

B. Key to genera and species

Use of keys

Specimen condition and preparation.

Clean specimens (greasy specimens are quite common in collections) with wings slightly open are needed to view the dorsal surface of the abdomen. At least one antenna and one leg of each pair must be present and complete.

It is often important to know the sex of the specimen to be keyed. Males and females are easily separated. The main sexual differences for all species are on the hind leg and the abdomen.

Female features are:

- Abdomen large, particularly terga 8 and 9 (Fig. A3.1).
- Tergum 9 with a very large median impression (median basin) (Fig. A3.3).
- Tergum 10 developed as a horn (cornus) (Fig. A3.9).
- Long sword-like sheath ventral to abdominal segments 9 and 10 or posterior to sternum 7 covering the ovipositor (Figs. A3.1 & A3.9).
- Hind leg similar in proportions but longer than fore and middle legs (Fig. A3.1).

Male features are:

- Abdomen slender and apical tergum similar to but sometimes a little longer than preceding terga (Fig. A3.2).
- Tergum 8, the last tergum, without a median impression (Fig. C28.3).
- Sternum 9, the last sternum, with a horn (cornus) at apex (Fig. A3.10).
- Abdomen without sword-like extension, and ended at tergum 8 and sternum 9 (Fig. A. 3.2 & A3.10).
- Hind leg clearly enlarged relative to fore and middle legs (Fig. A3.2).

Male identification does not require dissection; female identification usually does. The apical section of the ovipositor sheath should be removed to see the apical half of the ovipositor. To expose the apical half of the ovipositor, insert an insect pin near the apex of the sheath between the ovipositor and the apical section of the sheath. It should break at the junction of the basal and apical sections. Alternatively, the complete ovipositor may easily be pulled out of its sheaths either after relaxing a dried specimen for about 36 hours in a very humid atmosphere (in a closed container) or immediately

after pinning an alcohol preserved specimen. To see most or all the ovipositor of a relaxed or recently mounted alcohol preserved specimen, insert an insect pin between the ovipositor and the apical section of the sheath and gently slide the pin toward the base of the sheath. This will force the ovipositor out of the sheath and the apical section of the sheath will return to its normal position (the sheath will not break). Ensure that the ovipositor remains out of the sheath. Use a fine paintbrush dipped in 95% alcohol to remove any dirt from the ovipositor. The specimen is now ready to be keyed.

Lighting

The light source is important. The best light is diffused light. Diffused light could come directly from a daylight fluorescent light (13 watts is usually satisfactory) or is produced with a semi-opaque plastic between the light source and the specimen. The best diffusion is achieved when the plastic is less than 20 mm from the specimen. This type of lighting eliminates all or most glare from smooth surfaces or those with metallic reflections. Such lighting makes structural features very clear and has been used throughout our work as illustrated in the numerous figures. We use a small (5 by 7 cm) piece of transparent plastic (Mylar) placed vertically on a base of modeling clay about 20 mm from the specimen to provide a sharp, glare-free image, of ovipositor pits for example. A dissecting microscope with a magnifying range of 40–60 times is recommended to view a structure clearly.

Key construction

Each couplet is arranged in contrasting pairs of statements labeled, respectively, with upper and lower case letters. Each statement almost always describes one feature of a character. So, different expressions of the same character would be found, for example, in couplet 8A and 8a. Information that is not compared in the alternate part of the couplet is given between brackets. Clarification notes are given in parentheses. Almost all statements of each couplet are illustrated. Each figure in addition to a number has the statement code: a capital or a lower case letter. Two figures with the same statement code may be mentioned to show a range of variation for a character. The illustration shown is not necessarily that of the species named, but is a similar expression of the character to be observed. In these cases, other structures in the figure should be ignored as they do not represent the species keyed. Plates of figures are organized so that the contrasting statements of each character are adjacent to one another. Arrows and morphological terms are added for clarity.

Field guide to Siricidae of North America

Schiff *et al.* (2006) published a key to genera and species of the North American Siricidae. Their excellent illustrations should help anyone without a reference collection trying to identify a specimen. However, the names of many habitus images need to be revised. We refer to such habitus images under each species of our revision. For other modifications see Appendix 2.

1. Key to extant genera of Siricidae

1. A) Minimum distance (at top of eye) between eyes 0.7–1.2 times as long as maximum height of eye (Fig. B1.1).
 B) Distance between inner edges of antennal sockets 3.5–10.0 times as long as distance from outer edge of antennal socket to nearest edge of eye (Fig. B1.3).
 C) Flagellomeres flattened dorsoventrally (Fig. B1.5).
 [Additional character. Eye narrow: 1.7–1.9 times as high as long except in male of *Teredon cubensis* with a long eye (1.3 times as high as long) causing a very narrow gena.]
 2
- a) Minimum distance (at top of eye) between 1.2–1.6 times as long as maximum height of eye (Fig. 1.2).
 b) Distance between inner edges of antennal sockets 1.5–2.5 times as long as distance from outer edge of antennal socket to nearest edge of eye (Fig. B1.4).
 c) Flagellomeres circular or almost circular in cross section (Fig. B1.6).
 6
- 2(1) A) Fore wing vein 2r–m present (Fig. B1.7).
 B) Fore wing vein 1cu–a not aligned with vein M, but joining vein Cu near middle or in basal 0.25 between veins 1m–cu and M (Fig. B1.9).
 C) Hind wing with hamuli present basal and apical to junction of veins R1 and C (as in Fig. B1.11).
 3
- a) Fore wing vein 2r–m absent (Fig. B1.8).
 b) Fore wing vein 1cu–a aligned or almost aligned with vein M (Fig. B1.10).
 c) Hind wing with hamuli present only apical to junction of veins R1 and C (Fig. B1.12).
 4
- 3(2) A) Distance between inner edges of lateral ocelli subequal to distance from outer edge of lateral ocellus to nearest edge of eye (Fig. B1.13).
 B) Hind wing vein 1r–m slightly longer than vein M; vein M slightly curved (Fig. B1.15).
 C) Metatarsomere 1 scarcely compressed laterally and lateral surface not twisted when seen in dorsal view (as in Fig. B1.17).
 D) **Female:** cercus broad at base of cornus (Fig. B1.19).
 E) **Female:** tergum 9 with median basin more than 1.5 times as wide as long and median length about 0.5 as long as cornus (Fig. B1.21).
 *Siricosoma* Forsius, 1933
 [Note. Only one species, *Siricosoma tremecoides* Forsius, from the Malay Peninsula.]
- a) Distance between inner edges of lateral ocelli more than 1.5 times as long as distance from outer edge of lateral ocellus to nearest edge of eye (Fig. B1.14).
 b) Hind wing vein 1r–m clearly shorter than vein M; vein M markedly curved (Fig. B1.16).
 c) Metatarsomere 1 greatly compressed laterally and lateral surface twisted when seen dorsal view (Fig. B1.18).
 d) **Female:** cercus very small at base of cornus (Fig. B1.20).
 e) **Female:** tergum 9 with median basin about as wide as long and median length about 2.0 times as long as cornus (Fig. B1.22).
 *Teredon* Norton, 1869
 [Note. only one species, *Teredon cubensis* (Cresson) from Cuba.]

- 4(2) A) Antenna with 11–19 flagellomeres (Fig. B1.23).
- B) Fore wing cell 2R1 about 0.5 times as long as cell 3R1; vein 2r-rs joining stigma near middle; stigma gradually attenuated even after junction with vein 2r-rs (Fig. B1.25).
- C) **Male** (only *E. formosanus* studied): antenna as long as length of fore wing costal cell and stigma combined (Fig. B1.27).
- D) **Female**: tergum 9 with disc of median basin very convex and lightly to densely pitted (Fig. B1.29).
- E) **Female**: cercus present and thumb-like (Fig. B1.31).

..... ***Eriotremex* Benson, 1943**

[Note. Twelve species restricted to the Oriental region and Papua New Guinea. One species, *Eriotremex formosanus*, accidentally introduced into southeastern United States.]

- a) Antenna almost always with fewer than 14 flagellomeres (Fig. B1.24).
- b) Fore wing cell 2R1 at least 0.63 times as long as cell 3R1; vein 2r-rs joining stigma in apical 0.2–0.33; stigma before junction with vein 2r-rs parallel and beyond junction abruptly attenuated (Fig. B1.26).
- c) **Male**: antenna at most as long as length of fore wing costal cell (Fig. B1.28).
- d) **Female**: tergum 9 with disc of median basin at most slightly convex, but usually flat to concave, and most of surface not pitted (Fig. B1.30).
- e) **Female**: cercus absent (Fig. B1.32).

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- 5(4) A) Flagellomere 1 about 0.5 times as long as flagellomere 2 (Fig. B1.33).
- B) Fore wing cell 2R1 at most 0.7 times as long as cell 3R1 (Fig. B1.35).
- C) Head with setae (exclusive of those on occiput) enlarged at apex, club-like (Fig. B1.37).
- D) Frons with pits separated by 1–2 pit diameters (surface quite bright because surface between pits smooth) (Fig. B1.39).

..... ***Afrotremex* Pasteels, 1951**

[Note. Two species known *A. hyalinatus* (Mocsáry) and *A. violaceus* Pasteels. Both only recorded from sub-Saharan Africa.]

- a) Flagellomere 1 at least 0.7 times as long as flagellomere 2 (Fig. B1.34).
- b) Fore wing cell 2R1 at least 0.85 times as long as cell 3R1 (cell 2R1 commonly subequal or clearly longer than length of 3R1) (Fig. B1.36).
- c) Head with setae gradually tapering sharply at apex (Fig. B1.38).
- d) Frons with pits dense and generally in contact with each other (Fig. B1.40).

..... ***Tremex* Jurine, 1807**

[Note. Thirty three species known. Almost all species restricted to Palaearctic region except for one, *Tremex columba* Linnaeus, in North America. One species, *T. fuscicornis* (Fabricius), introduced into the Western Hemisphere.]

- 6(1) A) Gena behind eye with short ridge (Fig. B1.41).
- B) Hind wing without cell 1A (Fig. B1.43).
- C) Metatibia with one apical spur (Fig. B1.45).
- D) **Female**: apical section of sheath without teeth in apical third of dorsal margin (Fig. B1.47).

..... ***Xeris* A. Costa, 1894**

[Note. Ten species known. Three species in Palaearctic region and seven in New World.]

- a) Gena behind eye without ridge (Fig. B1.42).
- b) Hind wing with cell 1A (Fig. B1.44).
- c) Metatibia with two apical spurs (Fig. B1.46).
- d) **Female**: apical section of sheath with teeth in apical third of dorsal margin (except in a few species of *Urocerus* from Asia) (Fig. B1.48).

..... 7

- 7(6) A) Fore wing broadly rounded at apex (Fig. B1.49).
- B) Fore wing with cell 1Rs2 short (2r–m and 3r–m slightly longer than veins Rs2 and M above and below) (Fig. B1.51).
- C) Fore wing with cell 3R1 short (2.2 times as wide as long) (Fig. B1.53).

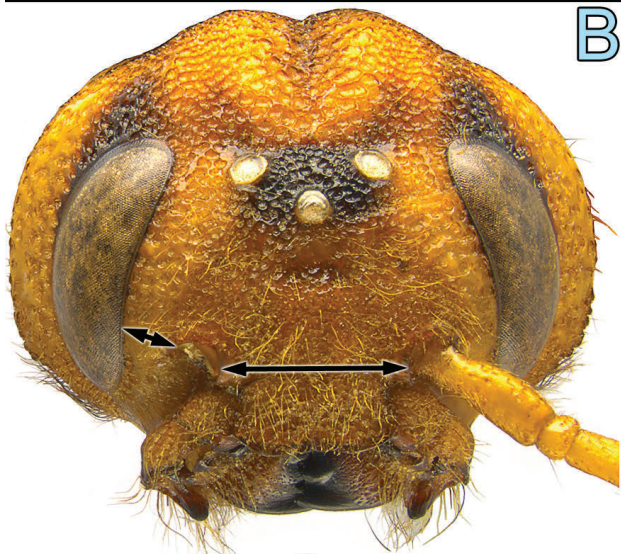
- D) Flagellum with 10 or 11 flagellomeres, and middle flagellomeres about 1.5 times as long as high in lateral view (Fig. B1.55).
**Sirotemex Smith, 1988**
 [Note. One species, *Sirotemex flammeus* Smith, from Mexico. Only males known.]
- a) Fore wing angularly rounded at apex (Fig. B1.50).
 b) Fore wing with cell 1Rs2 long (2r–m and 3r–m slightly or very clearly shorter than veins Rs2 and M above and below) (Fig. B1.52).
 c) Fore wing with cell 3R1 long (3.0–6.0 times as wide as long) (Fig. B1.54).
 d) Flagellum with 12 or more flagellomeres, and middle flagellomeres at least 2.0 times as long as high in lateral view (Figs. B1.56 & B1.57).
 **8**
- 8(7) A) Dark sections of body with dark blue or green metallic reflections (Figs. B1.58 & B1.60).
 B) Head entirely black with dark blue or green metallic reflections (Fig. B1.62), at most with dark brown on gena behind eye (Fig. B1.63).
 C) Fore wing with vein Cu1 complete or almost so (Fig. B1.66).
**Sirex Linnaeus, 1761**
 [Note. Twenty eight species known. Almost equally divided between the Palaearctic (15 species) and Nearctic (14 species) regions. One species, *S. noctilio*, introduced into temperate North America, South America, New Zealand, Australia and South Africa.]
- a) Dark sections of body without dark blue or green metallic reflections (Figs. B1.59 & B1.61).
 b) Head variably colored, but with at least a pale spot (white, light reddish brown or reddish brown) on gena behind eye in upper half (Figs. B1.64 & B1.65).
 c) Fore wing without vein Cu1, at most with a stump or very rarely complete on one wing only (Fig. B1.67).
 [Additional character. Female: cornus long and constricted in almost all species; rarely small and not constricted as in *Sirex longicauda*.]
 **9**
- 9(8) A) Gena densely pitted (Fig. B1.68).
 B) Fore wing vein 2r–m displaced apically and joined to cell 3M (Fig. B1.70).
 C) Pronotum with vertical surface mainly smooth, with pits medially and along dorsal margin (Fig. B1.72).
 D) Female: tergum 9 with median basin about as wide as long, and with short and slightly divergent ridge edges at base; cornus narrow (Fig. B1.74).
**Xoanon Semenov, 1921**
 [Note. Two species recorded from China, eastern Russia and Japan.]
- a) Gena with almost no pits (Fig. B1.69).
 b) Fore wing vein 2r–m more basal and joined to cell 2M (Fig. B1.71).
 c) Pronotum with vertical surface almost completely pitted (Fig. B1.73).
 d) Female: tergum 9 with median basin about 2.0 times as wide as long, and with long and very divergent ridge edges; cornus wide (Fig. B1.75).
**Urocerus Geoffroy, 1785**
 [Note. Thirty three known species. Most (28 species) restricted to Palaearctic region and few (7) in New World. Two of the New World species, *Urocerus gigas* and *U. sah*, introduced.]



