **Utah:** 2008, CBHR 1943, 658; 2008, CBHR 1944, 658; 2008, CBHR 1945, 658. **Washington:**

2005, CBHR 214, 658; 2005, CBHR 229, 658; 2005, CBHR 236, 658; 2005, CBHR 236e, 658; 2005, CBHR 238, 658; 2005, CBHR 238b, 658; 2005, CBHR 238c, 658; 2005, CBHR 238d, 658.



C40.1: *X. caudatus* ♀



C40.2: *X. caudatus* ♂



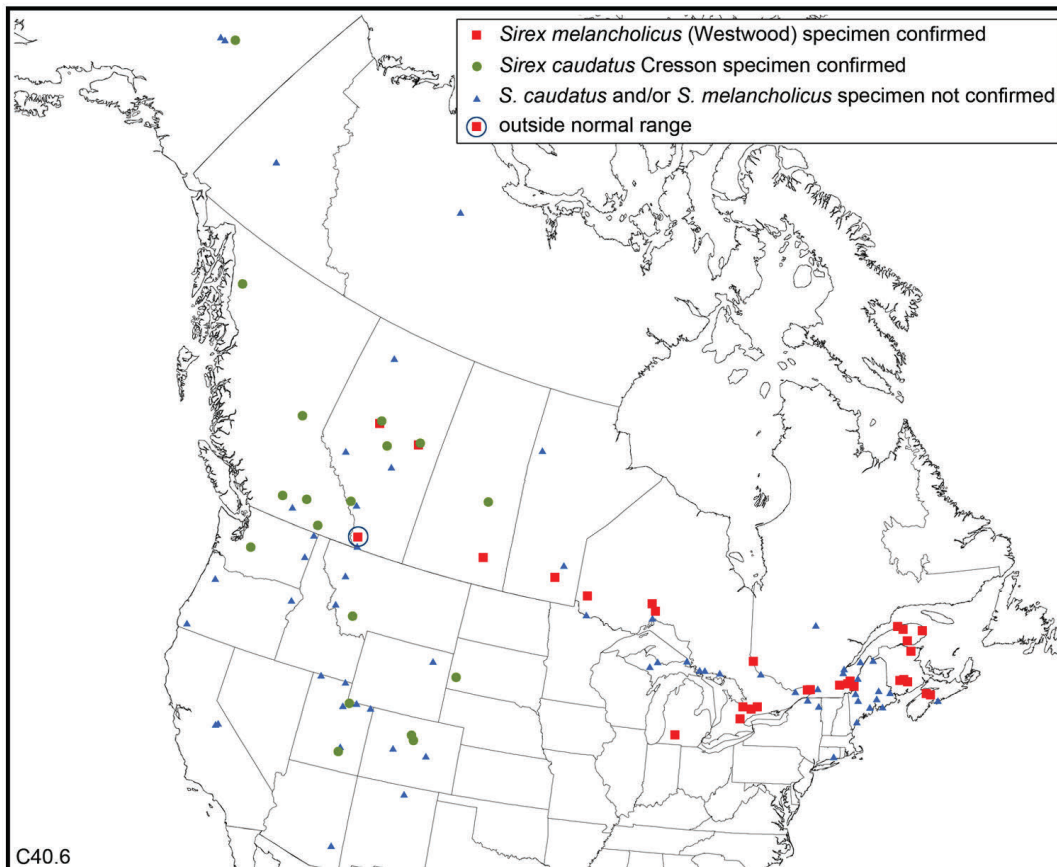
C40.3: *X. melancholicus* ♀



C40.4: *X. spectrum* ♂



C40.5: *X. spectrum* ♀



C40.6

41. *Xeris chiricahua* Smith, n. sp.

Fig. C41.1 (female habitus)

Fig. C41.2 (male habitus)

Fig. C41.3 (map)

Diagnostic combination

Among specimens with mainly clear wings and a white longitudinal band on the lateral margin of the pronotum [*caudatus* and *melancholicus*], **both sexes** of *X. chiricahua* are recognized by the long setae on the frons and vertex of the head, the dense pits on the head between the eyes and the postocellar furrows, and the pits on the gena ventral to the genal ridge which are continuous with pits on the occiput.

FEMALE. Description

Color. Head black except for large white spot on gena dorsal to middle of eye extending down to genal ridge; antenna black (apical 0.25 dark brown). Thorax black except for white longitudinal band extending from posterolateral to anterolateral angles, narrowing toward posterior angle, and extending on vertical portion ventral to anterior angle. Legs light reddish brown but black on pro- and mesocoxae, black on metacoxae or mostly light reddish brown on metacoxae. Fore wing clear except for a lightly tinted band before stigma and in apical 0.25, very lightly tinted in cell 2CU; costal cell brown and most of area ventral to anal cells yellowish brown; veins black (including veins C, R, and base of stigma on both sides of junction with vein 1r-rs). Abdomen completely black. Sheath with apical section black and basal section reddish brown.

Head. Eye in lateral view (N = 5) with maximum height 1.3–1.6 times as long as maximum length, and maximum height of eye 0.34–0.48 times as long as maximum height of head (from transverse ridge on gena above mandible to top of head). Gena in dorsal view with maximum distance between outer edges clearly wider than maximum distance between outer edges of eyes (in frontal view outer edges of eyes clearly not intersecting genae), and in lateral view distance between outer edge of eye and genal ridge 0.50–0.66 times as long as maximum length of eye. Transverse ridge near mandible narrow, sharp and mainly smooth. Head in dorsal view with pits very dense (many pits polygonal in outline on most of vertex) and numerous on gena below ventral margin of eye and genal ridge, pitted area of gena broadly connected to pitted area of occiput, and with many moderate size pits (diameter of pits 0.2–0.25 times lateral ocellus diameter) between outer edge of eye and genal ridge.

Thorax. Fore wing vein 3A absent, or reduced to a stump, but not extending toward posterior wing edge.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 0.8 times as wide as median length, with maximum width of basin 1.3–1.6 times as wide as median length and basin 0.6–0.8 times as long as medially median length of cornus. Cornus constricted in dorsal view, its minimum width (at constriction) 0.8 times as wide as maximum width of cornus subapically. **Sheath.** Length 1.4–1.5 times as long as fore wing length; basal section 0.22–0.27 times as long as apical section (N = 4); lateral surface of apical section with well defined ridge (as in Fig. B5.13, insert). **Ovipositor.** Lancet with 26–30 annuli (first 15 annuli very hard to see, but still outlined) (N = 2); junction of basal and apical sections of sheath aligned between 3rd and 4th annuli; major pits present on 4–5 apical annuli before teeth annuli, and at most one preceding annulus with a very small pit.

MALE. Description

Color. Femora (except for light reddish brown at extreme apex), tibiae (except for light reddish brown at very base) and tarsi (except for light reddish brown tarsomeres 3–5 or 4 and 5) black.