B1.1: *T. columba* ♀



B1.2: *S. nitidus* ♀



B1.3: *T. columba* ♀



B1.4: *S. nitidus* ♀



dorsal view



dorsal view



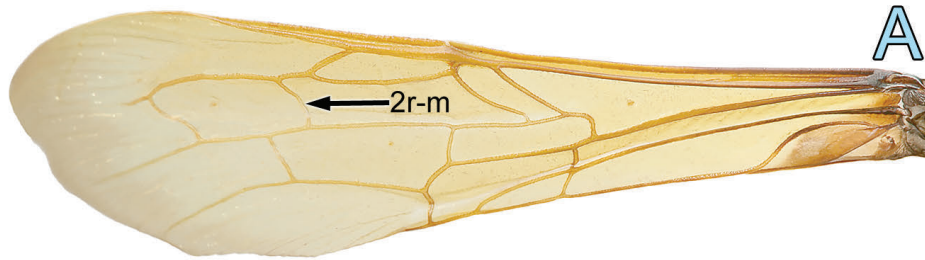
lateral view



lateral view

B1.5: *T. columba* ♀

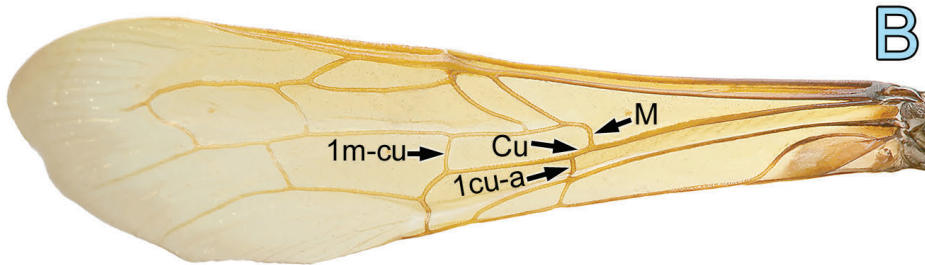
B1.6: *S. cyaneus* ♀



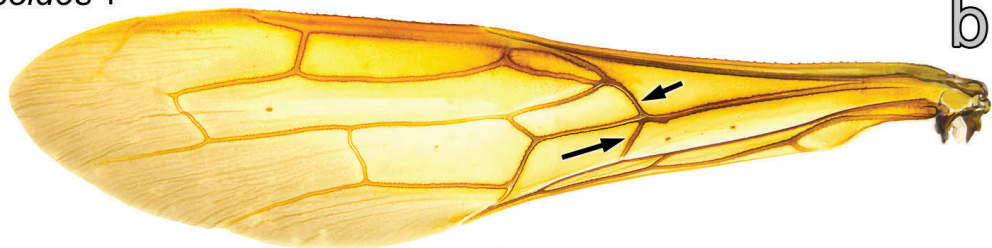
B1.7: *S. tremecoides* ♀



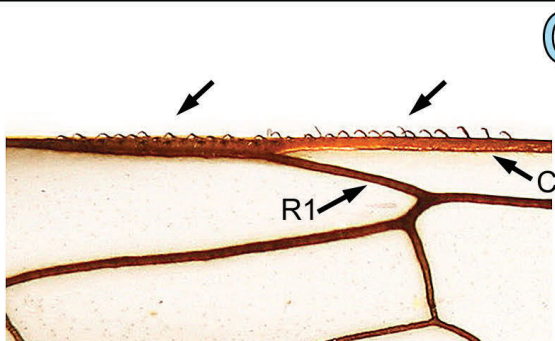
B1.8: *T. columba* ♀



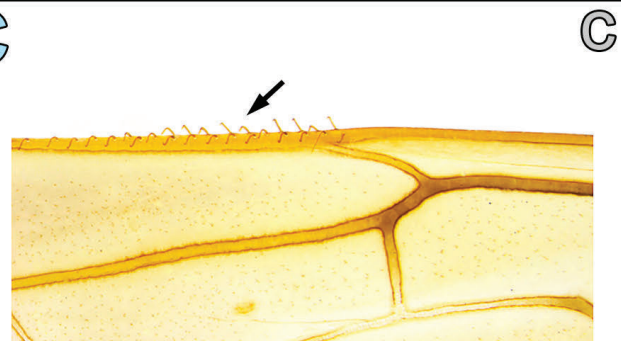
B1.9: *S. tremecoides* ♀



B1.10: *T. columba* ♀



B1.11: *S. nitidus* ♀



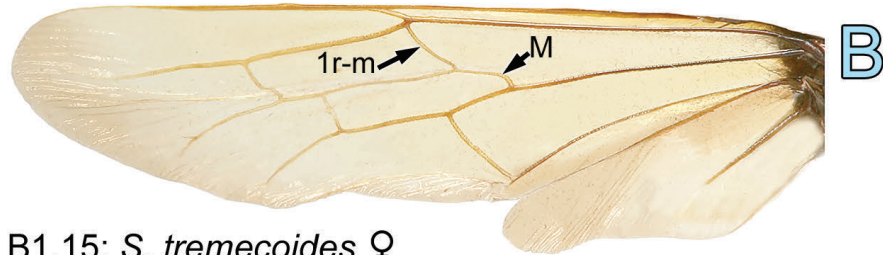
B1.12: *T. columba* ♀



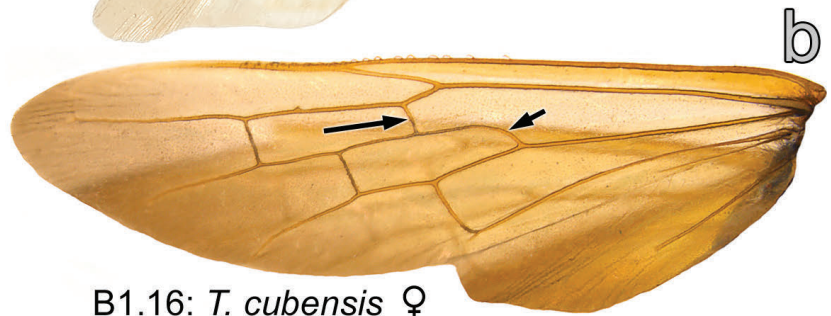
B1.13: *S. tremecoides* ♀



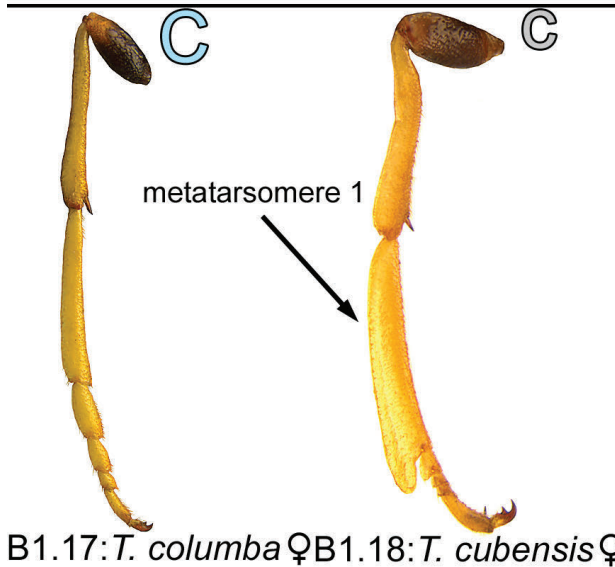
B1.14: *T. cubensis* ♀



B1.15: *S. tremecoides* ♀



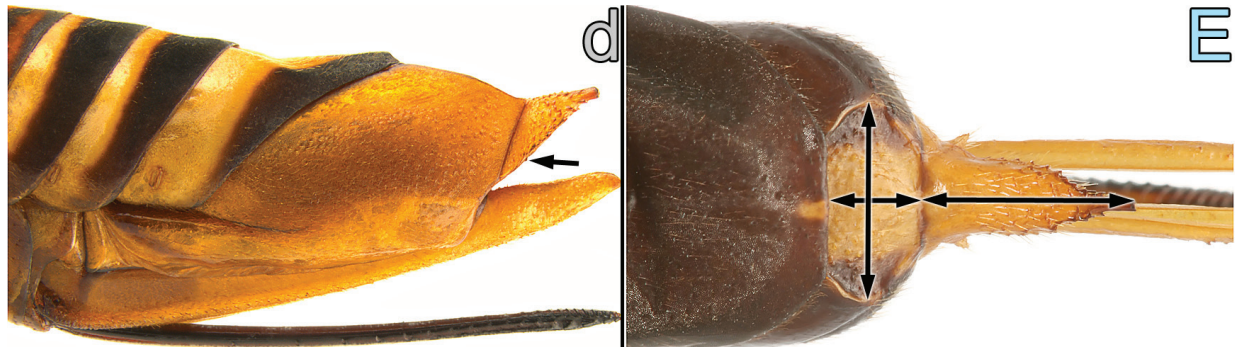
B1.16: *T. cubensis* ♀



B1.17: *T. columba* ♀ B1.18: *T. cubensis* ♀



B1.19: *S. tremecoides* ♀



B1.20: *T. cubensis* ♀

B1.21: *S. tremecoides* ♀



B1.22: *T. cubensis* ♀

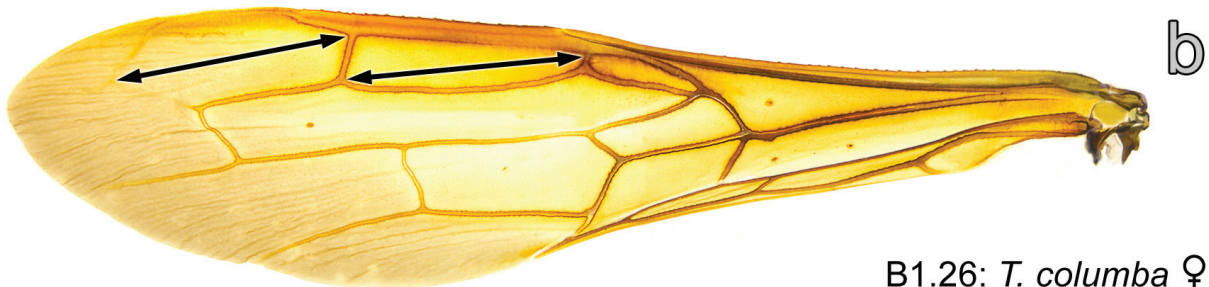
B1.23: *E. formosanus* ♀



B1.24: *T. columba* ♀



B1.25: *E. formosanus* ♀



B1.26: *T. columba* ♀



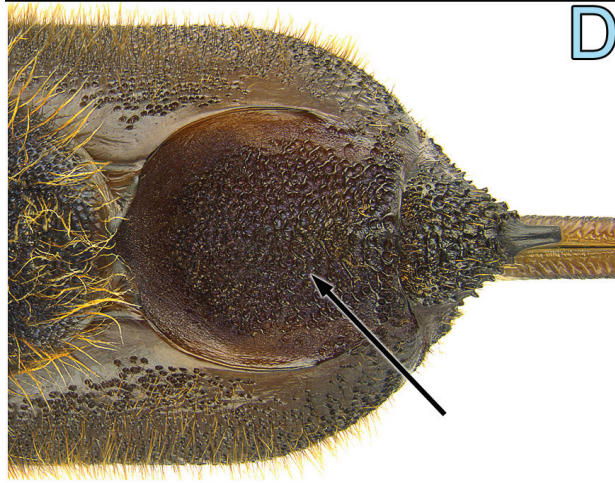
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B1.27: *E. formosanus* ♂



C

B1.28: *T. columba* ♂



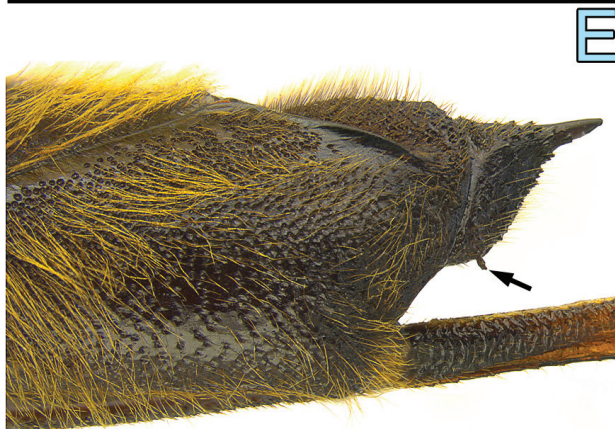
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B1.29: *E. formosanus* ♀



d

B1.30: *T. columba* ♀



E

B1.31: *E. formosanus* ♀



e

B1.32: *T. fuscicornis* ♀



B1.33: *A. hyalinatus* ♀



B1.34: *T. columba* ♀



B1.35: *A. hyalinatus* ♀



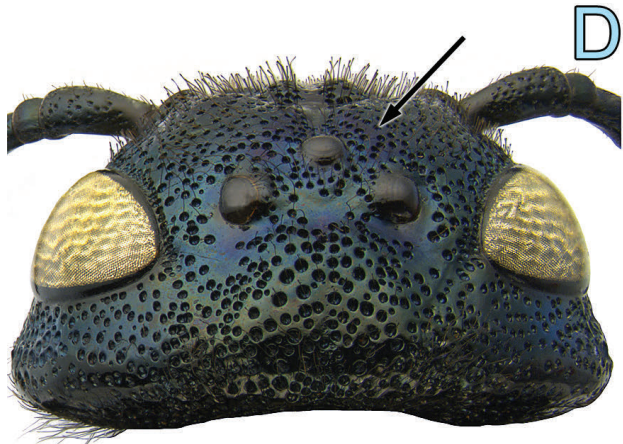
B1.36: *T. columba* ♀



B1.37: *A. hyalinatus* ♀



B1.38: *T. columba* ♀



B1.39: *A. hyalinatus* ♀



B1.40: *T. alchymista* ♀



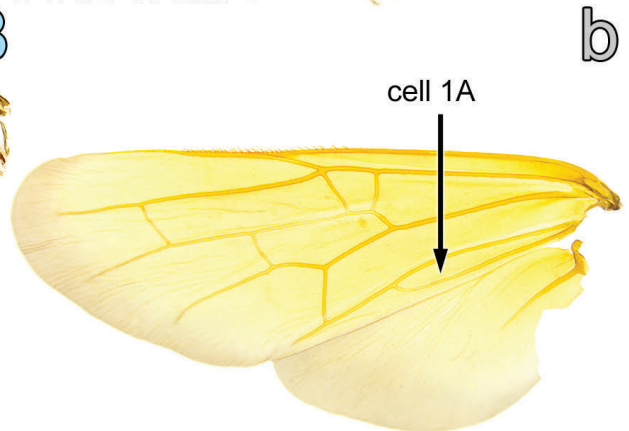
B1.41: *X. caudatus* ♀



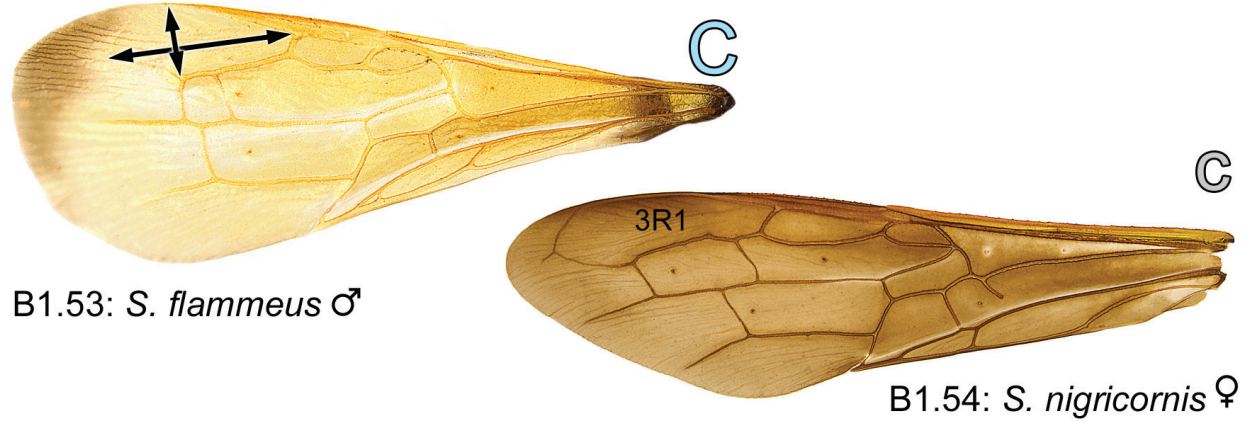
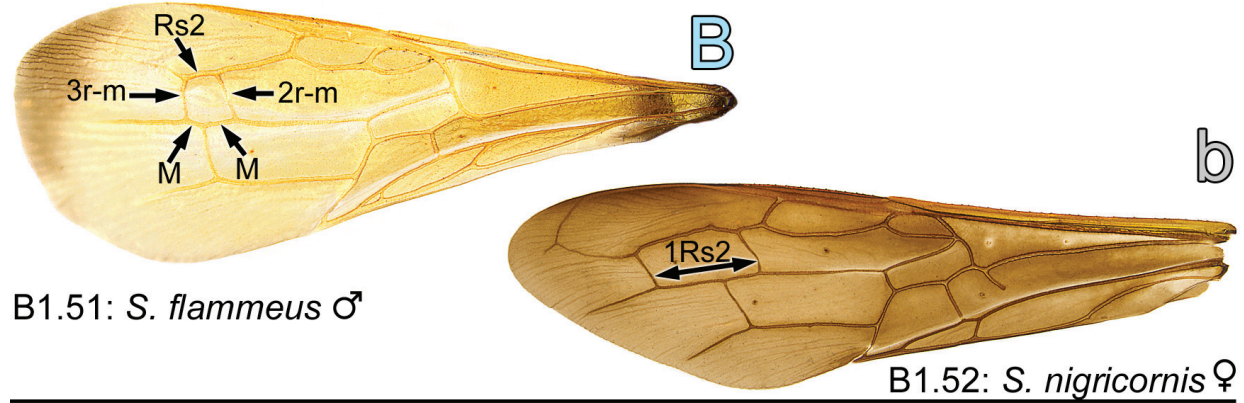
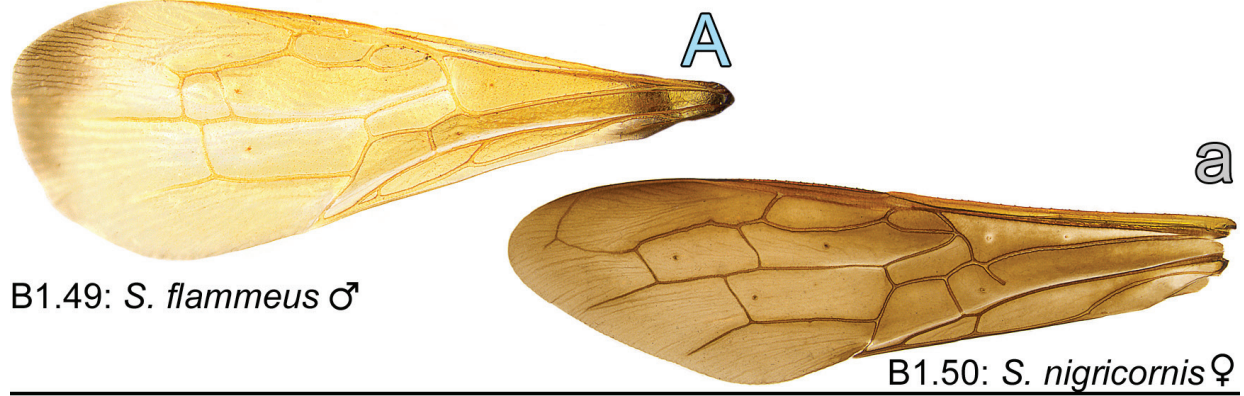
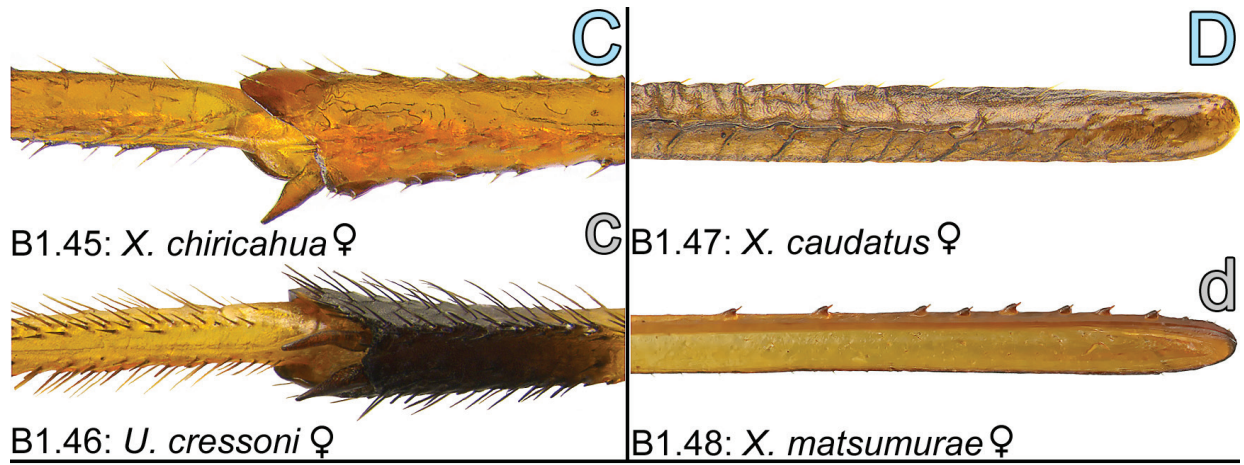
B1.42: *U. sah* ♂

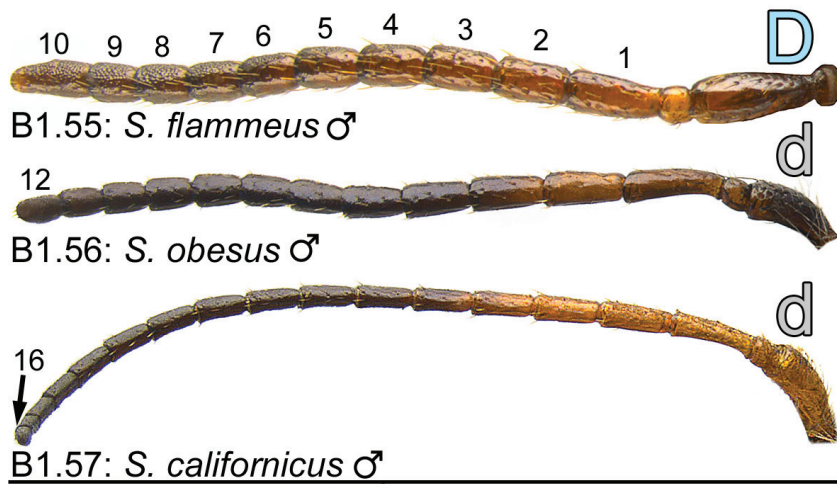


B1.43: *X. caudatus* ♀



B1.44: *U. californicus* ♀





B1.62: *S. nigricornis* ♀

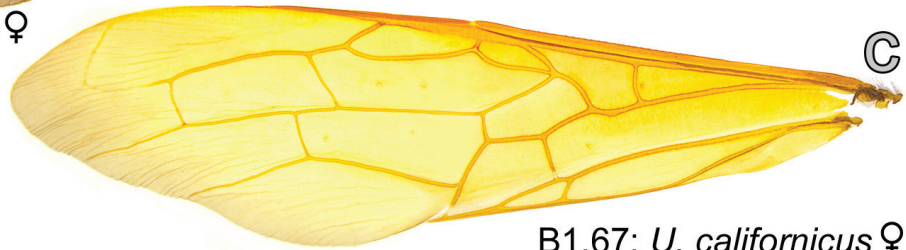
B1.63: *S. behrensii* ♀

B1.64: *U. cressoni* ♀

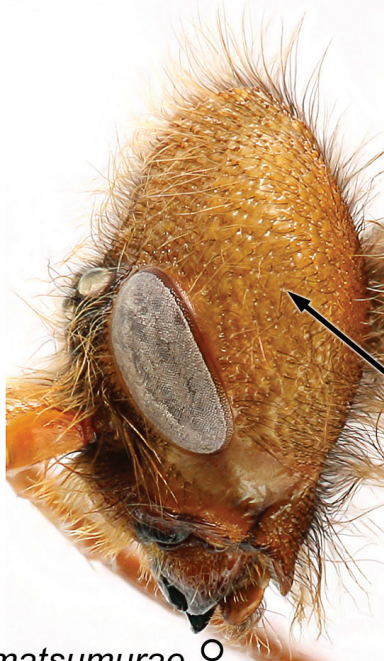
B1.65: *U. sah* ♂



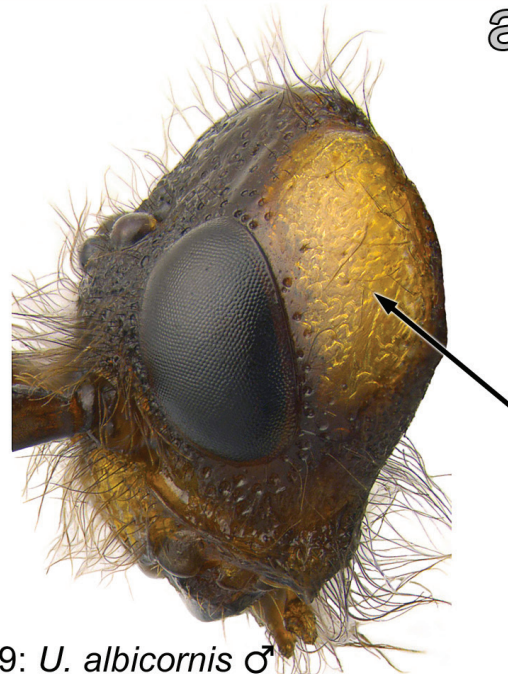
B1.66: *S. nigricornis* ♀



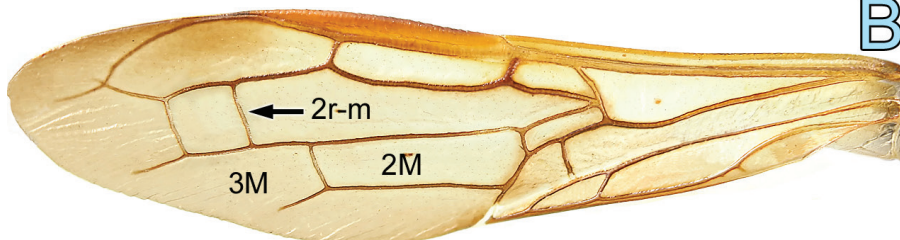
B1.67: *U. californicus* ♀



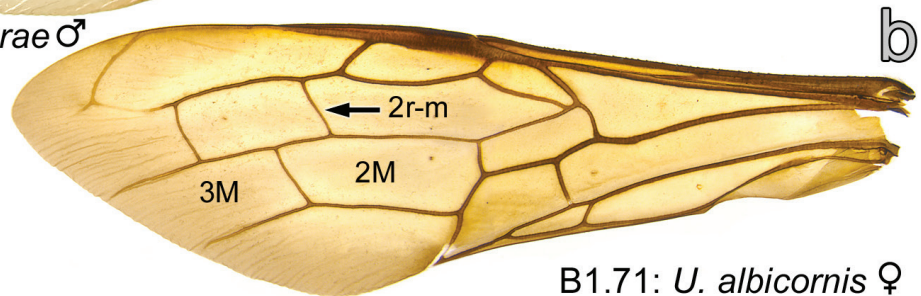
B1.68: *X. matsumurae* ♀



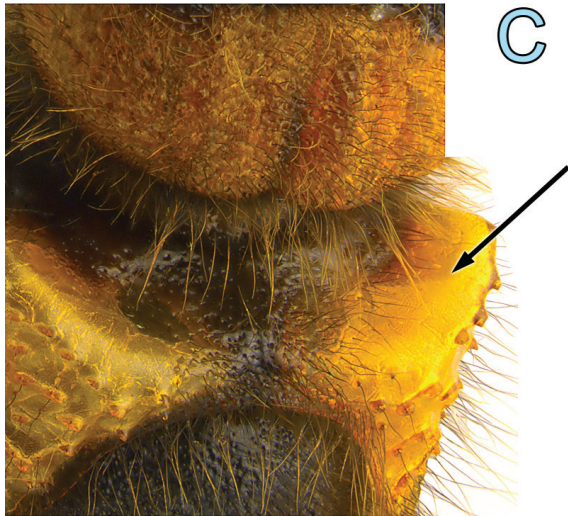
B1.69: *U. albicornis* ♂



B1.70: *X. matsumurae* ♂



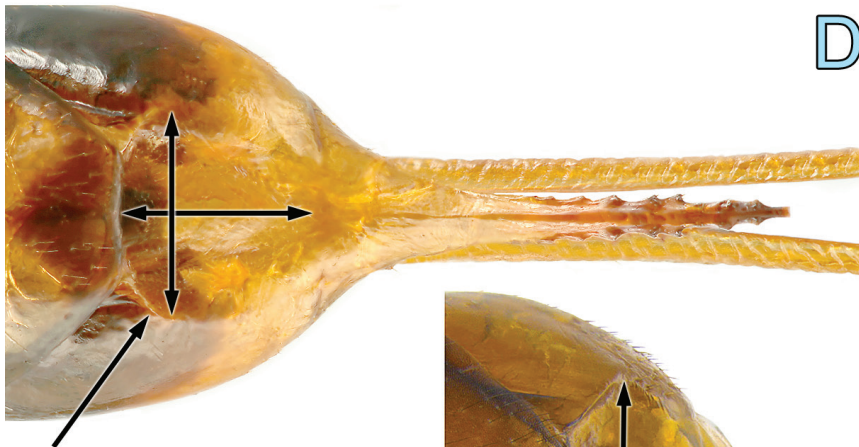
B1.71: *U. albicornis* ♀



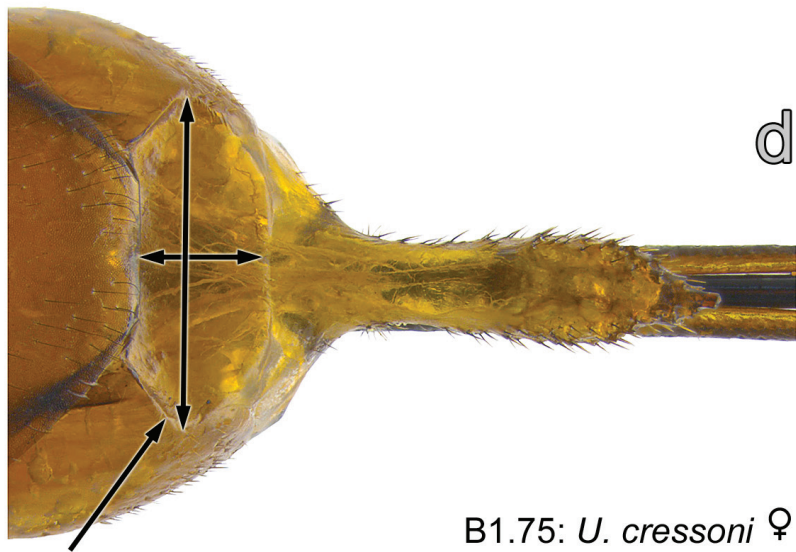
B1.72: *X. matsumurae* ♂



B1.73: *U. sah* ♀



B1.74: *X. matsumurae* ♀



B1.75: *U. cressoni* ♀

2. Key to New World Species of *Sirex*

Females

- 1 A) Metafemur black (Fig. B2.1) 2
- a) Metafemur light reddish brown (Fig. B2.2) [Doubtful specimens from Alaska and Yukon key out through both parts of the couplet.] 10
- 2(1) A) Metatarsomere 2 4–5 times as long as high (Fig. B2.3).
 B) Sheath with basal section relative to apical section less than 0.8 (Fig. B2.5).
 C) Ovipositor with more than 38 annuli.
 [Additional character: Fore wing vein 3A clearly present.] 3
- a) Metatarsomere 2, 1.5–3.5 times as long as high (Fig. B2.4).
 b) Sheath with basal section relative to apical section greater than 0.9 (Fig. B2.6).
 c) Ovipositor with fewer than 37 (usually 29–31) annuli. 4
- 3(2) A) Tibiae and tarsi reddish brown (Fig. B2.7).
 B) Ovipositor with 13–18 annuli outlined by annulus line only (Fig. B2.11) followed more distally by 23–28 annuli with pits before teeth annuli (Fig. B2.9); 10–15 annuli (anterior to teeth annuli at apex of ovipositor) each with a ridge extending from pit to ventral margin (Fig. 2.9).
 C) Sheath with basal section relative to apical section less than 0.53 (**if between** 0.53 and 0.61, use only A and B) (See Fig. B2.5 for measurements). *Sirex longicauda* Middlekauff, 1948
- a) Tibiae and tarsi dark brown or black (Fig. B2.8).
 b) Ovipositor with all annuli before apical teeth annuli with pits (Fig. B2.12); 5–7 annuli (anterior to teeth annuli at apex of ovipositor) each with a ridge from pit to ventral margin (Fig. B2.10).
 c) Sheath with basal section relative to apical section greater than 0.61 (**if between** 0.53 and 0.61, use only a and b) (See Fig. B2.5 for measurements). *Sirex areolatus* (Cresson, 1868)
- 4(2) A) Abdomen mostly reddish brown **and** abdominal segment 10 entirely light reddish brown (Fig. B2.13).
 B) Gena behind eye with a weakly outlined ridge (rounded and not sharp) (Fig. B2.16).
 C) Ovipositor pits (if necessary, remove apical section of sheath to see pits) 0.2 times as long as a annulus near middle or aligned with base of apical section of sheath (Fig. B2.18), **and** tibiae black and tarsi reddish brown.
 [Additional character: Fore wing vein 3A present and extended along posterior wing margin. Ovipositor with very small pits at base. *Sirex behrensii* (Cresson, 1880)
- a) Abdomen black (Fig. B2.14), **or** mostly reddish brown **and** abdominal segment 10 with cornus black at least apically (Fig. B2.15).
 b) Gena behind eye without ridge (Fig. B2.17).
 c) Ovipositor pits (if necessary, remove apical section of sheath to see pits) 0.12 times as long as a annulus (Figs. B2.20 & B2.21), or 0.3–0.7 times as long as an annulus near middle or aligned with base of apical section of sheath (Fig. B2.19), or if as C then tibiae light reddish brown. 5

- 5(4) A) Metatarsomere 2 with tarsal pad slightly shorter than ventral length of tarsomere (Fig. B2.22).
 B) Ovipositor without pits in basal 0.4–0.5 or pits very small at base (Fig. B2.24).
 C) Tibiae and tarsi light reddish brown (Fig. B2.26) **and** abdomen black with dark blue metallic reflections (Fig. B2.29), **or** tibiae and tarsi completely black (one specimen from Alaska).
 D) Specimen from Alaska, Yukon, north of central Alberta and probably northernmost British Columbia
[Additional character: Head dorsally with diameter of pits 0.15–0.25 that of lateral ocellus.]
 14
- a) Metatarsomere 2 with tarsal pad about half as long as ventral length of tarsomere (Fig. B2.23).
 b) Ovipositor with medium to large pits on all annuli before teeth annuli (Fig. B2.25).
 c) Tibiae and tarsi black (Fig. B2.27), **or** light reddish brown (Fig. B2.28) **and** most of abdomen reddish brown (Fig. B2.30).
 d) Specimen clearly south or east of region described in D.
 6
- 6(5) A) Fore wing darkly tinted (Fig. B2.31a) or clear with darkly tinted bands near middle and apex (Fig. B2.31b).
 7
- a) Fore wing clear and slightly yellow tinted (Fig. B2.32).
 9
- 7(6) A) Gena in lateral view (Fig. B2.33) and in dorsal view (Fig. B2.35) with most pits relatively larger and 0–1 diameters apart (only a few pits farther apart).
 B) Ovipositor pits near base (e.g., annuli 3–5) as long as pits of middle annuli or pits aligned with base of apical sheath section (0.3 or more than 0.37 times as long as annulus) (Fig. B2.37).
 8
- a) Gena in lateral view (Fig. B2.34) and in dorsal view (Fig. B2.36) with most pits relatively smaller and 1–3 diameters apart (rarely, pits touching).
 b) Ovipositor pits near base (e.g., annuli 3–5) shorter (about 0.25 as long as annulus) than pits of middle annuli or pits aligned with base of apical sheath section (about 0.3 times as long as annulus) (Fig. B2.38).
 ***Sirex californicus* (Ashmead), 1904**
 [Note. Adults of this species exist in two color forms. The dark-legged form keys out here. The pale-legged form keys out in couplet 13.]
- 8(7) A) Metatarsomere 2 in lateral view about 1.5 times as long as high (Fig. B2.39), and ventral tarsal pad about 0.5–0.7 times as long as tarsomere.
 B) Mesoscutum with discal pits usually without tooth-like processes except at middle; some processes fused laterally into irregular transverse ridges (Fig. B2.41).
 C) Abdomen black.
 D) Ovipositor with pits near middle or pits aligned with base of apical section of sheath (if necessary, remove apical section of sheath to see pits) about as long as high and small, their length 0.3 as long as annulus (Fig. B2.43).
 ***Sirex obesus* Bradley, 1913**
- a) Metatarsomere 2 in lateral view 2.0–2.5 times as long as high (Fig. B2.40), and ventral pad 0.3–0.5 times as long as tarsomere.
 b) Mesoscutum with most discal pits with tooth-like processes; most processes fused in many directions forming a net-like pattern (Fig. B2.42).
 c) Abdomen black **or** mainly reddish brown.
 d) Ovipositor with pits near middle or pits aligned with base of apical section of sheath (if necessary, remove apical section of sheath to see pits) 1.4–1.8 times as long as high and their length 0.37–0.45 as long as annulus (Fig. B2.44).
 ***Sirex nigricornis* Fabricius, 1781**

- 9(6) A) Femora brown.
- B) Mesoscutum with most discal pits with processes; processes usually fused in many directions forming a net-like pattern (Fig. B2.45).
- C) Fore wing without vein 3A (Fig. B2.47).
- D) Ovipositor with pits (if necessary, remove apical section of sheath to see pits) near middle or aligned with base of apical section of sheath about 3.0 times as long as wide, their anterior end long and furrow-like (Fig. B2.49).
- E) Ovipositor thin and long: annulus length divided by ovipositor diameter at annulus between pits 1 and 2 = 1.9–2.4, and between pits 12 and 13 = 1.5–2.1 (Fig. B2.51).
-*Sirex xerophilus* Schiff, n. sp.
- a) Femora black though sometimes dark brown dorsally.
- b) Mesoscutum with most discal pits usually mainly round with tooth behind large pits; some processes fused laterally into irregular transverse ridges (Fig. B2.46).
- c) Fore wing with vein 3A (Fig. B2.48).
- d) Ovipositor with pits (if necessary, remove apical section of sheath to see pits) near middle or pits aligned with base of apical section of sheath 1.2–1.3 times as long as wide, their anterior end not extended as narrow furrow (Fig. B2.50).
- e) Ovipositor thick and short: annulus length divided by ovipositor diameter at annulus between pits 1 and 2 = 1.3, and between pits 12 and 13 = 1.0 (Fig. B2.52).
-*Sirex mexicanus* Smith, n. sp.
- 10(1) A) Abdomen posterior to segment 2 or 3 almost completely reddish brown (Fig. B2.53).
- B) Gena (Fig. B2.55) and vertex (Fig. B2.57) with pits large (diameter 0.3–0.4 times that of lateral ocellus) and dense (on gena and vertex pits 0.0–0.5 pit diameter apart).
- C) Metatarsomere 2 1.7 times as long as high (Fig. B2.59).
- [Additional characters. Metatarsomere 2 in ventral view with tarsal pad 0.9 times as long as tarsomere. Sheath with apical section clearly shorter than basal section, their junction aligned between 15th and 16th annuli of ovipositor. Cornus in dorsal view short and clearly angular.]
-*Sirex hispaniola* Goulet, n. sp.
- a) Abdomen black with dark blue metallic reflections (Fig. B2.54).
- b) Gena (Fig. B2.56) and vertex (Fig. B2.58) with pits smaller (diameter 0.1–0.25 that of lateral ocellus) and scattered (on gena pits 4–10 pit diameters apart, and on vertex 2.0–8 pit diameters apart).
- c) Metatarsomere 2 2.0–3.6 times as long as high (Fig. B2.60).
-11
- 11(10) A) Head posterodorsally with setae each with or without small pit at base (Fig. B2.61).
- B) Mesoscutum with most discal pits mainly round with tooth behind larger pits, giving a rasp-like pattern; few processes fused laterally into irregular transverse ridges (Figs. B2.63 & B2.64).
- C) Metatarsomere 2 with tarsal pad 0.3–0.4 times as long as tarsomere (Fig. B2.66).
- D) Ovipositor pits (if necessary, remove apical section of sheath to see pits) near middle or pits aligned with base of apical section of sheath at least 0.5 as long as annulus length (Fig. B2.68).
- [Additional character. Metatarsomere 5 black or dark brown.]
-*Sirex noctilio* Fabricius, 1793
- a) Head posterodorsally with setae with large, clearly outline pit at base (Fig. B2.62).
- b) Mesoscutum with most discal pits with processes; processes usually fused in many directions forming a net-like pattern (Fig. B2.65).
- c) Metatarsomere 2 with tarsal pad 0.4–0.5 or 0.8 times as long as tarsomere (Fig. B2.67).
- d) Ovipositor pits (if necessary, remove apical section of sheath to see pits) near middle or pits aligned with base of apical section of sheath 0.1–0.4 times as long as annulus (Figs. B2.69–B2.71).
- 12

12(11) A) Tibiae light reddish brown and their dorsal surface almost always with dark blue with metallic reflections (Fig. B2.72).

[**Additional characters:** Ovipositor pits near middle or aligned with base of apical section of sheath (if necessary, remove apical section of sheath to see pits) 1.5–2.0 times as long as wide and 0.3–0.4 times as long as length of annulus (Fig. B2.71). Fore wing clear, faintly yellow tinted, and without dark bands at middle and apex.]