Thorax. Metatibia with deep notch on dorsal edge in basal 0.25 (Fig. B5.39).

Type Material

Holotype female (USNM) in perfect condition; labeled [White] “RustlerPark ChiricahuaMts 13Jun56 ARIZ OLCartwright”; [Red] “HOLOTYPE *Xeris chiricahua* D. R. Smith, 2011”. Type locality: U.S.A., Arizona, Chiricahua Mountains, Rustler Park.

Paratypes. 3 females and 1 male. **USA. Arizona:** *Cochise Co.*, same data as holotype (1F, 1M, CNC, USNM); *Coconino Co.*, Kaibab National forest, 35.381°N 111.901°W, 6.VI–29.VIII.2008, R. Hofstetler (1F, CNC). **Colorado:** Florissant vi,24,14, resting on pine tree (1F, USNM).

Taxonomic notes

At first sight, specimens of *X. chiricahua* are similar to those of *X. caudatus* because they share the white longitudinal band on the lateral margin of the pronotum. But they differ in the length of frontal clypeal setae, the much denser pits on the vertex and dense and widespread field of pits on the gena below ridge merging with pits of the occiput.

Origin of specific epithet

The name *chiricahua* refers to the mountains where

the species was discovered, stressing the insularity of the mountains in this region. The name is a noun in apposition.

Hosts and phenology

The host of *X. chiricahua* is unknown, but females of *Xeris* with a long ovipositor and few pits on the ovipositor are known to attack Pinaceae. The Chiricahua Mountains

are rich in pines at high elevations. The three specimens were captured on June 13.

Range

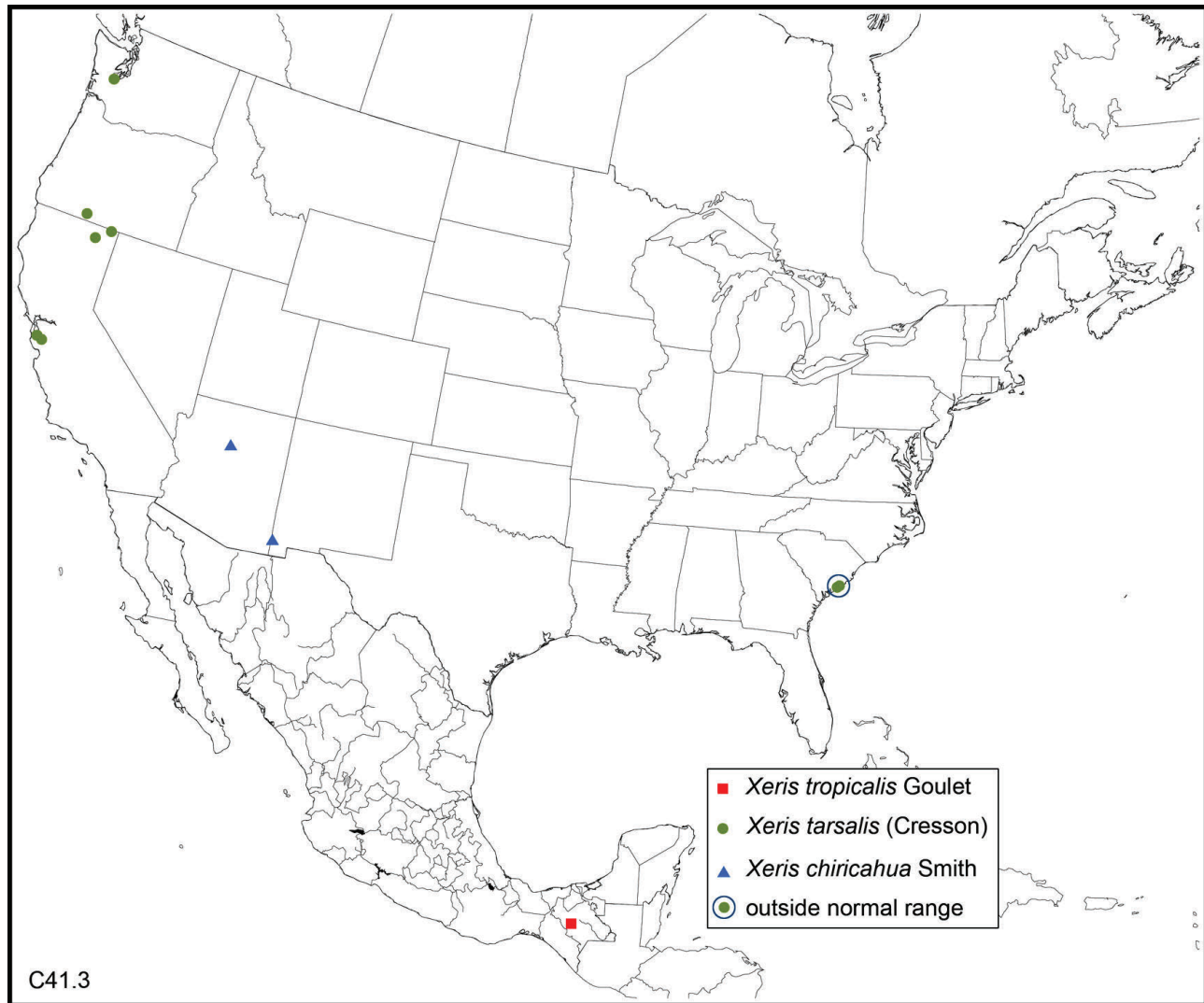
United States: AZ. CO. We suspect the species may also occur in Mexico (Fig. C41.3).



C41.1: *X. chiricahua* ♀



C41.2: *X. chiricahua* ♂



42. *Xeris indecisus* (MacGillivray) species re-instated

Fig. C42.1, Schiff *et al.* 2006: 84, 85 (female with reddish brown abdomen, habitus)

Fig. C42.2, Schiff *et al.* 2006: 95, 96 (female with black abdomen, habitus)

Fig. C42.3, Schiff *et al.* 2006: 83 (male with reddish brown abdomen, habitus)

Fig. C42.4, Schiff *et al.* 2006: 91 (male with black abdomen, habitus)

Fig. C39.1 (live female with dark abdomen)

Fig. C42.5 (live male with dark abdomen)

Fig. C42.6 (map)

Urocerus indecisus MacGillivray, 1893: 243. Holotype male (INHS, Webb 1980), not examined. Type locality, near Olympia, Washington.

Xeris morrisoni Bradley, 1913: 24 (not Cresson, 1880: 35); accepted by Ries 1951: 84, Middlekauff 1960: 69.

Xeris morrisoni indecisus; Maa, 1949: 85 (change in combination and rank); accepted by Burks 1958: 17, Smith 1979: 129.

Xeris spectrum townesi Maa, 1949: 88. Holotype female (USNM), examined by DRS and HG. Burks 1958: 17, Burks 1967: 27, Smith 1979: 129. **NEW SYNONYM.** Type locality: "Hoquiam [Washington]".