.....*Sirex varipes* Walker, 1866

– a) Tibiae completely light reddish brown (Fig. B2.73).
..... **13**

13(12) A) Fore wing clear with dark bands at center and apex or completely darkly tinted (Fig. B2.74).
B) Metarsomere 5 completely black (Fig. B2.76).
C) Metatarsomere 2 with tarsal pad about 0.5 times as long as ventral length of tarsomere (Fig. B2.78).
D) Ovipositor pits near middle portion or pits aligned with base of apical section of sheath 1.5–2.0 times as long as wide and 0.3–0.4 as long as annulus length (Fig. B2.80).

.....*Sirex californicus* (Ashmead, 1904)

[**Note.** This species has two color forms: the pale legged form keys out here, and the dark-legged form in couplet 7.]

– a) Fore wing clear, faintly yellow tinted, and with at most a dark band at apex (Fig. B2.75).
b) Metarsomere 5 entirely light reddish brown or almost black in apical half (Fig. B2.77).
c) Metatarsomere 2 with tarsal pad about 0.8 times as long as ventral length of tarsomere (Fig. B2.79).
d) Ovipositor either without pits in basal 0.4–0.5, **or** pits present, almost as long as wide, and at most 0.25 times as long as annulus length (Figs. B2.81 & B2.82).
..... **14**

14(13) A) Ovipositor pits near middle or pits aligned with base of apical section of sheath 0.15–0.25 as long as annulus and present even on annulus 2 but much smaller than pits at middle; ovipositor annulus lines clearly outlined in basal 0.3–0.4 (Fig. B2.83).

[**Additional character.** Lancet with length of annulus 10 1.27–1.85 times as long as width of ovipositor at this annulus.]

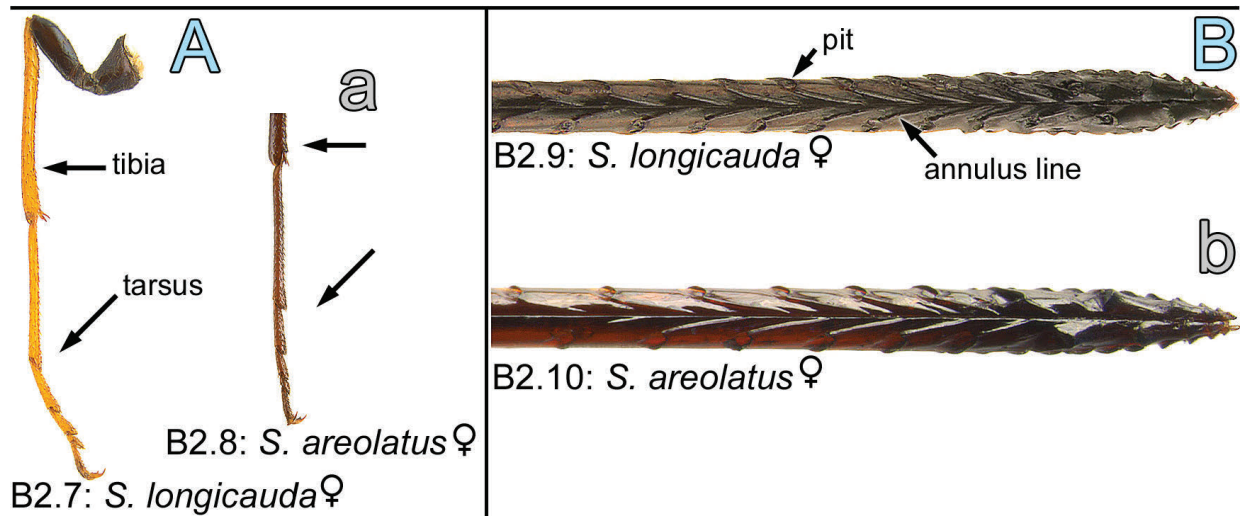
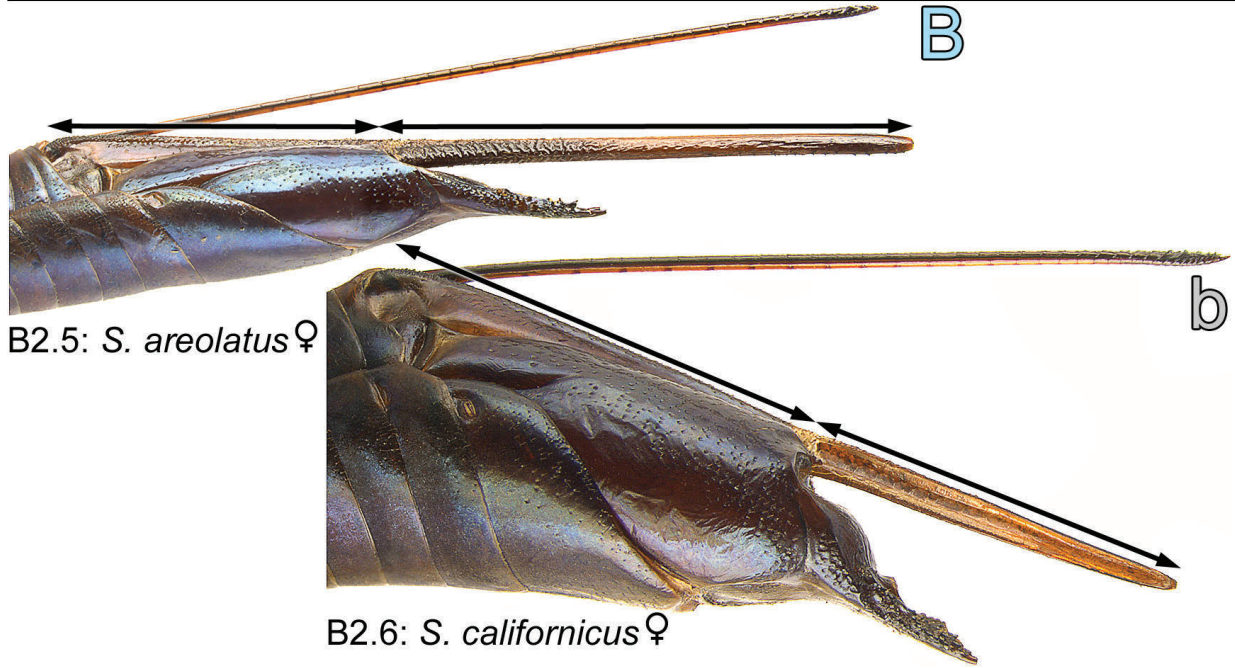
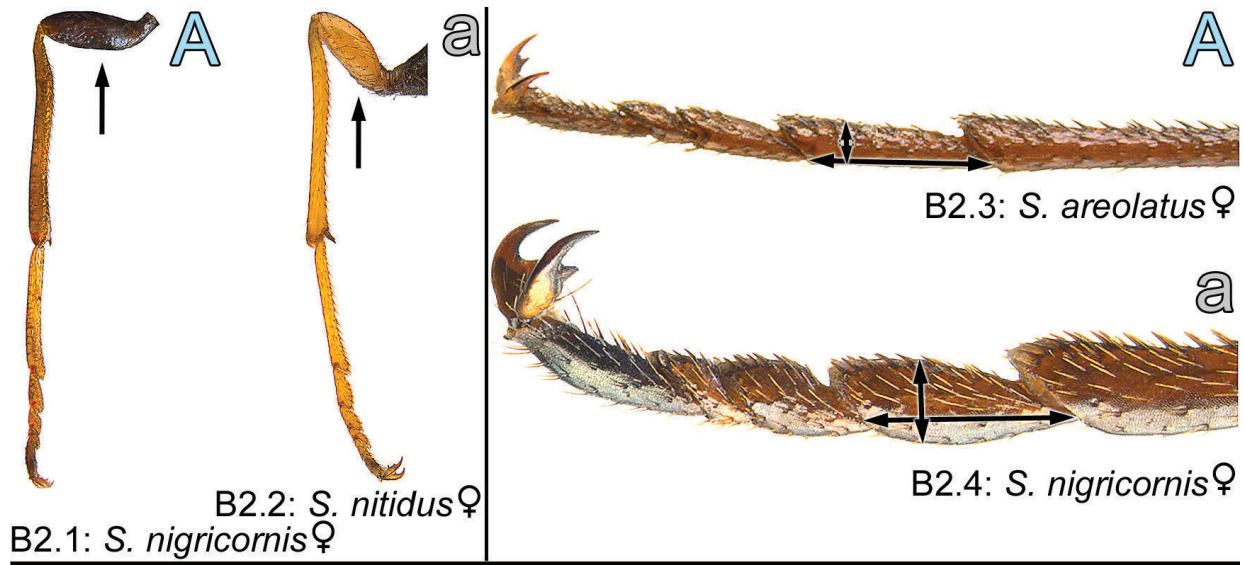
.....*Sirex nitidus* (T. W. Harris, 1841)

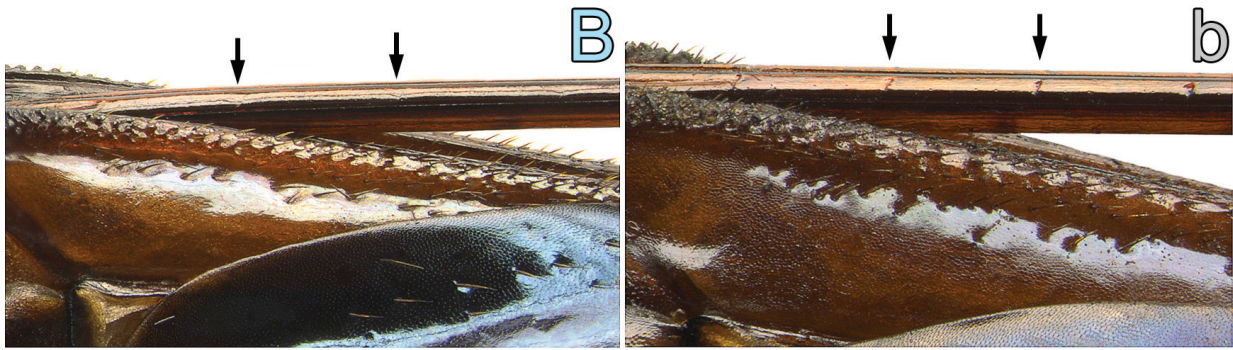
– a) Ovipositor pits near middle portion or pits aligned with base of apical section of sheath 0.0–0.14 times as long as annulus and pits absent in basal 0.4–0.5 of ovipositor; ovipositor annulus lines in basal 0.3 weakly outlined near dorsal edge or not outlined at all (Fig. B2.84).
..... **15**

15(14) A) Sheath with basal section relative to apical section less than 0.87 (**if between** 0.87–1.0, use only B and C).
B) Lancet with length of annulus 10 greater than 1.82 times as long as width of ovipositor at this annulus (**if between** 1.76–1.82, use A and C) [based on 26 specimens, we found no values below 1.85] (Fig. B2.85).
C) Cornus usually long (about 2.0 times as long as wide) and broad in basal half (Fig. B2.87).

.....*Sirex abietinus* Goulet, n. sp.

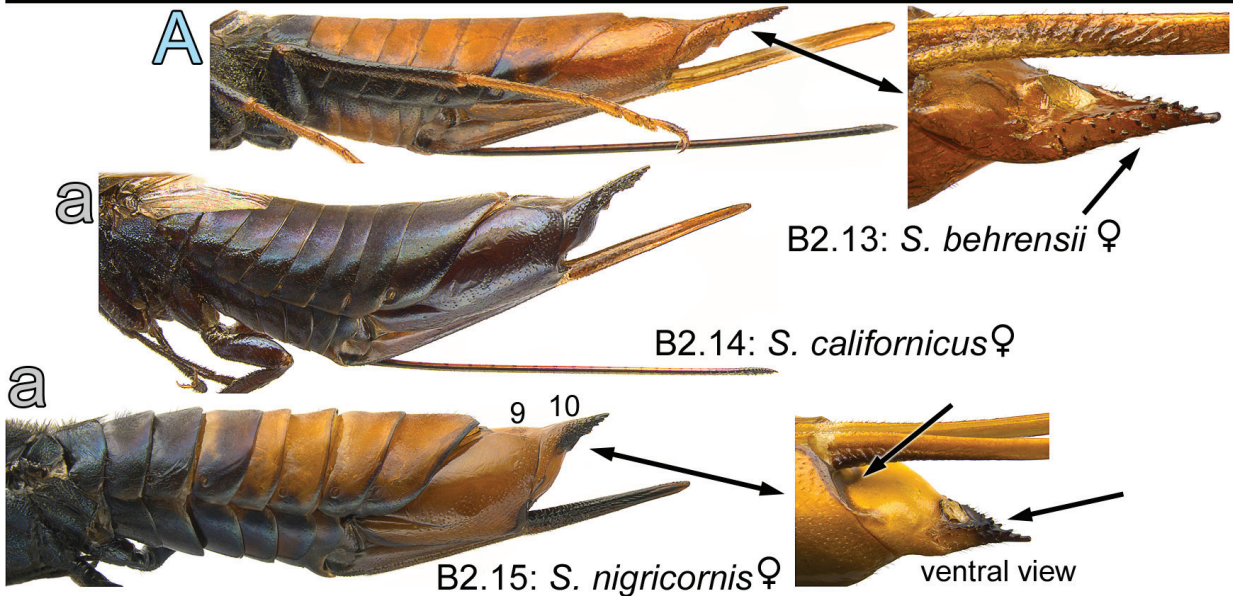
– a) Sheath with basal section relative to apical section greater than 1.0 (**if between** 0.87–1.0, use b and c).
b) Lancet with length of annulus 10 less than 1.76 times as long as width of ovipositor at this annulus (**if between** 1.76–1.82, use a and c) [based on 40 specimens, we found no values below 1.77] (Fig. B2.86).
c) Cornus usually short (about 1.5 times as long as wide) and narrow in basal half (Fig. B2.88).
.....*Sirex cyaneus* Fabricius, 1781





B2.11: *S. longicauda* ♀

B2.12: *S. areolatus* ♀



B2.13: *S. behrensii* ♀

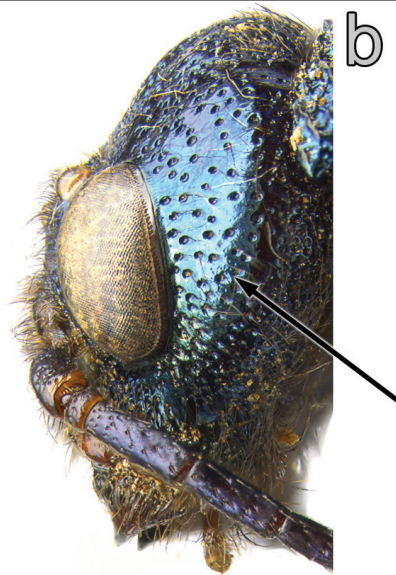
B2.14: *S. californicus* ♀

B2.15: *S. nigricornis* ♀

ventral view



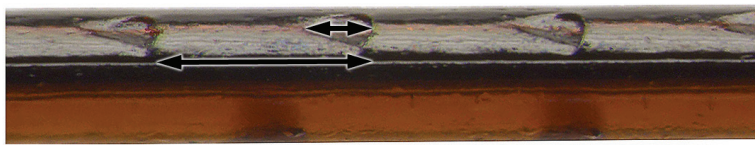
B2.16: *S. behrensii* ♀



B2.17: *S. californicus* ♀



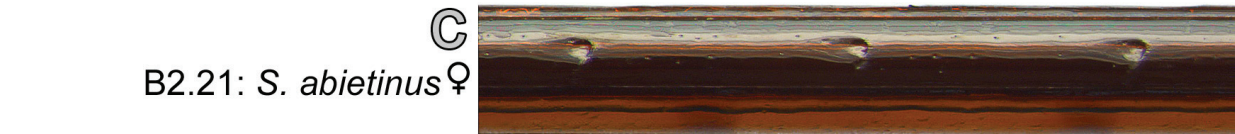
B2.18: *S. behrensii* ♀



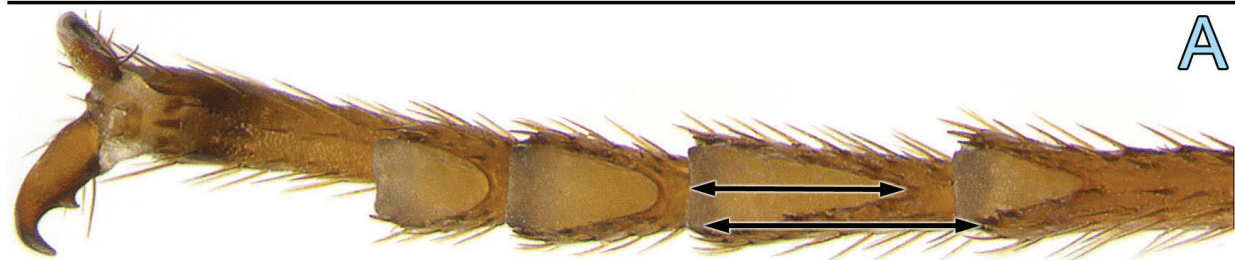
B2.19: *S. californicus* ♀



B2.20: *S. cyaneus* ♀



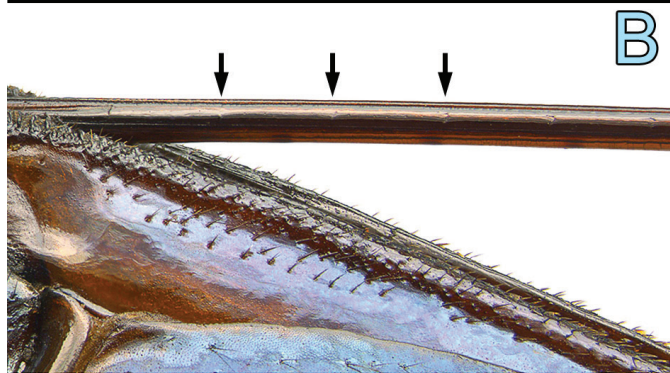
B2.21: *S. abietinus* ♀



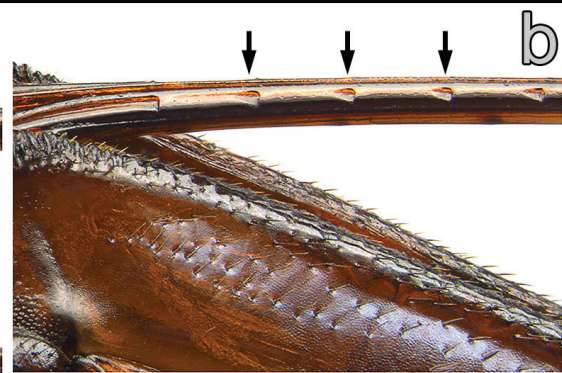
B2.22: *S. nitidus* ♀



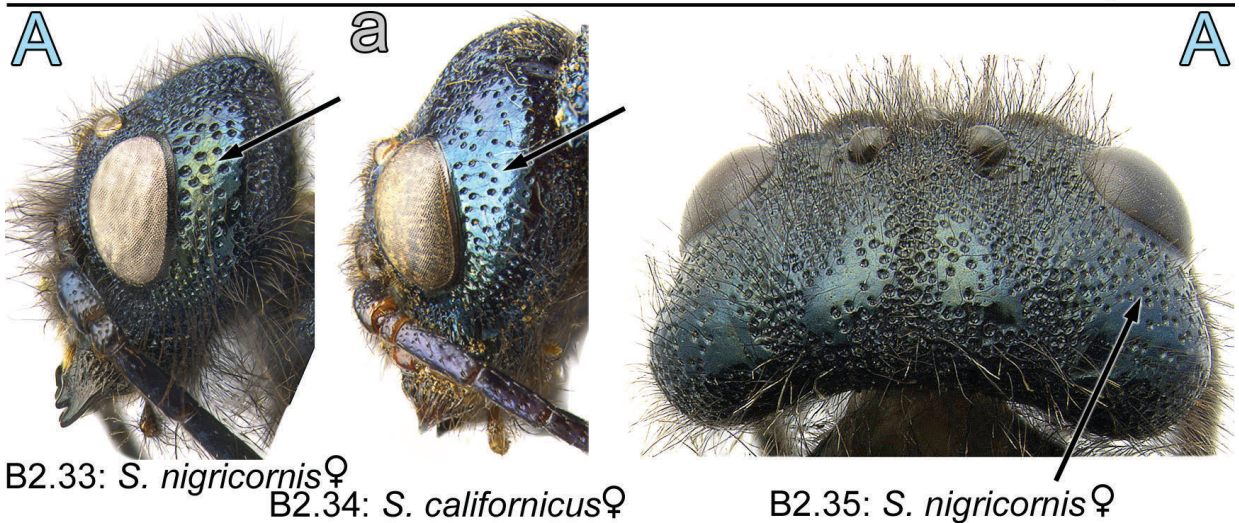
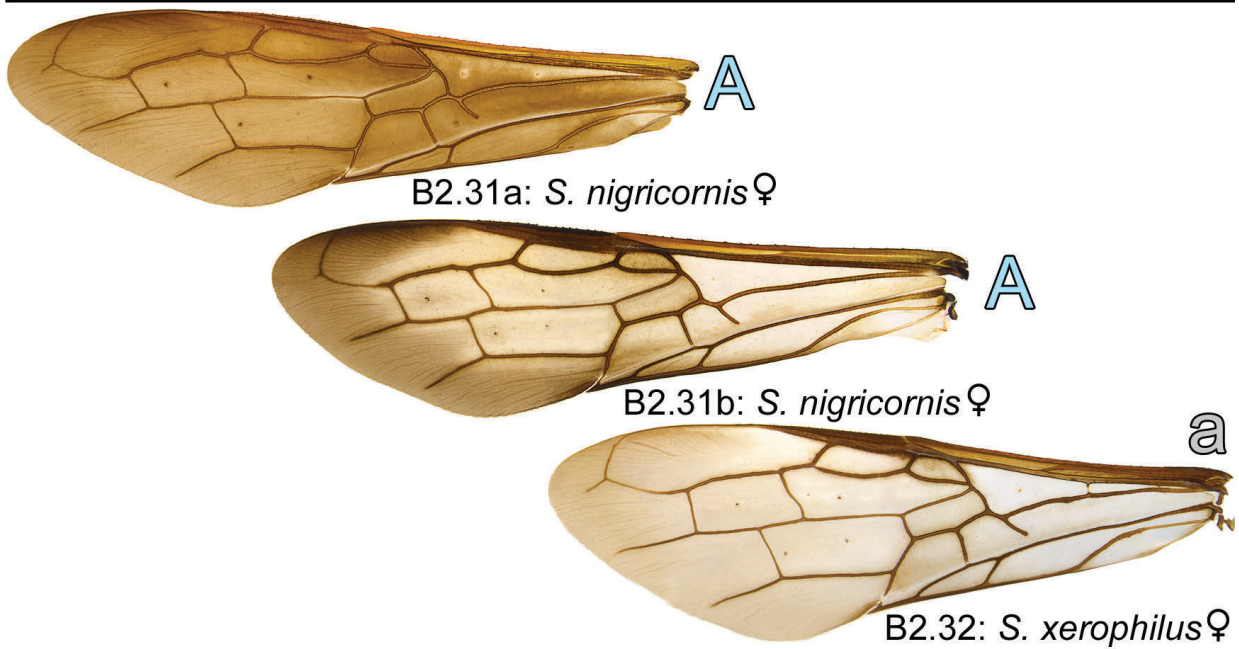
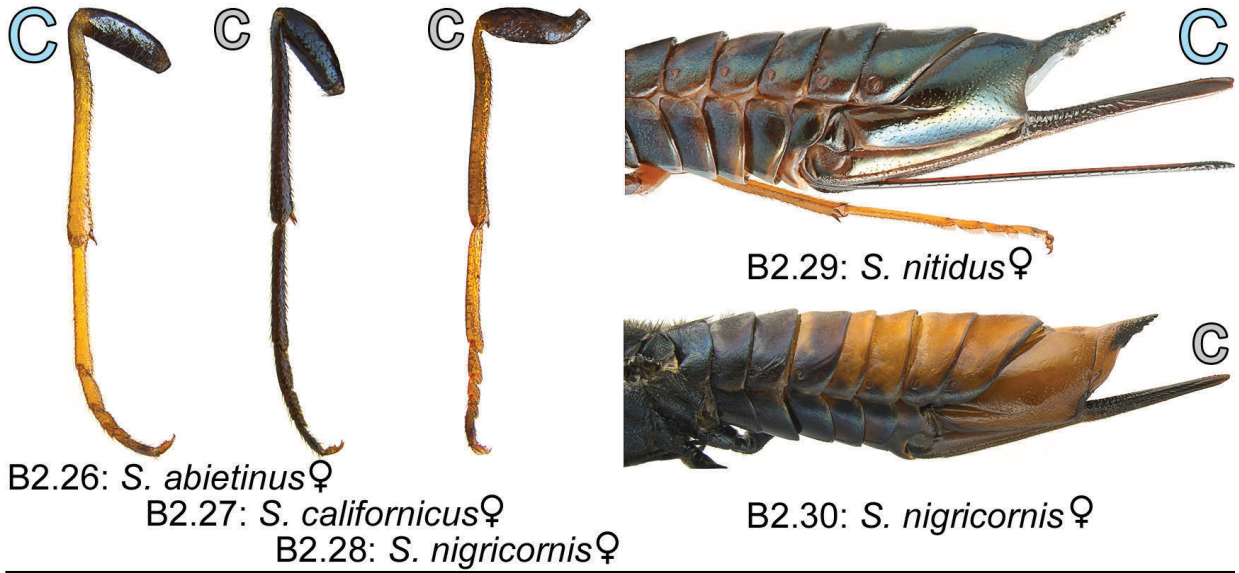
B2.23: *S. noctilio* ♀