Xeris spectrum Middlekauff 1960: 70 (in part) (not Linnaeus, 1758: 560).

Diagnostic combination

Among adults without a longitudinal band on the lateral margin of the pronotum [*morrisoni*, *tarsalis* and *tropicalis*], **both sexes** of *X. indecisus* are recognized by the wide gena (in frontal view maximum width between the outer edges of eyes clearly less than maximum width between genae), and the narrow, sharp and mainly smooth transverse ridge above the mandible. **Female** also have

completely light reddish brown femora. **Males** also have the width of the gena between the genal ridge and the outer edge of eye generally more than half as wide as the maximum eye length.

FEMALE. Description

Color. Head black except for large white spot on gena dorsal to middle of eye extending down to genal ridge (Fig. B5.19); flagellum black but reddish brown on 8–12 apical flagellomeres (black abdomen form) (Fig. B5.49), or completely light reddish brown (reddish brown abdomen form, but unusually also for the black abdomen form) (Fig. B5.50). Thorax completely black or with small to large white spot present on vertical surface near anterolateral angle of pronotum (spot very narrow if visible in dorsal view) (Fig. B5.38). Legs light reddish brown except for coxae; coxae almost all light reddish brown except on surface at dorsal angle (especially in specimen with reddish brown abdomen) to brown or black with reddish brown apex (Fig. B5.38). Fore and hind wings tinted very light brown but clearly darker in cells 1R1, 1M and 2CU (almost completely clear except for a dark band before stigma and somewhat darkened in apical 0.25 in old preserved specimens) or, in southwestern United States completely darkly tinted (Fig. B5.16); costal cell brown and most of surface behind anal cells yellowish brown; veins dark brown or black (including veins C and R, and vein 1r-rs near junction with stigma). Abdomen segments 1 or 1 and 2 black, and segments 2–10 or 3–10 reddish brown (pale form) (Fig. B5.46), or abdomen completely black (dark form, not found in southwestern United States) (Fig. B5.47). Sheath with apical section black and basal section reddish brown.

Head. Eye in lateral view (20 specimens measured) with maximum height 1.36–1.66 times as long as maximum length, and maximum height of eye 0.42–0.50 times as long as maximum height of head (from transverse ridge on gena above mandible to top of head) (as in Fig. B5.7). Gena in dorsal view with maximum distance between outer edges clearly wider than maximum distance between outer edges of eyes (in frontal view outer edges of eyes clearly not intersecting genae) and in lateral view distance between outer edge of eye and genal ridge 0.50–0.64 as long as maximum length of eye (Fig. B5.27). Transverse ridge above mandible narrow, sharp and mainly smooth (Fig. B5.21). Head in dorsal view with pits restricted to vertex (quite densely pitted from dorsoposterior edge of eye to occiput) and postocellar area (medially and a little more widespread near lateral ocelli) (Fig. B5.33); in lateral view pits almost absent on gena ventral to genal ridge (Fig. B5.19), and pits scattered (mainly near eye) and small (diameter of pit 0.2–0.3 that of ocellus) between outer edge of eye and genal ridge

(Fig. B5.19).

Thorax. Fore wing vein 3A absent (81%), reduced to a stump (18%), or rarely extending slightly as a nebulous vein (1%), but not extending along posterior margin of wing.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 0.7 times as wide as median length, with maximum width of basin 1.3 times as wide as median length, and basin 0.5 times as long medially as median length of cornus. Cornus constricted in dorsal view, its minimum width (at constriction) 0.8 times as wide as maximum width of cornus subapically. **Sheath.** Length 1.2–1.5 times as long as fore wing length; basal section 0.20–0.31 times as long as apical section (Fig. B5.25); lateral surface of apical section with well defined ridge (as in Fig. B5.13, see insert). **Ovipositor.** Lancet with 25–33 annuli (first 15 annuli difficult to see, but still outlined); junction of basal and apical sections of sheath aligned between 2nd and 3rd, at 3rd, or between 3rd and 4th annuli; major pits present on last 4–6 apical annuli before teeth annuli, and at most 6 preceding annuli with a very small pit.

MALE. Description

Color. Antenna, coxae, femora (at least metafemur mostly black, but pro- and mesofemur black in most specimens to mainly reddish brown), tibiae (except for brown at very base in some specimens) and tarsi (except reddish brown tarsomeres 3–5 or 4 and 5) black. Pronotum completely black, or vertical surface in front of dorsolateral angle with small to large white spot; dorsal surface of pronotum black or with white spot extending at most toward posterolateral angle. Abdomen black on segments 1 and 2 and laterally on terga 3–8, and reddish brown elsewhere (pale form), or completely black (dark form).

Thorax. Metatibia with shallow notch on dorsal edge in basal 0.25 (Fig. B5.40).

Taxonomic notes

The holotype of *U. indecisus* was not examined. The description (especially the femora and pronotal color pattern) matches our concept for this species.

Xeris spectrum townesi specimens share with *X. indecisus* the large spot size on the gena, and the denser pits on the gena and vertex; **females** share the flagellum and the pronotum color, and **males** share the pronotum and metafemur color. Males of the pale abdomen form match the description of the type of *Xeris indecisus*, and females of the black abdomen form match *Xeris spectrum townesi*. **Both sexes** of both color forms are easily associated. Both color forms have the same range

except from Utah and the Black Hills of South Dakota and south where only the pale color form occurs), and adults are often found together.

The pale abdomen and dark abdomen forms were classified until now as two species (Maa 1949, Ries 1951, Middlekauff 1960, Smith 1979). Information from morphology and DNA barcoding confirms that the two discrete color forms of both sexes belong to one species. Therefore, these color forms are treated here as one species.

Xeris indecisus has been ranked as a subspecies of *X. morrisoni* (Maa 1949, Ries 1951, Middlekauff 1960, Smith 1979). However, the information from morphology and DNA barcoding confirms that the two taxa are different. Moreover, the two species are sympatric in Colorado and females are easily distinguished on color pattern. Therefore, we consider *X. indecisus* and *X. morrisoni* as specifically distinct.

Geographical variation

Adults of *X. indecisus* have two distinct color forms: the abdomen is either mainly reddish brown or completely black. Both color forms are known from coastal and interior regions of British Columbia south to California. However, the reddish brown abdomen form is the only form recorded in southwestern United States (Arizona, Colorado, Nevada, South Dakota and Utah). Dark winged specimens are recorded from the latter states. Wings less darkly tinted where both color forms occur.

Less obvious are variations in ovipositor length. The basal section of the sheath is proportional to body size, but the apical section is not. We calculated the ratio between the basal and apical section as a general measure of relative size for the ovipositor, based on 72 specimens. In South Dakota, females (18) have generally a short ovipositor with a ratio of basal to apical sections of 0.24–0.31 (mean = 0.27). At the other extreme, specimens (10) from Lake Tahoe, California, have a ratio of 0.20–0.25 (mean = 0.23). In Oregon and British Columbia, females (44) have ratios of 0.20–0.32 (average 0.25). Therefore specimens from California have a relatively longer apical section of the sheath than most of specimens from elsewhere. DNA barcodes based on 21 specimens from regions with long and short ovipositors does not segregate specimens into two groups. We see no reasons to recognize subspecies.

Hosts and phenology

Xeris indecisus has a wide host range (Bedard 1938 – under *X. morrisoni*, Cameron 1965, Morris 1967). Based on 121 reared and confirmed specimens, all but one host are Pinaceae: *Abies* sp. (13), *A. concolor* (17), *A. grandis* (10), *A. lasiocarpa* (8), *A. magnifica*, *Larix occidentalis* (12), *Picea* sp. (1), *P. sitchensis* (10), *Pinus contorta* (2), *P. ponderosa*, *Pseudotsuga menziesii* (28), and *Tsuga heterophylla* (20). There is one record from *Calocedrus decurrens* (Cupressaceae).

Based on 24 field-collected specimens, the earliest and latest capture dates are May 18 and September 11. The main flight period is from the first half of June to the first half of September.

Range

CANADA: BC. **USA:** CA, CO, ID, MT, NV, OR, SD, UT, WA. *Xeris indecisus*, a widespread western species in forested regions, is recorded from British Columbia to California and Colorado (Burks 1967, Cameron 1965, Smith 1979) (Fig. C42.6). The specimens of *X. indecisus* recorded by Burks (1967) under *X. spectrum townesi* from Arizona needs confirmation as they could be specimens of *X. chiricahua*. One female was intercepted in Osaka, Japan, from United States (Okutani 1965) and we have seen a female intercepted in New Zealand (FRNZ and PANZ).

Specimens studied and included for distribution map: 232 females and 113 males BYUC, CFIA, CNC, DEBU, EDUM, MTEC, OSAC, PFRC, UASM, UCRC, USFS–GA, USFS–MS, and USNM.

Specimens for molecular studies: 21 specimens. See Fig. E2.3.

CANADA. British Columbia: 2006, *CBHR 418*, 658; 2006, *CBHR 419*, 658; 2004, *SIRCA 092*, 658; 2004, *SIRCA 093*, 658. **USA. California:** 1999, *CBHR 98*, 658; 2007, *CNCS 1076*, 600; 2007, *CNCS 1077*, 576; 2007, *CNCS 1078*, 654. **Colorado:** 2005, *CBHR 189*, 658. **Oregon:** 1999, *CBHR 108*, 658; 2006, *CBHR 385*, 658; 2006, *CBHR 1078*, 658; 2007, *CNCS 1080*, 615. **Washington:** 2005, *CBHR 215*, 658; 2005, *CBHR 216*, 658; 2005, *CBHR 228*, 658; 2005, *CBHR 235*, 658; 2005, *CBHR 239*, 658; 2005, *CBHR 241*, 658; 2005, *CBHR 254*, 658; 2008, *CBHR 1310*, 658.



C42.1: *X. indecisus* ♀ with reddish brown abdomen



C42.2: *X. indecisus* ♀ with black abdomen



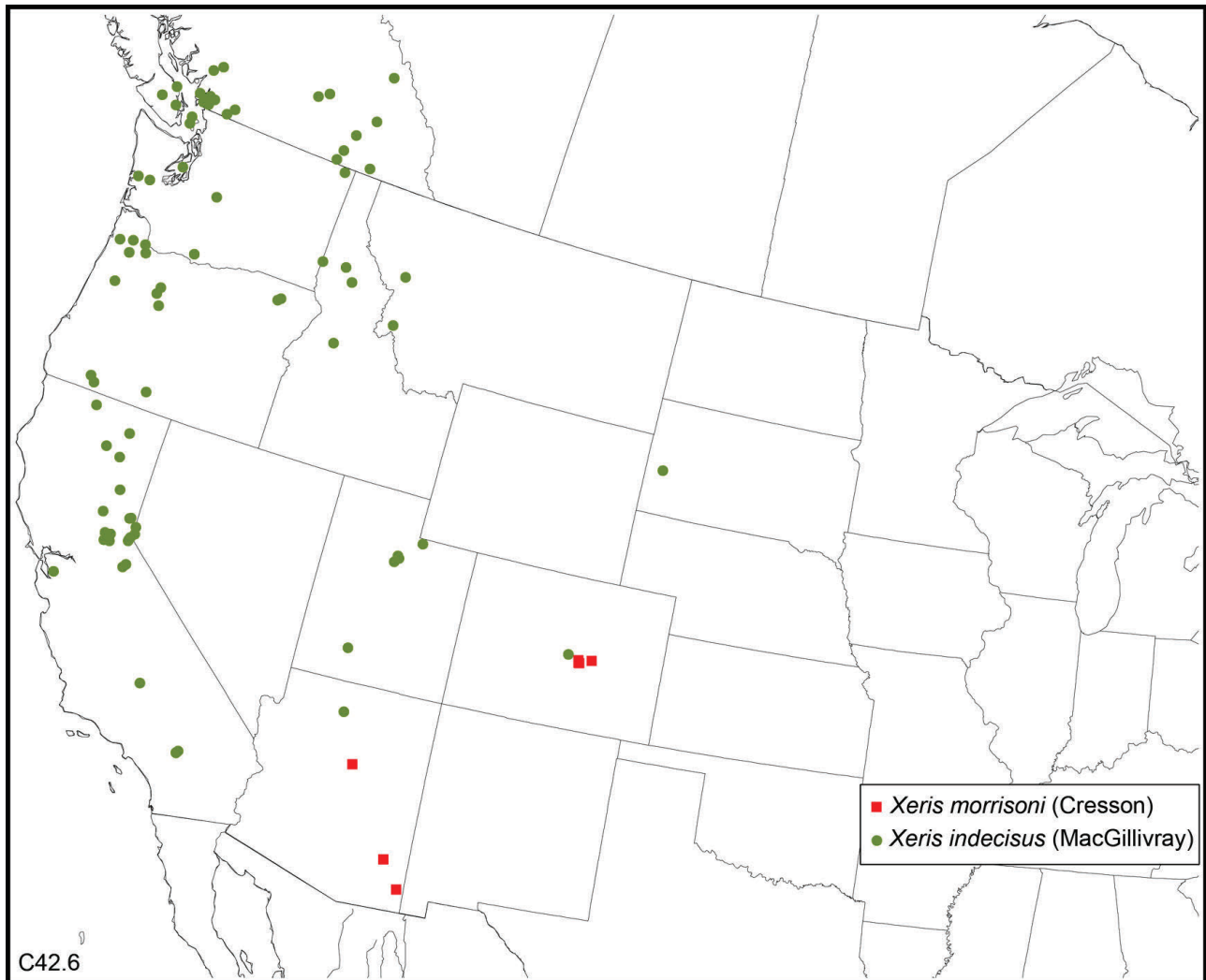
C42.3: *X. indecisus* ♂ with reddish brown abdomen



C42.4: *X. indecisus* ♂ with black abdomen



C42.5: *X. indecisus* ♂ with black abdomen



43. *Xeris melancholicus* (Westwood), n. stat.