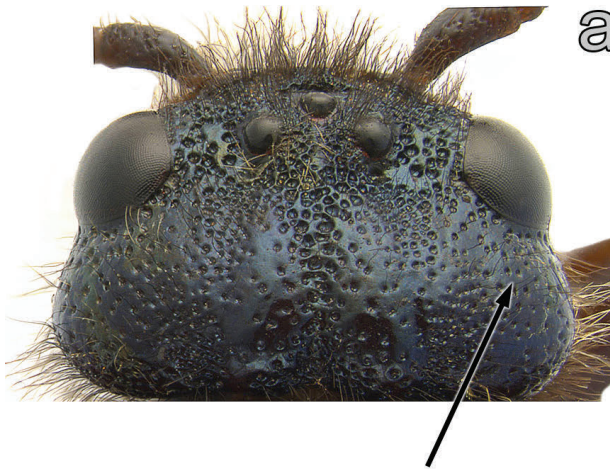


B2.24: *S. abietinus* ♀

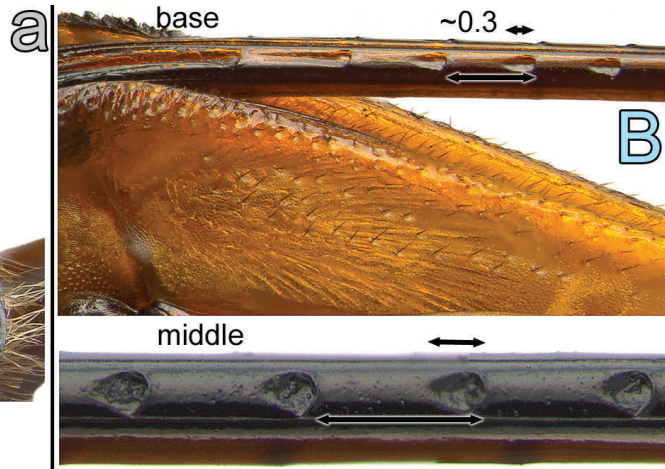


B2.25: *S. californicus* ♀

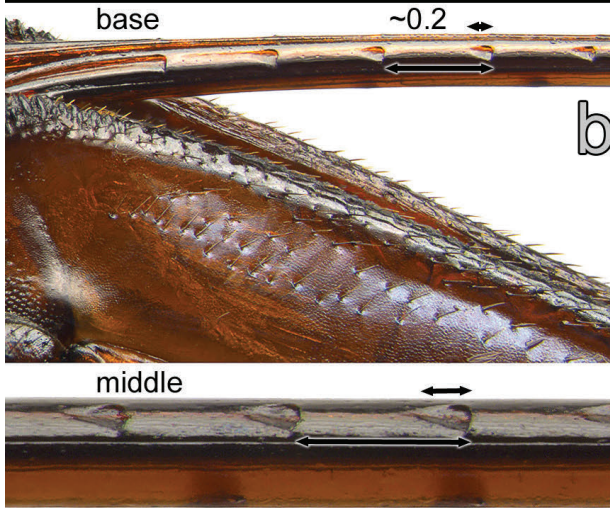




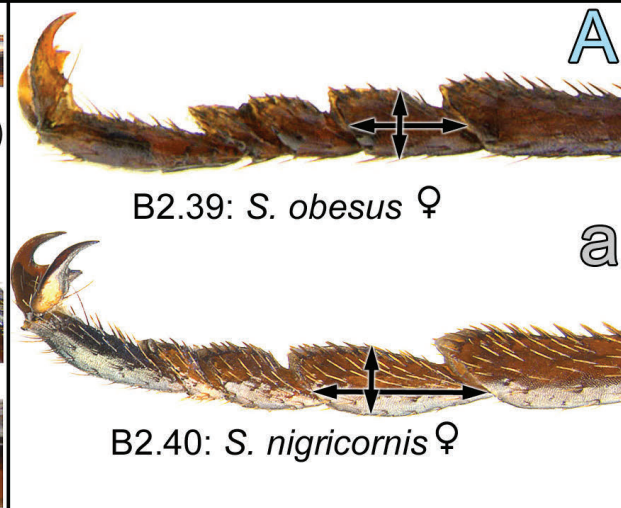
B2.36: *S. californicus* ♀



B2.37: *S. nigricornis* ♀

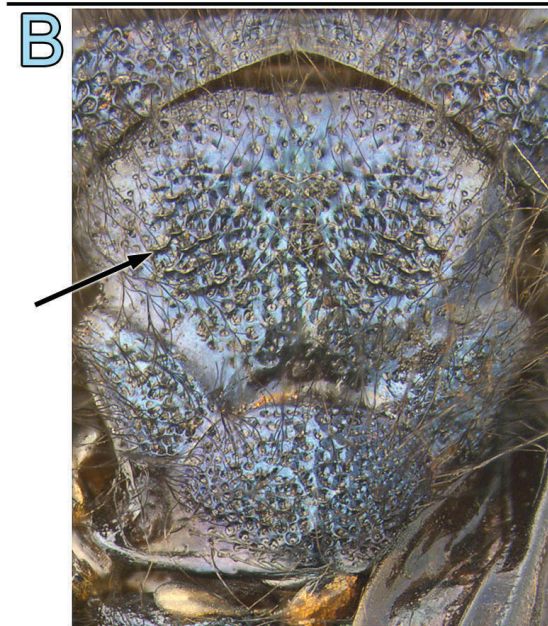


B2.38: *S. californicus* ♀

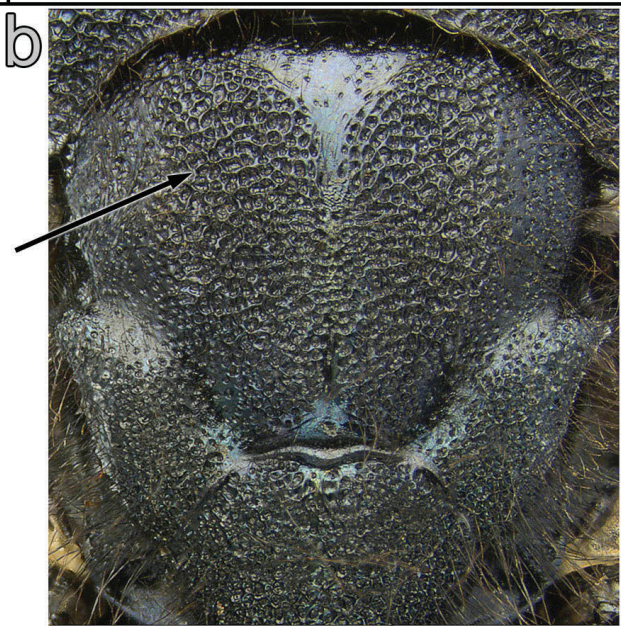


B2.39: *S. obesus* ♀

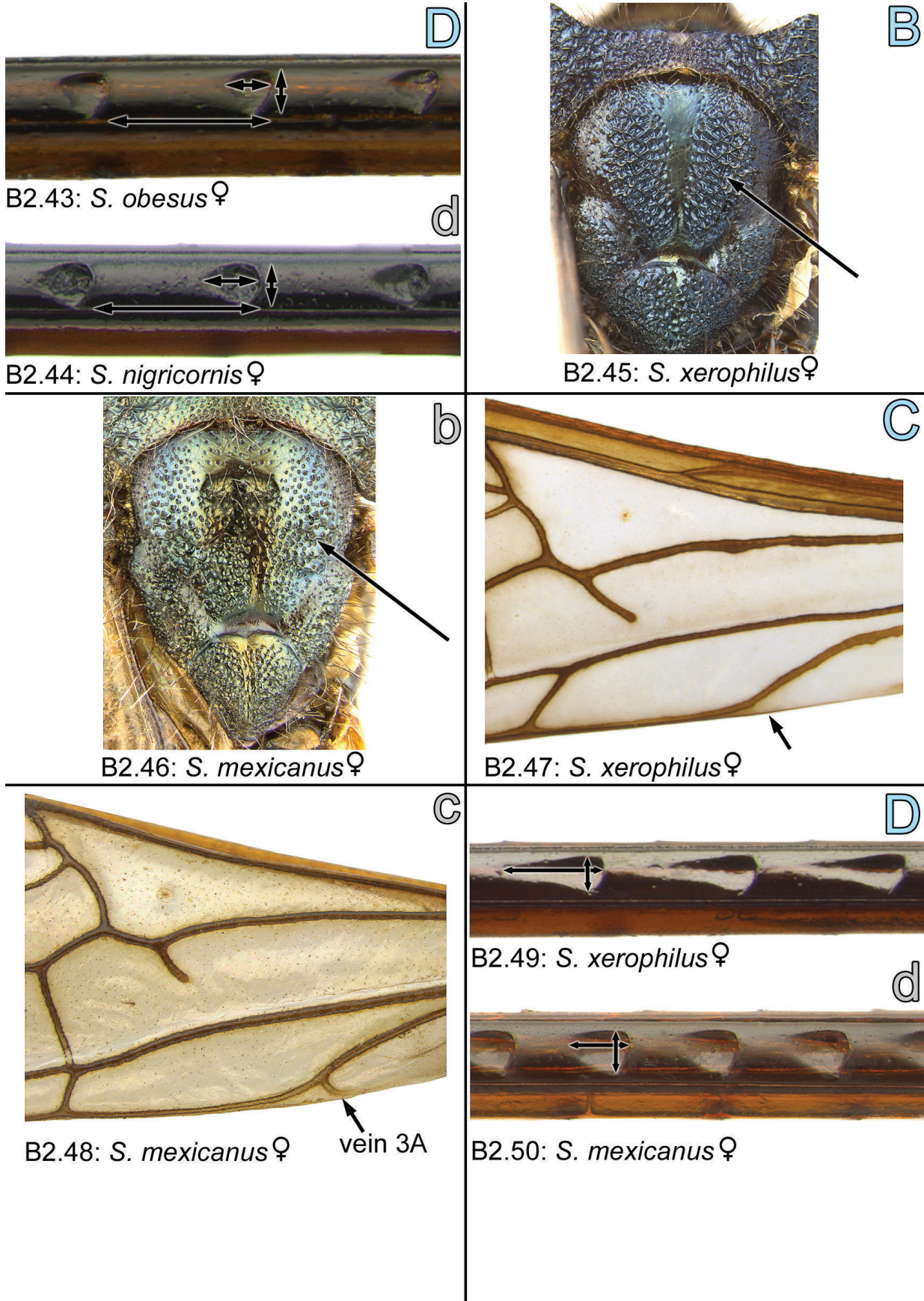
B2.40: *S. nigricornis* ♀

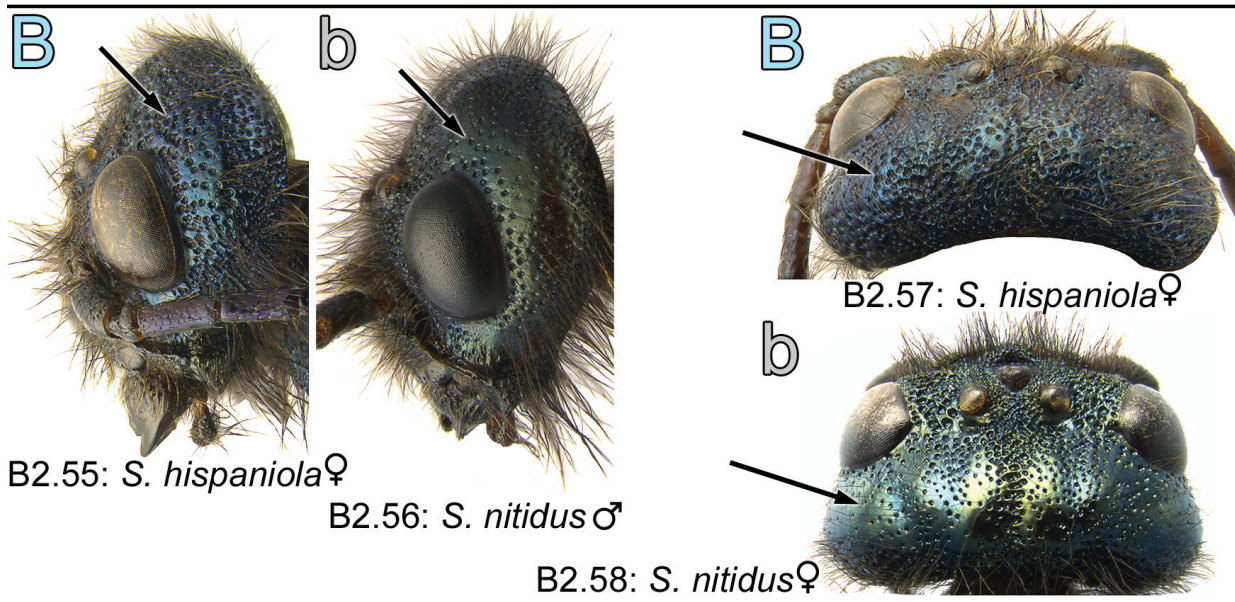
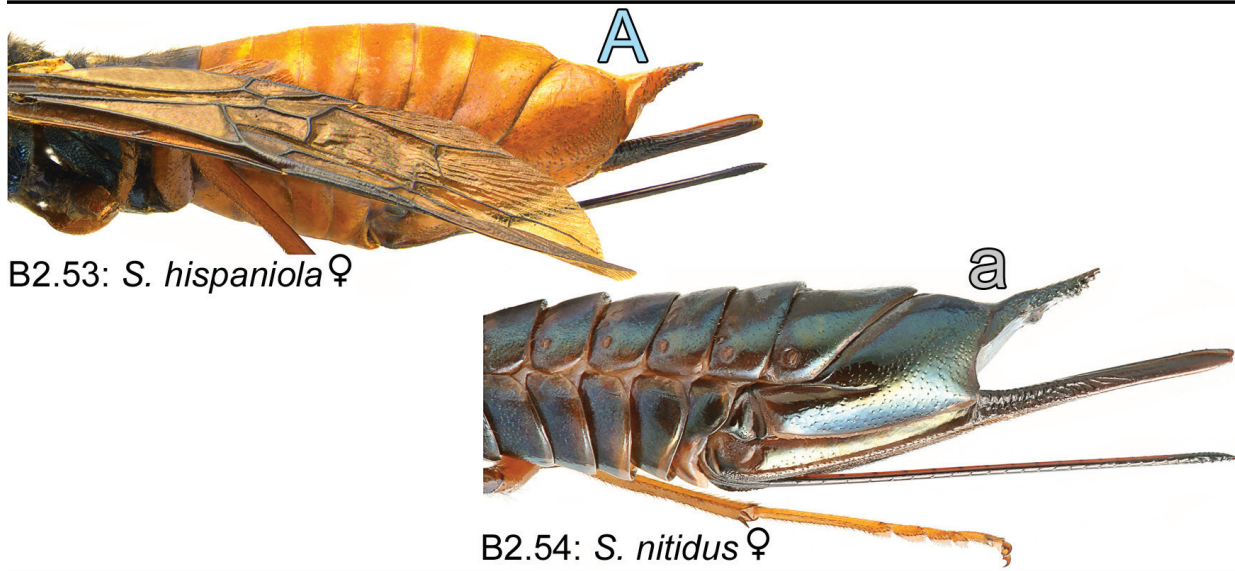
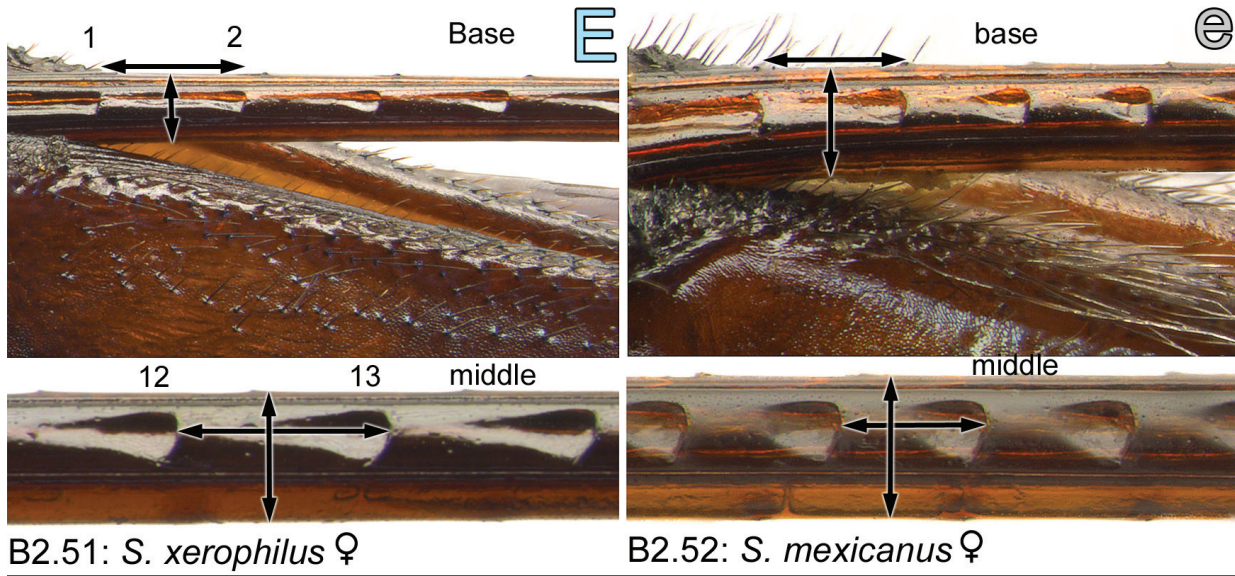


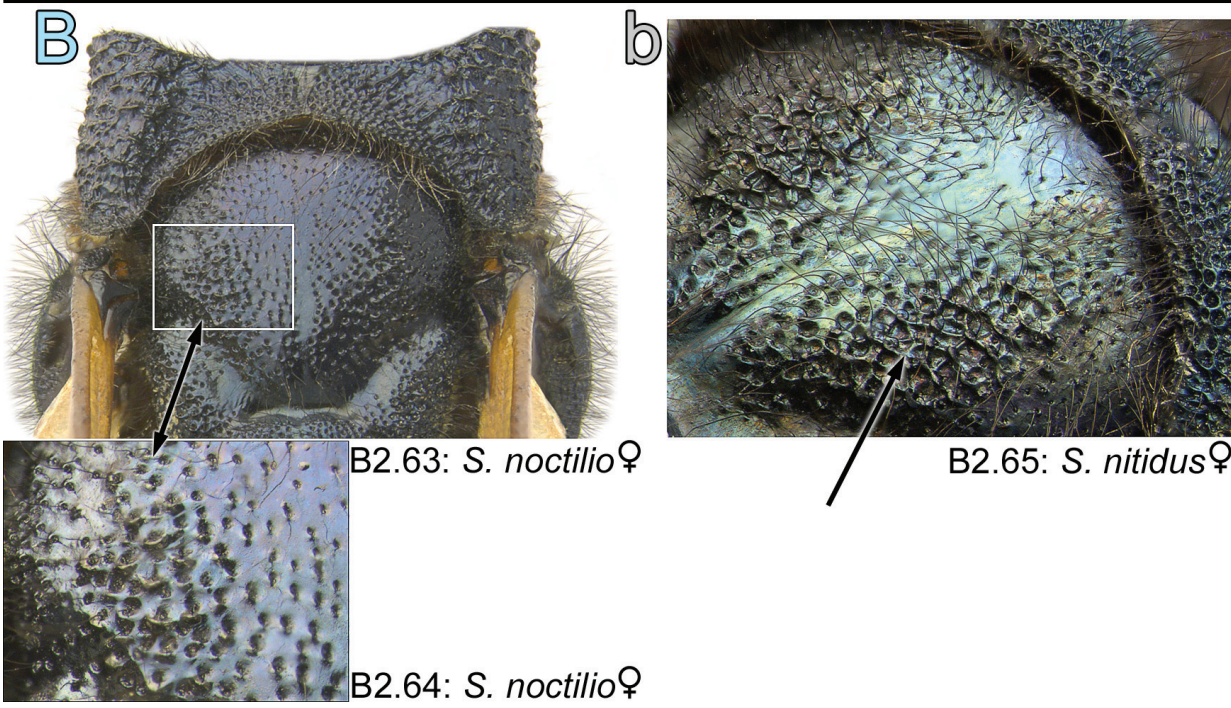
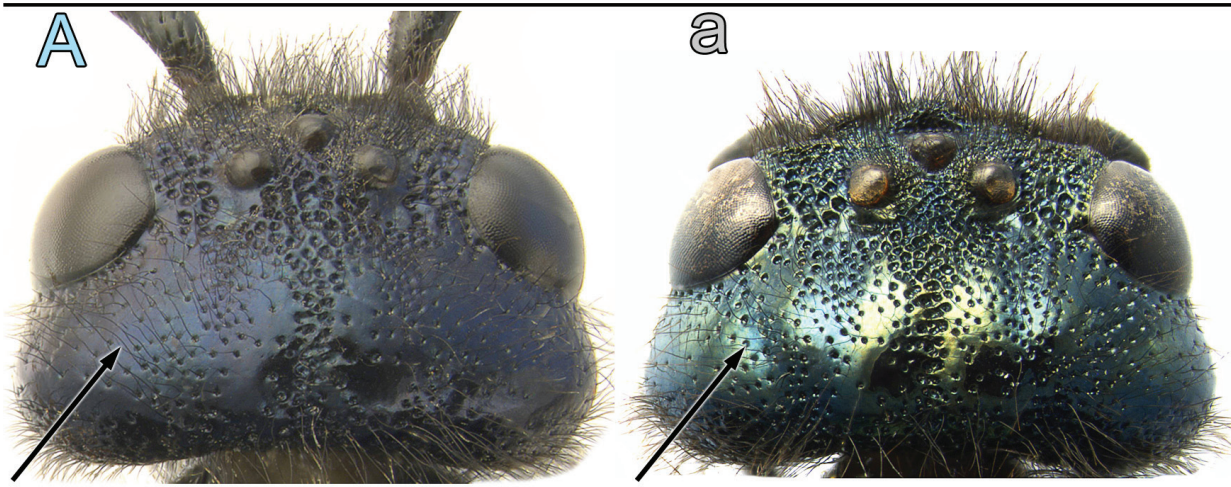
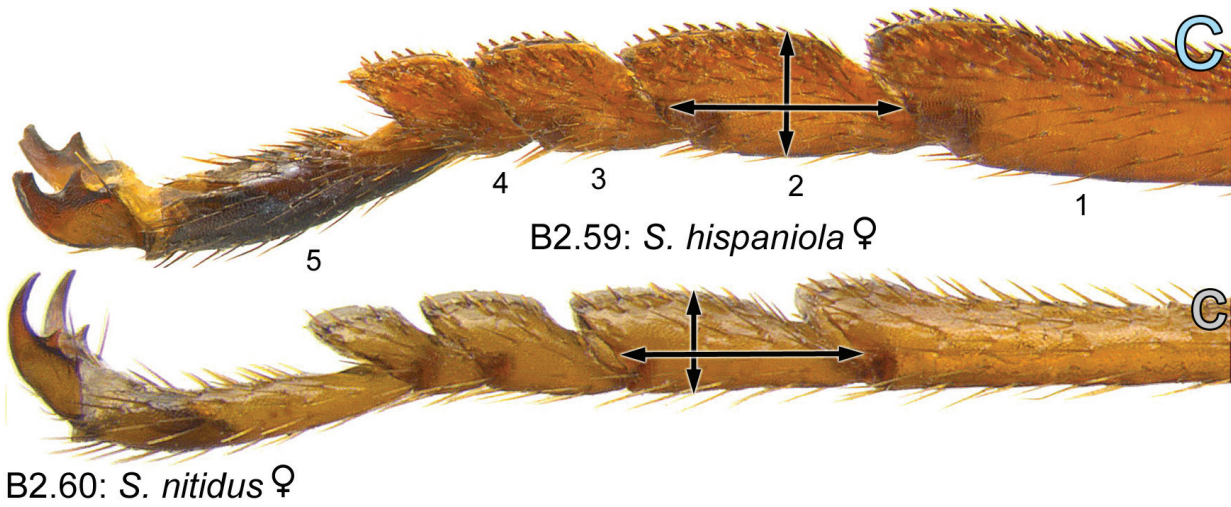
B2.41: *S. obesus* ♀

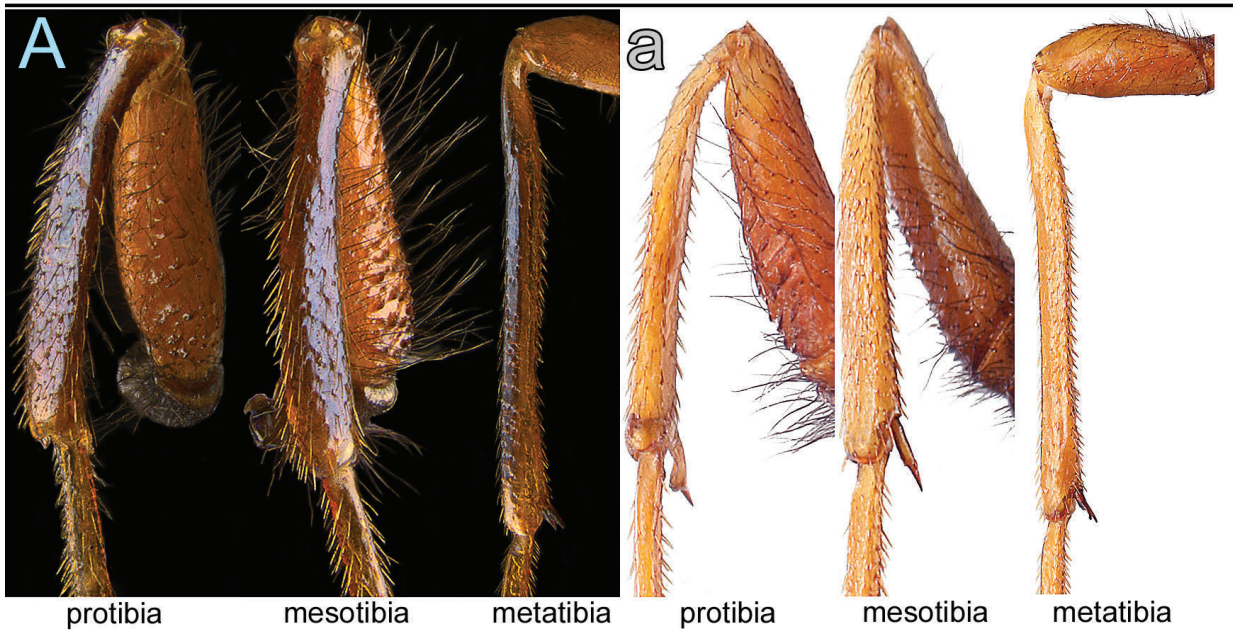
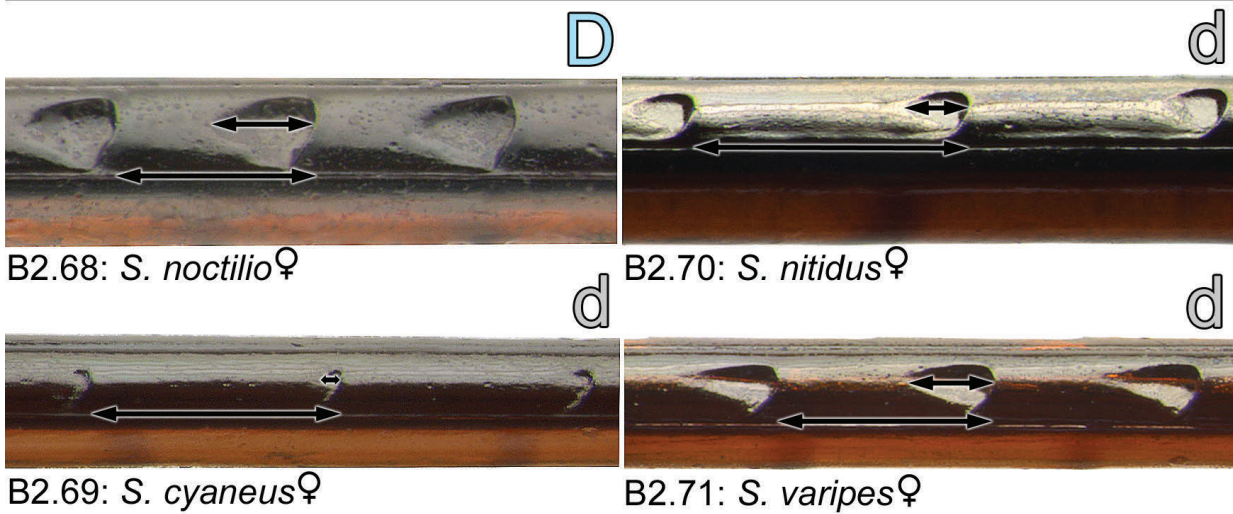
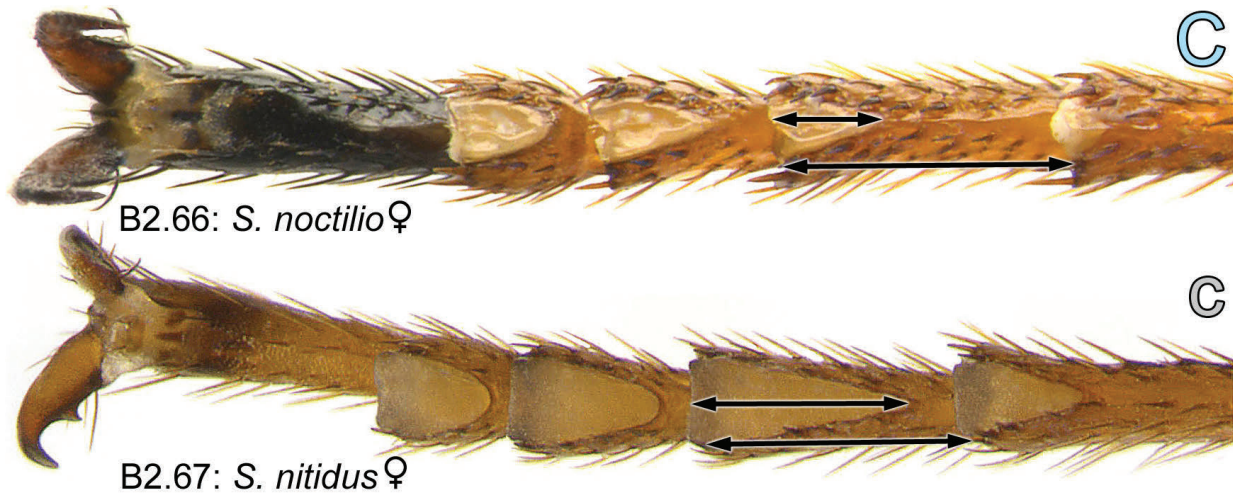