Fig. C43.1, Schiff *et al.* 2006: 92, 93 (female habitus)
 Fig. C43.2 (male habitus)
 Fig. C40.6 (map)

Sirex melancholicus Westwood, 1874: 116, pl. XXI, fig. 8. Holotype male (OXUM), images of male prepared by James E. Hogan and sent to HG for study.

Urocerus caudatus; Cresson, 1880: 67 (not Cresson, 1865: 247–248).

Xeris spectrum; Maa, 1949: 86 (not Linnaeus, 1758: 560). Burks 1958: 17, Smith and Schiff 2002: 185.

Xeris spectrum spectrum; Maa, 1949: 86 (change in status); accepted by Burks 1958: 17, Middlekauff 1960: 70 (in part), Burks 1958: 17, Smith 1979: 129.

Diagnostic combination

Among specimens with a lateral longitudinal band on the pronotum and with short setae on the head [*caudatus*], **both sexes** of *X. melancholicus* are recognized by the very small pits (pit diameter 0.1–0.2 times lateral ocellus diameter) and very few pits on the gena between the upper and lower limits of the genal ridge, and the small white spot that usually does not extend to the genal ridge. **Females** also have completely light reddish brown coxae (except for the black anterior and posterior dorsal edges), and generally longer apical section of the sheath (basal section/apical section ratio more than 0.27 for most specimens). **Males** of *melancholicus* cannot be separated from males of *caudatus*.

FEMALE. Description

Color. Head black except for small white spot behind eye; white spot usually not extending down to genal ridge (Fig. B5.41); antenna completely black. Thorax black except for white longitudinal band extending from posterolateral to anterolateral angles including vertical portion of anterior angle (Fig. C43.3). Legs light reddish brown but narrowly black at dorsal coxal articulation (Fig. C43.1). Fore and hind wings almost completely clear except for a very lightly tinted darkened band before stigma and in apical 0.25; fore wing very lightly tinted in cell 2CU, costal cell brown and most of surface behind anal cells yellowish brown, veins black (including veins C and R, and vein 1r-rs near junction with stigma) (Fig. B5.17). Abdomen completely black. Sheath with apical section black and basal section reddish brown.

Head. Eye in lateral view (20 specimens measured) with maximum height 1.37–1.64 times as long as maximum length, and maximum height of eye 0.42–0.51 times as long as maximum height of head (from transverse ridge on gena above mandible to top of head) (as in Fig. B5.7).

Gena in dorsal view with maximum distance between outer edges clearly wider than maximum width between outer edges of eyes (in frontal view outer edges of eyes clearly not intersecting genae) (Fig. B5.4), and in lateral view distance between outer edge of eye and genal ridge 0.48–0.61 times as long as maximum length of eye (as in Fig. B5.27). Transverse ridge above mandible narrow, sharp and mainly smooth (as in Fig. B5.21). Head in dorsal view with pits restricted to vertex (scarcely pitted from dorsoposterior edge of eye to occiput) and postocellar area (scattered or absent on most of median furrow, but a little more widespread near lateral ocelli) (Fig. B5.2), in lateral view pits almost absent on gena ventral to genal ridge, and few and very small (diameter of pit 0.1–0.2 lateral ocellus diameter) between outer edge of eye and genal ridge (mainly near eye) (Fig. B5.43).

Thorax. Fore wing vein 3A absent (73%), reduced to a stump (24%) or rarely extending toward posterior wing edge as a nebulous vein (3%), but not extending along posterior margin of wing.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 0.8 times as wide as median length, maximum width of basin 1.6 times as wide as median length, and basin 0.5 times as long medially as median length of cornus (Fig. C39.2). Cornus constricted in dorsal view, its minimum width (at constriction) 0.8 times as wide as maximum width subapically (Fig. C39.2). **Sheath.** Length 1.2–1.4 times as long fore wing length; basal section 0.24–0.35 times as long as apical section (Fig. C43.4); lateral surface of apical section with well defined ridge (Fig. B5.13, see insert). **Ovipositor.** Lancet with 25–29 annuli (first 15 annuli hard to see, but still outlined; N = 14) (Fig. B5.15); junction of basal and apical sections of sheath aligned between 2nd and 3rd, at 3rd, or 3rd and 4th annuli; major pits present on 4–5 apical annuli before teeth annuli (Fig. B5.15), and 7–15 preceding annuli with a very small pit (as in Fig. B5.15).

MALE. Description

Color. Coxae, tibiae (except very base) and tarsomeres 1–5 black (apical articles sometimes brown or reddish brown in old or teneral specimens); femora completely or mainly, and extreme base of tibiae (not sharply outlined but gradual shift) reddish brown (Fig. B5.51).

Thorax. Metatibia with shallow notch on dorsal edge in basal 0.25.

Taxonomic notes

Initially we thought that *X. caudatus* was a well defined and widespread species. We had several barcoded specimens from eastern North America confirming our

concept. However, it was not to remain so straightforward. NMS reported a population from the Cascade Mountains, Washington, based on a rather distinct barcode relative to eastern specimens. For more information see “taxonomic notes” under *X. caudatus*.

As more specimens from western North America became available, we noticed that the eastern population had a shorter apical section of the sheath relative to the basal section. We carefully measured all the available specimens and confirmed a marked difference in the sheath length between the eastern and western populations. We also measured the basal and apical sections of the sheath. To insure an accurate measurement of the apical section we had to consider two situations. If the apical section covered the ovipositor we recorded its length because the apical section is straight or almost so, but if the apical section was separated from the ovipositor we measured its length up to the end of the ovipositor because the ovipositor is straight whereas the apical section of the ‘detached’ sheath is curved and therefore gives a shorter (and inaccurate) length measurement. The ratio derived from the basal section length relative to that of the apical section for the eastern unit (42 specimens) gave a mean = 0.295 (standard deviation = 0.031) and the western unit (73 specimens) gave a mean = 0.237 (standard deviation = 0.016). There is a difference of 1.25 standard deviations between the mean of the two populations. Based on a difference of two standard deviations, the overlapping zone is 0.25–0.27. Therefore, 75% of the females of each population could be segregated correctly, and specimens with values between 0.25 and 0.27 are of uncertain status. Moreover, in Alberta both populations exist sympatrically. Therefore, we consider the eastern and western populations as specifically distinct.

Two names apply to this complex. Cresson’s type of *U. caudatus* is a female from Colorado and is associated with the western species. Cresson’s name is older. However, we do not know if the eastern species is named or not. We could not assign the male holotype of *S. melancholicus* to this species with certainty because we did not have a diagnostic character for distinguishing males of the western *X. caudatus* from those of the eastern species. The male of *S. melancholicus* is probably a specimen from a region east of the Rocky Mountains because most of Westwood’s new species of Siricidae are from eastern North America. If so, Westwood’s type would match the eastern species. However, we are not certain because Westwood did describe one western species of Siricidae. In spite of this and to avoid creating a synonym, we decided to assign Westwood’s name to *X. melancholicus* rather than describing it with a new name.

Specimens of *X. melancholicus*, like *X. caudatus*,

are quite easily distinguished from other New World species of *Xeris* using the key. We discussed under *X. caudatus* the differences between *X. caudatus* and named species of the *X. spectrum* species complex from Eurasia. The discussion about the Eurasian species and *X. melancholicus* is the same as that given under *X. caudatus* and so is not repeated.

Biological notes

Males and females of *X. melancholicus* were observed aggregating at the highest point of Mount Rigaud, Quebec. Though mating was not observed then, we assume that both sexes get together for this purpose.

Hosts and phenology

Xeris melancholicus has a wide host range (Middlekauff 1960, Stillwell 1960, Cameron 1965, Morris 1967, Kirk 1975). Based on 24 reared and confirmed specimens, all are Pinaceae: *Abies balsamea* (15), *Larix occidentalis*, *P. glauca* (4), and *Pinus banksiana* (5).

Based on 155 field-collected specimens, the earliest and latest capture dates are June 12 and August 18. The main flight period is from the second half of June to the first half of August with a peak in the second half of July. We collected 11 specimens (3 females and 8 males) though more were seen at the summit of Mount Rigaud, Quebec, between June 15 and June 27 (1985 to 2011).

Range

CANADA: AB, BC, MB, NB, NS, ON, QC, SK. **USA:** CT, ME, MI. *Xeris melancholicus*, a widespread species, is recorded from the central Alaska, northernmost British Columbia and central Alberta to Newfoundland, Michigan and Connecticut (Fig. C40.6).

Specimens studied and included in the distribution map: 126 females and 54 males from BDUC, CNC, FRLC, GLFC, LEMQ, MNRQ, NFRC, UAM, USFS–AK, USFS–GA, USFS–MS, and USNM.

Specimens for molecular studies: 13 specimens. See Fig. E2.3.

CANADA. Alberta: 2008, *CNCS 1086*, 576; 2008, *CNCS 1087*, 563; 2008, *CNCS 1088*, 515; 2008, *CNCS 1089*, 579. **Nova Scotia:** 2006, *CBHR 297*, 658; 2005, *CBHR 300*, 658. **Ontario:** 2007, *SIRCA 041*, 624; 2007, *SIRCA 042*, 616. **USA. Michigan:** 2005, *CBHR 203*, 658. **Minnesota:** 2008, *CBHR 1375*, 658; 2008, *CBHR 1461*, 534; 2008, *CBHR 1462*, 578. **New York:** 2006, *CBHR 603*, 658.



C43.1: *X. melancholicus* ♀



C43.2: *X. melancholicus* ♂



C43.3: *X. melancholicus* ♀



C43.4: *X. melancholicus* ♀

44. *Xeris morrisoni* (Cresson)

Fig. C44.1, Schiff *et al.* 2006: 88, 89 (female habitus)

Fig. C44.2, Schiff *et al.* 2006: 87 (male habitus)

Fig. C42.6 (map)

Urocerus morrisoni Cresson, 1880: 35. Lectotype female (ANSP), designated by Cresson (1916), examined by DRS and HG. Cresson 1916: 10. Type locality: "Colorado, Utah and Washington Territory".

Sirex morrisonii; Kirby, 1882: 382 (change in combination and spelling).

Xeris morrisoni; Ashmead, 1898: 180 (change in combination); accepted by Bradley, 1913: 24; Ries 1951: 84.

Urocerus tarsalis; synonym proposed by Konow, 1898:88 (not Cresson, 1880:35); accepted by Bradley, 1913: 24; Ries 1951: 84.

Urocerus indecisus; synonym proposed by Konow, 1898:226 (not MacGillivray, 1893: 243); accepted by Bradley, 1913: 24; Ries 1951: 84.

Xeris morrisoni morrisoni; Maa, 1949: 85 (change in rank); accepted by Burks 1958: 17, Smith 1979: 129.

Diagnostic combination

Among adults without a marginal longitudinal band on the pronotum [*indecisus*, *tarsalis* and *tropicalis*], **both sexes** of *X. morrisoni* are recognized by the wide gena (in frontal view maximum width between the outer edges of eyes clearly less outer edges of genae), and the narrow, sharp and mainly smooth transverse ridge above the mandible. **Females** have black femora. **Males** have the width of the gena between the genal ridge and the outer edge of eye generally less than 0.5 times as wide as the maximum eye length.

FEMALE. Description

Color. Head and thorax black except for small white spot behind eye extending ventrally to level of middle of eye (as in Fig. B5.35); antenna black but reddish brown in apical 0.5 (Fig. B5.30). Legs black but light reddish brown at apex of femora (metafemur almost white in basal 0.15), tibiae and tarsi (Fig. B5.28). Fore and hind wings very darkly tinted, veins black (including veins C and R, and vein 1r-rs near junction with stigma). Abdomen segments 1 or 1 and 2 black, segments 2–10 or 3–10, and apical section of sheath reddish brown.

Head. Eye in lateral view (20 specimens measured) with maximum height 1.35–1.60 times as long as maximum length, and maximum height of eye 0.49 times as long as maximum head height (from transverse ridge on gena above mandible to top of head) (as in Fig. B5.7). Gena in dorsal view with maximum distance between outer edges

clearly wider than maximum width between outer edges of eyes (in frontal view, outer edges of eyes clearly not intersecting genae), and in lateral view distance between outer edge of eye and genal ridge 0.43–0.50 times as long as maximum length of eye (Fig. B5.26). Transverse ridge above mandible narrow, sharp and mainly smooth (as in Fig. B5.21). Head in dorsal view with pits restricted to vertex (from dorsoposterior edge of eye to occiput) and postocellar area (on median furrow and a little more widespread near lateral ocelli), in lateral view pits almost absent on gena ventral to genal ridge (as in Fig. B5.35), and scattered (mainly near eye) and small (diameter of pit 0.2–0.3 times ocellus diameter) between outer edge of eye and genal ridge (Fig. B5.26). Frons ventral to median ocellus impressed but not very clearly outlined, quite long, and smooth.