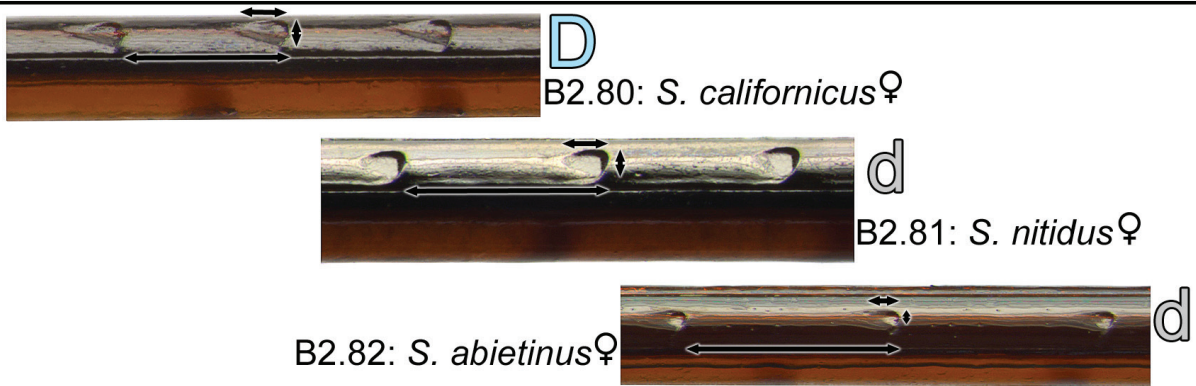
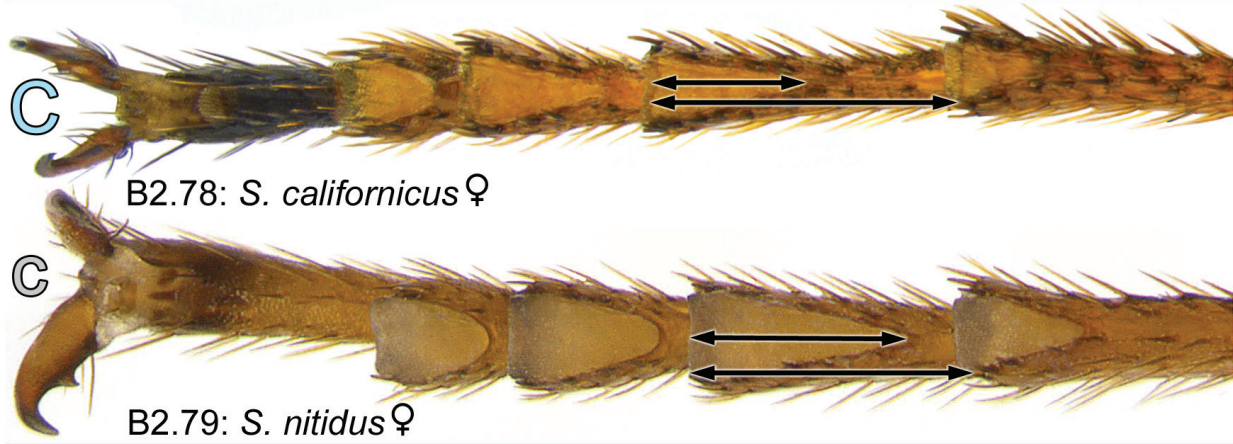
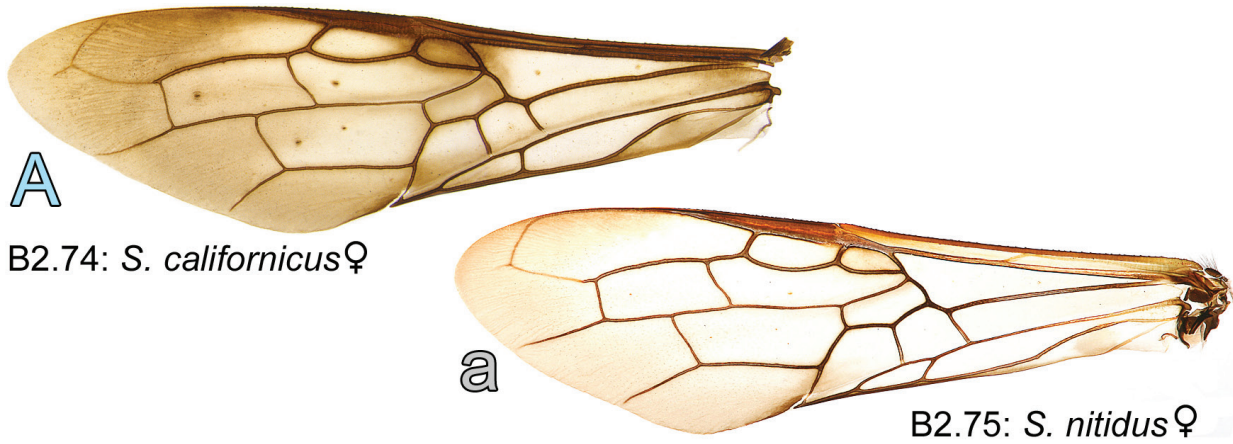
B2.42: *S. nigricornis* ♀

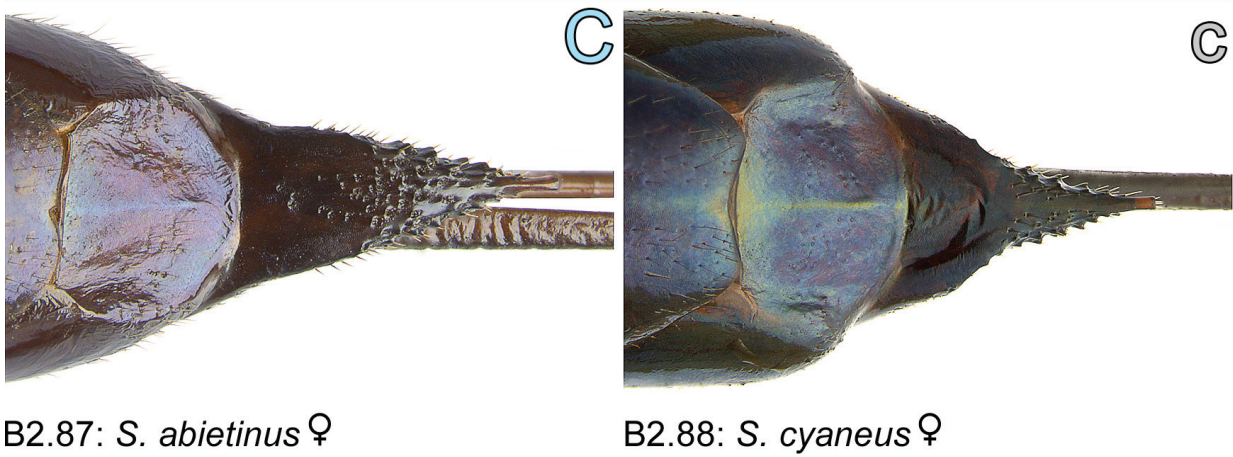
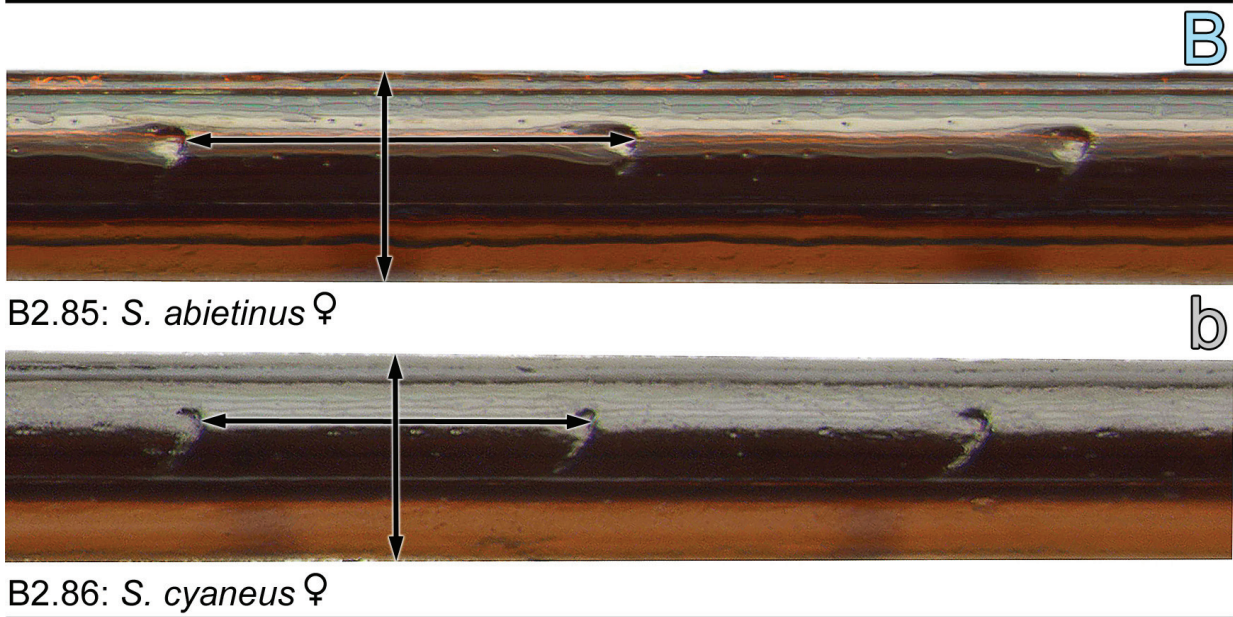
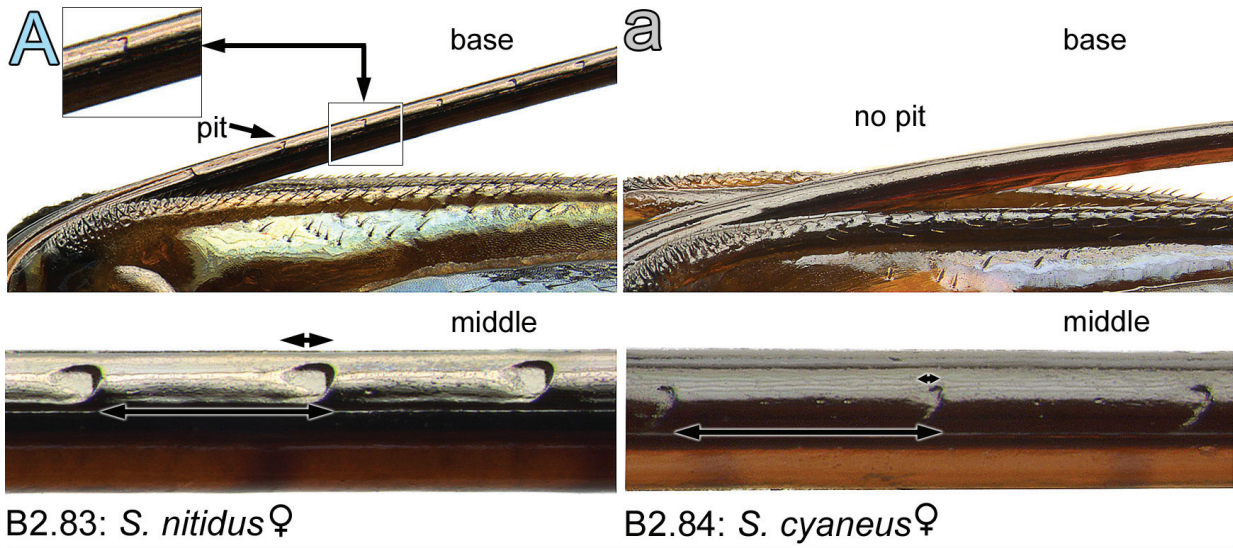












Males

- 1 A) Metafemur black (Fig. B2.89).
..... 2
- a) Metafemur mainly reddish brown (Figs. B2.90–B2.92).
..... 5
- 2(1) A) Legs completely black (including base of metatibia) (Fig. B2.93).
[**Additional characters.** Head with dorsal surface coarsely pitted, but pits scattered.]
..... *Sirex areolatus* (Cresson, 1868)
- a) Fore and middle legs with tibiae and tarsi reddish brown or paler (mesotibia and/or mesotarsomere 1 partly brown or black on dorsal surface in some species) (Figs. B2.94 & B2.95).
..... 3
- 3(2) A) Head with dorsal surface finely pitted and the pits scattered (Fig. B2.96).
..... 4
- a) Head with dorsal surface coarsely and densely pitted (Fig. B2.97).
[**Additional characters.** Abdomen black except for segments 5 and 6 (rarely an additional segment), or abdomen light reddish brown except for anterior segments.]
..... *Sirex nigricornis* Fabricius, 1781
- 4(3) A) Metatibia with extreme base light reddish brown (Fig. B2.98).
B) Mesotibia and/or mesotarsomere 1 with dorsal surface light reddish brown and with brown or black spot dorsally (spot size varies from small to large) (Fig. B2.100).
..... *Sirex nitidus* (T. W. Harris, 1841)
[**Notes.** Many specimens of this color form seen from Alaska, northernmost British Columbia, and the Yukon Territory, and Saskatchewan east to Newfoundland. In a few of these specimens, abdomen completely black. In Alaska, femora commonly black, and mesotibia and mesotarsomeres 1–3 widely black.]
- a) Metatibia with base more widely light reddish brown (Fig. B2.99).
b) Mesotibia and mesotarsus completely light reddish brown (Fig. B2.101).
..... *Sirex longicauda* Middlekauff, 1948
- 5(1) A) Metafemur completely reddish brown; metatibia light reddish brown or black (Figs. B2.102 & B2.103).
B) Gena black with dark blue metallic reflections (Fig. B2.105).
..... 6
- a) Metafemur reddish brown, **and** black along dorsal surface; metatibia brown (Fig. B2.104).
b) Gena brown posterodorsally (Fig. B2.106).
[**Additional characters.** Metatibia and metatarsus brown, not reddish brown or black; dorsal surface of head coarsely and densely pitted.]
..... *Sirex behrensii* (Cresson, 1880)
- 6(5) A) Metatibia and metatarsus reddish brown or paler, **and** base of metatibia not obviously pale (Fig. B2.107).
B) Gena posterodorsally with pits mostly touching (except *S. californicus*) one another to about one diameter apart, only a few pits farther apart (Fig. B2.110).
..... 7
- a) Metatibia and at least metatarsomeres 1–3 almost completely black, **and** metatibia clearly light reddish brown at base or black (Figs. B2.108 & B2.109).
b) Gena posterodorsally with pits mostly 1–3 diameters apart, the pits rarely touching (Fig. B2.111).
..... 10

- 7(6) A) Antenna black or, at most, pedicel and flagellomeres 1 and 2 brown (Fig. B2.112).
 B) Fore wing clearly yellow tinted, especially the cells posterior to costal cell and stigma (Fig. B2.114).
 [Additional character. Head densely pitted dorsally.]
 *Sirex obesus* Bradley, 1913
- a) Antenna with at least scape, pedicel and flagellomeres 1–5 light reddish brown (Fig. B2.113).
 b) Fore wing clear, scarcely tinted (Fig. B2.115).
 8
- 8(7) A) Antenna with scape, pedicel and flagellomeres 1–3 or 4 light reddish brown, remaining flagellomeres black (Fig. B2.116).
 B) Head dorsally with scattered pits and pit diameter 0.15–0.3 times lateral ocellus diameter (Fig. B2.118).
 *Sirex californicus* (Ashmead, 1904)
- a) Antenna almost completely reddish brown or paler (apical 2–4 flagellomeres darker in a few specimens) (Fig. B2.117).
 b) Head dorsally densely pitted and pit diameter 0.3–0.4 times lateral ocellus diameter (Fig. B2.119).
 9
- 9(8) A) Coxae black (as in Fig. B2.120)
 B) Mesoscutum submedially with net-like arrangement of polygonal pits with distinct raised margins; pit diameter 0.5–1.0 times lateral ocellus diameter (Fig. B2.122).
 *Sirex xerophilus* Schiff, n. sp.
- a) Coxae completely reddish brown (Fig. B2.121).
 b) Mesoscutum submedially with mostly round pits usually separated from one another, and usually without raised margins; pit diameter 0.3–0.7 times lateral ocellus diameter (Fig. B2.123).
 *Sirex mexicanus* Smith, n. sp.
- 10(6) A) Metatibia at base widely light reddish brown (Fig. B2.124).
 B) Head with setae posterodorsally behind eye each with a small pit at their base or without pit (Fig. B2.127).
 C) Mesoscutum submedially with small pits, each usually with a tooth behind (giving a rasp-like pattern), the tooth usually not fused laterally with others (Fig. B2.129).
 *Sirex noctilio* Fabricius, 1793
- a) Metatibia at base narrowly light reddish brown (Figs. B2.125 & B2.126).
 b) Head with setae posterodorsally behind eye each with a deeply outlined pit at their base (Fig. B2.128).
 c) Mesoscutum submedially with moderate to large pits, each often surrounded with raised margins forming a net-like pattern (Fig. B2.130).
 11
- 11(10) A) Mesotibia and/or mesotarsomere 1 with brown to black spot on dorsal surface (Fig. B2.131).
 13
- a) Mesotibia and metatarsomere 1 completely light reddish brown (Fig. B2.132).
 12
- [Note. In the range of balsam fir in Alberta and perhaps Saskatchewan, males of *S. cyaneus* matching above two couplets cannot be segregated with certainty using this character. Elsewhere this character almost always (99%) works.]
- 12(11) A) Abdomen with tergum 8 (in most specimens) and sterna 8 and 9 (in all specimens) black or mainly so (Fig. B2.133).
 B) Western Alberta and eastward.
 *Sirex cyaneus* Fabricius, 1781
- [Note. In western Alberta the apex of abdomen is light reddish brown. Character works from Manitoba eastward. No males seen from Saskatchewan.]
- a) Abdomen with apical segments light reddish brown (Fig. B2.134).
 b) Rocky Mountains and westward.
 *Sirex abietinus* Goulet, n. sp.

- 13(11)** A) Mesotibia dark brown on about 0.5 of outer surface and dark spot not expanded on inner and lateral surfaces; mesotarsomere 1 or 1 and 2 dark brown (Fig. B2.135).
 B) Metatibia with base narrowly light reddish brown, the length of reddish brown area about as long as minimum width of tibia (Fig. B2.137).
 C) Abdomen with tergum 7 and sterna 7 and 8 black (Fig. B2.139) **or** light reddish brown (Fig. B2.140) (if the latter, use A, B, and D).
 D) Across North America where spruces grow.

.....*Sirex nitidus* (T. W. Harris, 1841)

[**Note.** Specimens with abdomen light reddish brown apical segments rarely seen in eastern North America, but commonly seen in western North America. In Alaska and probably Yukon, mesotibia very darkly and widely black as in *S. varipes*. *Sirex varipes* recorded only south of southern British Columbia.]

- a) Mesotibia black on about 0.7 of outer surface, and partly or completely covering lateral and inner surfaces; tarsomeres 1 and 2 or 1–3 black (Fig. B2.136).
 b) Metatibia with base very narrowly light reddish brown, the length of reddish brown area shorter than minimum width of tibia (Fig. B2.138).
 c) Abdomen with apical segments light reddish brown (as in Figs. B2.140 & B2.141).
 d) Rocky Mountains westward.