Thorax. Fore wing vein 3A presence or absence not recorded.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 0.7 times as wide as median length, with maximum width of basin 1.3 times as wide as median length, and basin 0.7 times as long medially as median length of cornus. Cornus constricted in dorsal view, its minimum width (at constriction) 0.8 times as wide as maximum width subapically. **Sheath.** Length 1.2–1.5 times as long fore wing length; basal section 0.22–0.30 times as long apical section (N = 6); lateral surface of apical section with well defined ridge (as in Fig. b5.13 see insert). **Ovipositor.** Lancet with 31–34 annuli (first 15 annuli very hard to see, but still outlined); junction of basal and apical section of sheaths aligned between 3rd and 4th annuli; major pits present on 5 apical annuli before teeth annuli, and at most with a very small pit on preceding annulus.

MALE. Description

Color. Antenna, femora, tibiae and tarsi (except for reddish brown tarsomeres 3–5 or 4 and 5) black. Abdomen black on segments 1 and 2 and at side of terga 3–8, reddish brown elsewhere. Pronotum in dorsal view with brown spot on anterolateral angle.

Thorax. Metatibia with shallow notch on dorsal edge in basal 0.25.

Taxonomic notes

Xeris morrisoni is similar to *X. indecisus* (pale abdomen form). Females of *X. morrisoni* are easily distinguished on leg and flagellum color and **both sexes** on the narrow gena. The DNA barcodes support the species level status between the two species. No specimens with intermediate structures and color pattern are known.

Hosts and phenology

Xeris morrisoni has a moderately wide host range. Based on 232 reared and confirmed specimens, all are Pinaceae: *Abies concolor* (228; most specimen records from Kirk (1975)), *Picea pungens* (1), and *Pseudotsuga menziesii* (3). Based on other, better sampled species of this genus, we expect that this species has a wider host range than this.

Based on 13 field-collected specimens, the earliest and latest capture dates are from early June to late July.

Range

United States: CO. *Xeris morrisoni* is recorded from forested regions of southwestern United States (Burks 1958, Burks 1967, Cameron 1965, Smith 1979) (Fig. C42.6).

Specimens studied and included for the distribution map: 7 females and 6 males from OSAC, UAIC, and USNM.

Specimens for molecular studies: 6 specimens. See Fig. E2.3.

USA. Colorado: 2005, *CBHR 190*, 658; 2005, *CBHR 533*, 627; 2005, *CBHR 534*, 658; 2005, *CBHR 535*, 608; 2005, *CBHR 536*, 658; 2005, *CBHR 537*, 658.



C44.1: *X. morrisoni* ♀



C44.2: *X. morrisoni* ♂

45. *Xeris tarsalis* (Cresson)

Fig. C45.1, Schiff *et al.* 2006: 98, 99 (female habitus)

Fig. C45.2, Schiff *et al.* 2006: 97 (male habitus)

Fig. C41.3 (map)

Urocerus tarsalis Cresson, 1880: 52. Holotype female (ANSP), examined by DRS. Cresson 1916: 10. Type locality: "Washington Territory".

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

Xeris macgillivrayi Bradley, 1913: 24, figs. 30, 35.

Holotype female [published measurements suggest one specimen] (CUIC) [according to Maa (1949), but not listed by Hoebeke (1980)], not examined. Middlekauff 1960: 69. Synonym by Maa 1949: 82; accepted by Burks 1958: 17, Smith 1979: 129. Type locality: "near Olympia, Washington", as hand stamped in some copies, but no locality, number of specimens and depository given.

Xeris tarsalis; Maa, 1949: 82 (change in combination); accepted by Burks 1958: 17, Smith 1979: 129.

Xeris morrisoni; synonym by Konow 1898: 88 (not Cresson, 1880: 35) accepted by Ries, 1951: 84.

Diagnostic combination

Both sexes of *X. tarsalis* are easily recognized by the narrow gena (in frontal view, the outer edges of eyes touch or slightly intersect the genae), and the widespread and dense pits covering almost all the dorsal surface of the head and gena ventral to the genal ridge. **Females** have a quite short apical section of the sheath (basal section of sheath about 0.6 times apical section), no ridge on the apical section of the sheath, and a broad and not constricted cornus in dorsal view.

FEMALE. Description

Color. Head and thorax black except for small white spot on gena dorsal to middle of eye; white spot not extending down to genal ridge (Fig. B5.5); antenna black but shifting to reddish brown in apical 0.3. Thorax black. Legs black but reddish brown at apex of metatibia, and tarsi (Fig. C45.1). Fore and hind wings darkly tinted (including C cell), veins black (including veins C and R, and vein 1r-rs near junction with stigma). Abdomen segments 2–10 and sheath reddish brown but black on tergum 1, and lateral edge of terga 2 to 7 and sternum 2–7.

Head. Eye in lateral view (20 specimens measured) with maximum height 1.21–1.37 times as long as maximum length (Fig. B5.5), and maximum height of eye 0.52–0.60 times as long as maximum height of head (from transverse ridge on gena above mandible to top of head) (Fig. B5.5). Gena in dorsal view with maximum distance between outer edges as wide as maximum width between

outer edges of eyes (in frontal view, outer edges of eyes touching or slightly intersecting genae) (Fig. B5.3), and in lateral view distance between outer edge of eye and genal ridge 0.42–0.64 times as long as maximum length of eye (Fig. B5.5). Transverse ridge near mandible narrow, sharp and mainly smooth (as in Fig. B5.21). Head in dorsal view with pits dense but sometimes narrowly absent submedially (Fig. B5.21); pits quite numerous between eye and genal ridge, and not extending below ventral level of eye and genal ridge (thus separated by smooth area from pitted surface of occiput) (Fig. B5.5).

Thorax. Fore wing vein 3A extending toward posterior wing margin as a nebulous vein.

Abdomen. Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 0.7 times as wide as median length, maximum width of basin 1.2 times as wide as median length, and basin 0.6 times as long as median length of cornus (Fig. C45.3). Cornus not constricted in dorsal view, its minimum width (where constriction normally seen in other species of *Xeris*) equal to maximum width subapically (Fig. C45.3).

Sheath. Length about as long as length of fore wing; basal section of sheath 0.6 times as long as apical section (Fig. B5.11); lateral surface of apical section without longitudinal ridge (Fig. B5.11 insert). **Ovipositor.** Lancet with 35–37 annuli (all annuli clearly outlined); junction of basal and apical sections of sheath aligned between 8th and 9th, or 9th and 10th annuli; pits present on all annuli before teeth annuli and large, with anterior end extending to preceding annulus as shallow furrow (Fig. B5.14).

MALE. Description

Color. Antenna, tibiae and tarsi (except tarsomeres 3–5 or 4 and 5) black. Abdomen reddish brown or paler on terga 2–7 or 2–8, and black on tergum 1 or 1 and 2, and on sternum 2–9.

Thorax. Metatibia with shallow notch on dorsal edge in basal 0.25.

Taxonomic notes

Females of *X. tarsalis* are unusual, with a rather short ovipositor. However, the most unusual feature is the presence of large pits along the entire length of the ovipositor. In all other species of *Xeris*, the ovipositor is smooth except for a few small pits near the apex. This structural difference may reflect a different life style. For example, the common *X. caudatus* has mycangia, but NMS confirmed the absence of fungus in them. Their larvae probably survive on fungi brought by other Siricidae, as observed by Fukuda and Hijii (1997) with *X. malaisei* in Japan (*X. spectrum* in their publication). However, we suspect that females of *X. tarsalis* may

carry a fungus in its mycangia.

Hosts and phenology

Xeris tarsalis has a wide host range (Middlekauff 1960, Westcott 1971). Based on 138 reared and confirmed specimens, all host are Cupressaceae: *Cupressus macrocarpa* (131), *Juniperus sp.* (2), *J. occidentalis* (3; from scorched trees (Westcott 1998)), *Calocedrus decurrens* (5), and *Thuja plicata*.

Based on 108 field-collected specimens, the earliest and latest capture dates are early March to early October. The main flight period is from early July to early October with a peak from early September to early October.

Range

USA: CA (Middlekauff), OR, SC (probably not established), WA. *Xeris tarsalis* is known from the Cascade Mountains and Sierra Nevada west to the Pacific coast (Cameron 1965, Smith 1979) (Fig. C41.3). One female was intercepted in South Carolina, and we have seen a female (FRNZ) intercepted in Auckland, New Zealand.

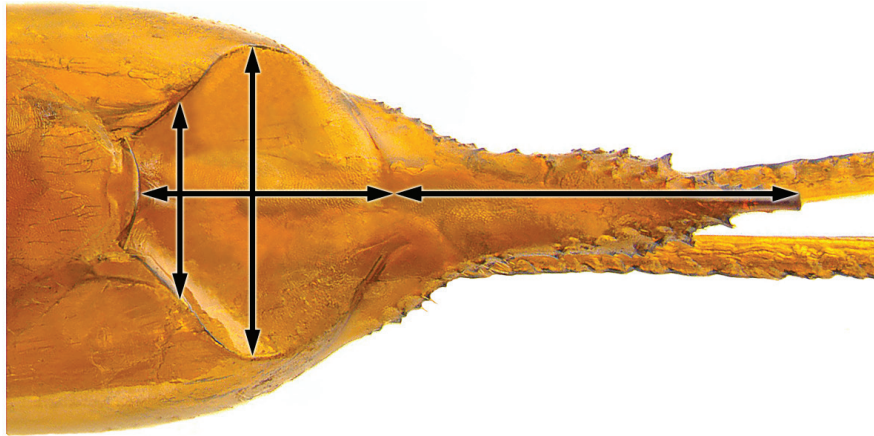
Specimens studied and included for the distribution map: 67 females and 77 males from CUCC, OSAC, and USNM.



C45.1: *X. tarsalis* ♀



C45.2: *X. tarsalis* ♂



C45.3: *X. tarsalis* ♀

46. *Xeris tropicalis* Goulet, n. sp.

Fig. C46.1 (female habitus)

Fig. C41.3 (map)

Xeris tarsalis; Smith, 1978: 89; Smith, 1988:243 (not Cresson, 1880: 52).

Diagnostic combination

Both sexes of *X. tropicalis* are easily recognized by the broad rounded and coarsely pitted transverse ridge dorsal to the mandible, the widespread and dense pits on the head dorsally, and the pits on the gena ventral to the genal ridge continuous with pits on the occiput.

FEMALE. Description

Color. Head and thorax black except for white spot extending from dorsal edge of eye to surface between genal ridge and outer edge of eye (Fig. C46.1); antenna black but 7 apical antennomeres reddish brown. Pronotum in dorsal view with small white spot on anterolateral corner. Legs black except yellow at extreme apex of femora, basal 0.2 of tibiae, and base of tarsomere 1 (Fig. C46.1). Wings very darkly tinted except for clear base of hind wing, veins black (including veins C and R, and vein 1r-rs near junction with stigma). Abdomen segment 1, lateral surface of tergum 2 and sternum 2 black; segments 2–10 reddish brown except for black apical section of sheath.

Head. Eye in lateral view (one specimen measured) with maximum height 1.23 times as long as maximum length, and maximum height of eye 0.51 times as long as maximum height of head (from transverse ridge on gena above mandible to top of head) (Fig. B5.6). Gena in dorsal view with maximum distance between outer edges hardly wider than maximum width between outer

edges of eyes (in frontal view, outer edges of eyes not intersecting genae, but very close to them), and in lateral view distance between outer edge of eye and genal ridge 0.42 times as long as maximum length of eye (Fig. B5.6). Transverse ridge above mandible broad, rounded and coarsely pitted (Fig. B5.20). Head in dorsal view with pits dense and widespread, but absent along weakly outlined furrow behind lateral ocelli, in lateral view pits numerous on gena ventral to level of eye and genal ridge, and pitted area of gena broadly connected to pitted area of occiput. Frons ventral to median ocellus impressed but not too clearly outlined, quite long, and smooth.

Thorax. Fore wing vein 3A reduced to a stump or absent. **Abdomen.** Median basin of tergum 9 with base (outlined by two lateral black longitudinal furrows) 0.8 times as wide as median length, with maximum width of basin 1.7 times as wide as median length, and basin 0.45 times as long medially as median length of cornus. Cornus constricted in dorsal view, its minimum width (at constriction) 0.85 times as wide as maximum width subapically. **Sheath.** Length 0.9 times as long as length of fore wing; basal section of sheath 0.4 times as long as apical section (Fig. B5.12); lateral surface of apical section with well defined ridge (as in Fig. B5.13, see insert). **Ovipositor.** Lancet with 31 annuli (first 14 annuli outlined but difficult to see); junction of basal and apical sections of sheath aligned between 4th and 5th annuli; major pits present on last 6 annuli before teeth annuli, and two preceding annuli with very small pits.

MALE. Unknown.

Type material

Holotype female (CNC), in perfect condition except left antenna broken and glued on label; labeled: [White] “6

mi.N.E. San Cristobal L. C., Chis. Mex. V.19 1969 H. E. Howden”, [White & black frame] “*Xeris tarsalis* (Cr.) D. R. Smith 75”, [Red] “HOLOTYPE *Xeris tropicalis* Goulet CNC No. 23908”. Type locality: Mexico, Chiapas, San Cristobal de las Casas.

Origin of specific epithet

Xeris tropicalis is the southernmost record of *Xeris* and the specimen is clearly in a tropical region. The name *tropicalis* stress this aspect. The name is an adjective.

Host and phenology

The host of *X. tropicalis* is unknown but conifers are suspected. The single female was captured in mid May.

Range

Xeris tropicalis is only known from the type locality in southernmost Mexico (Fig. C41.3).



C46.1: *X. tropicalis* ♀