.....*Sirex varipes* Walker, 1866

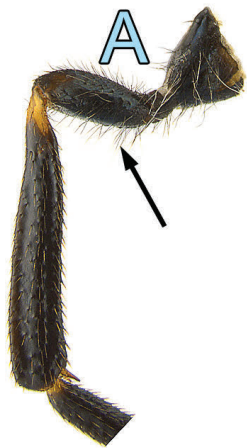
3. Key to Species of *Tremex*

- 1 A) Body setae generally short; frons in lateral view with setae about 0.5 times as long as distance between inner edges of lateral ocelli (Fig. B3.1).
 B) **Female:** cornus in lateral view with lateral edge protruded and angular in basal 0.3 (Fig. B3.3).
 C) **Female:** abdominal tergum 9 laterally with slightly raised, semicircular pit anterior to each seta and pit clearly separated from other such pits (Fig. B3.5).
 D) **Female:** metatarsomere 2 in lateral view with dorsal edge clearly convex (Fig. B3.7).
 E) **Male:** metatarsomere 5 as long as metatarsomere 2 (Fig. B3.9).

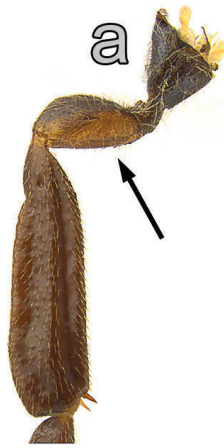
.....*Tremex columba* (Linnaeus, 1763)

- a) Body setae generally long; frons in lateral view with setae about as long as or longer than distance between inner edges of lateral ocelli (Fig. B3.2).
 b) **Female:** cornus in lateral view with lateral edge straight in basal 0.3 (Fig. B3.4).
 c) **Female:** abdominal tergum 9 laterally with distinct circular pit surrounding each setae, and pit contiguous with other such pits (Fig. B3.6).
 d) **Female:** metatarsomere 2 in lateral view with dorsal edge almost straight (Fig. B3.8).
 e) **Male:** metatarsomere 5 as long as metatarsomere 2 + 3 (Fig. B3.10).

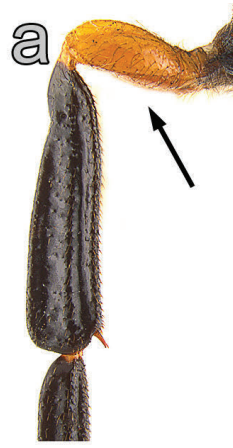
.....*Tremex fuscicornis* (Fabricius, 1787)



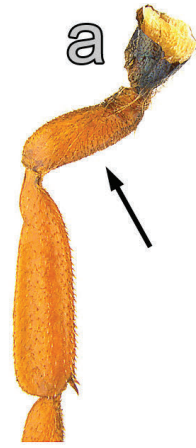
B2.89: *S. longicauda* ♂



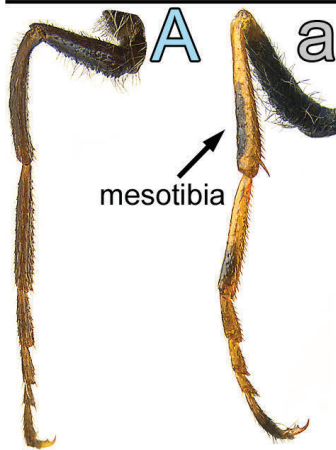
B2.90: *S. behrensii* ♂



B2.91: *S. nitidus* ♂



B2.92: *S. californicus* ♂

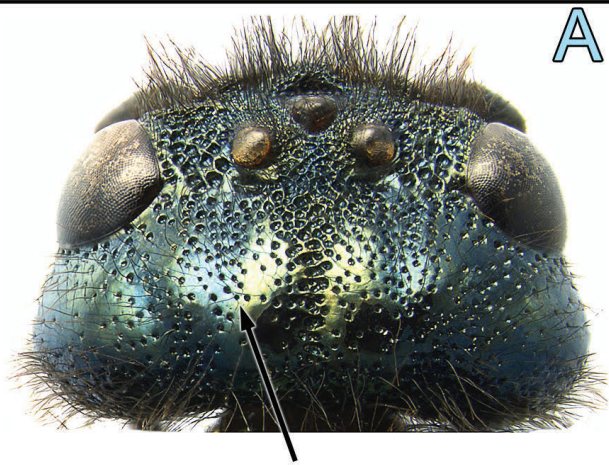


B2.93: *S. areolatus* ♂

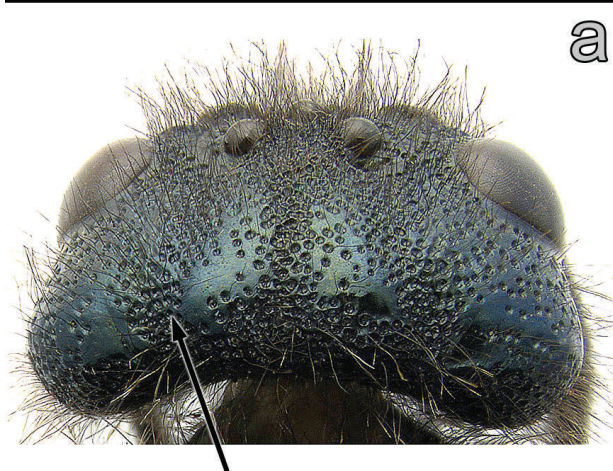
B2.94: *S. nigricornis* ♂



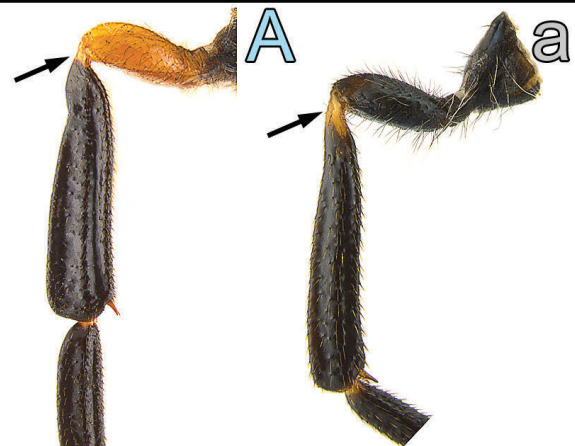
B2.95: *S. longicauda* ♂



B2.96: *S. nitidus* ♀

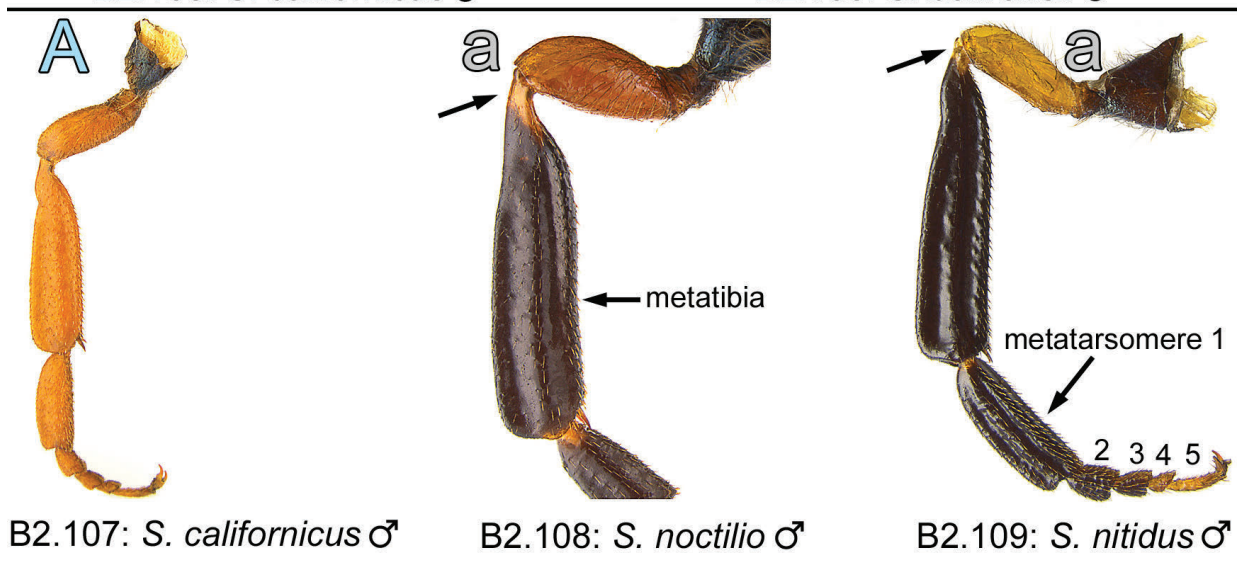
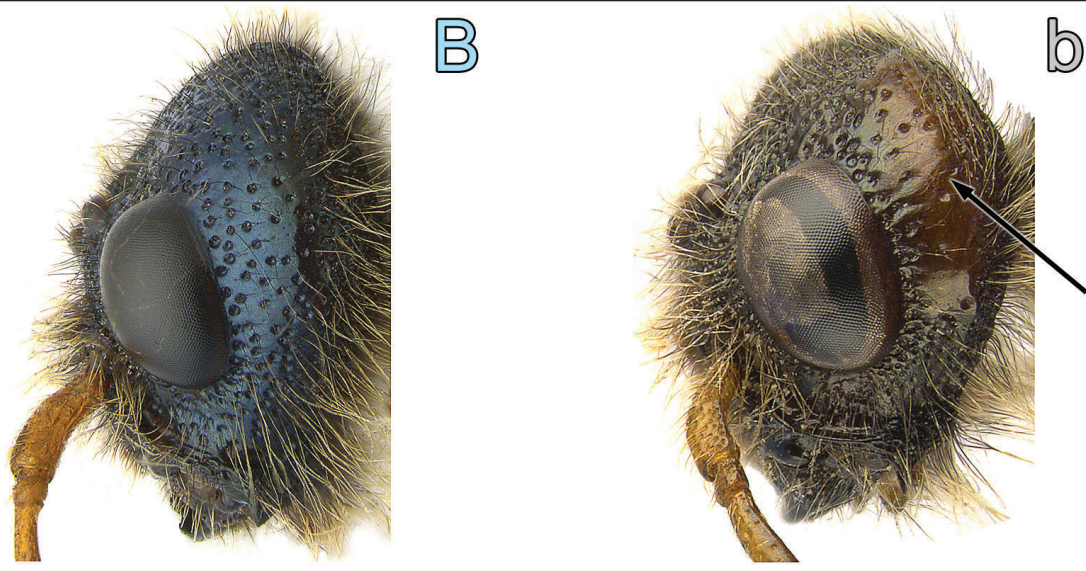
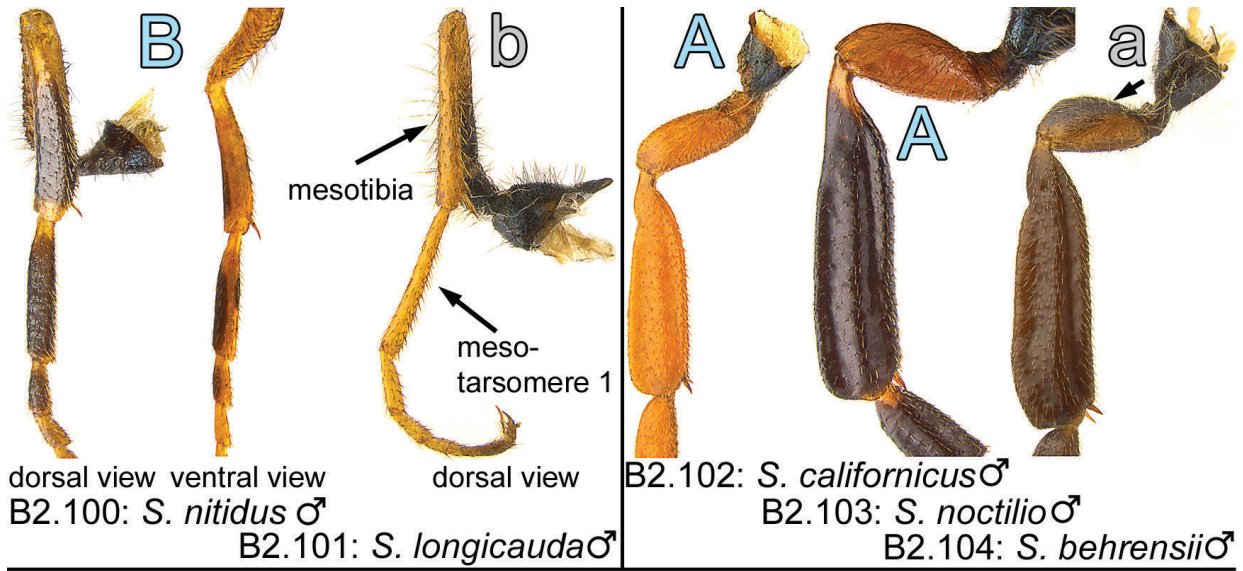


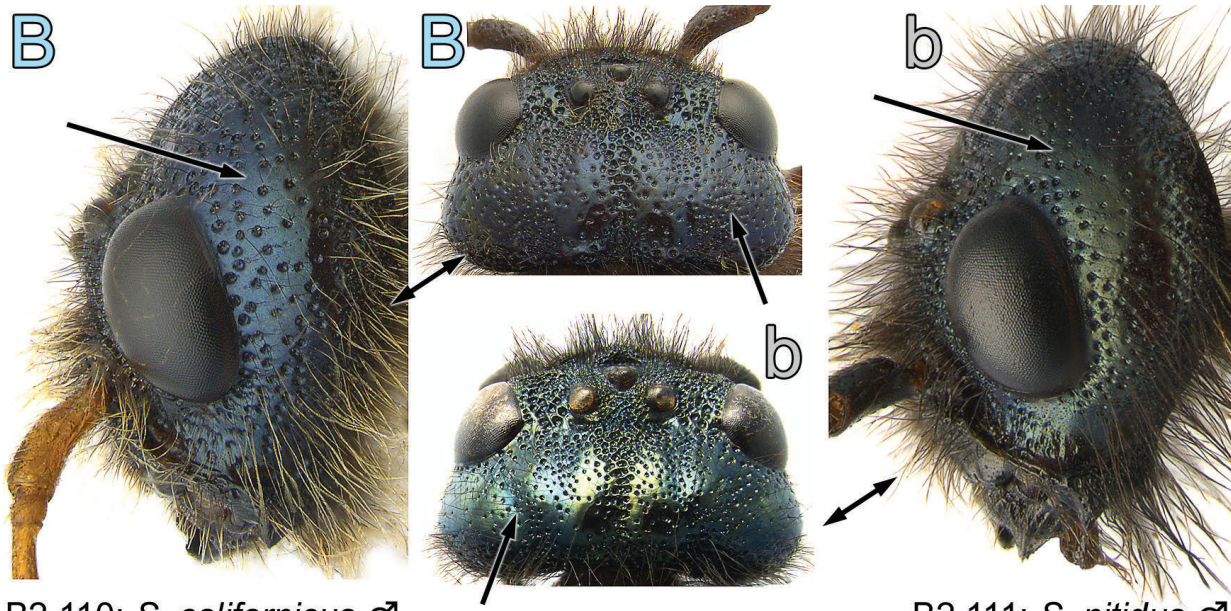
B2.97: *S. nigricornis* ♀



B2.98: *S. nitidus* ♂

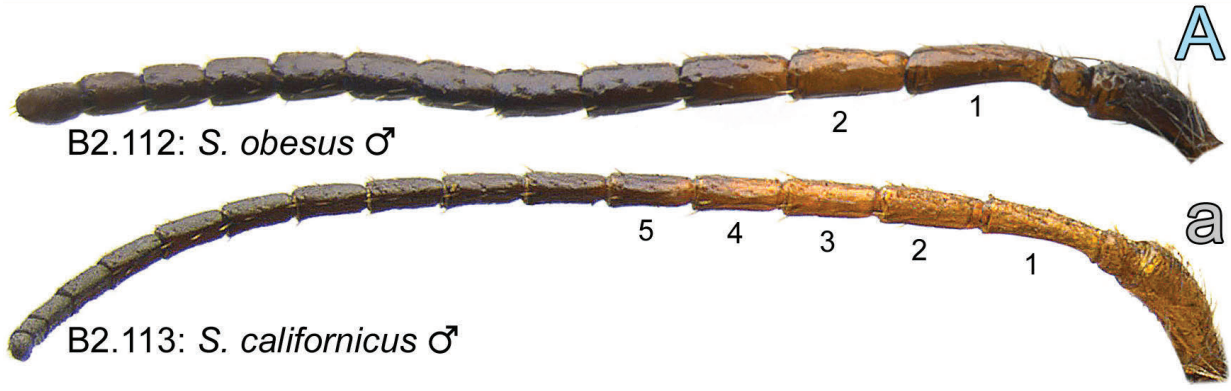
B2.99: *S. longicauda* ♂





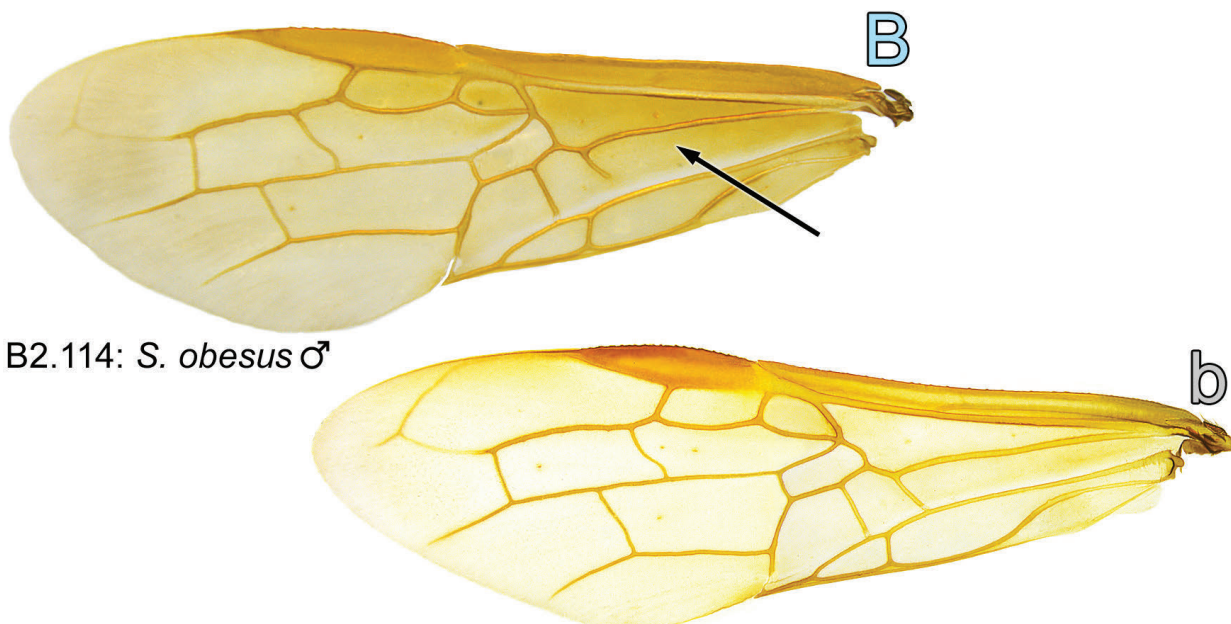
B2.110: *S. californicus* ♂

B2.111: *S. nitidus* ♂



B2.112: *S. obesus* ♂

B2.113: *S. californicus* ♂



B2.114: *S. obesus* ♂

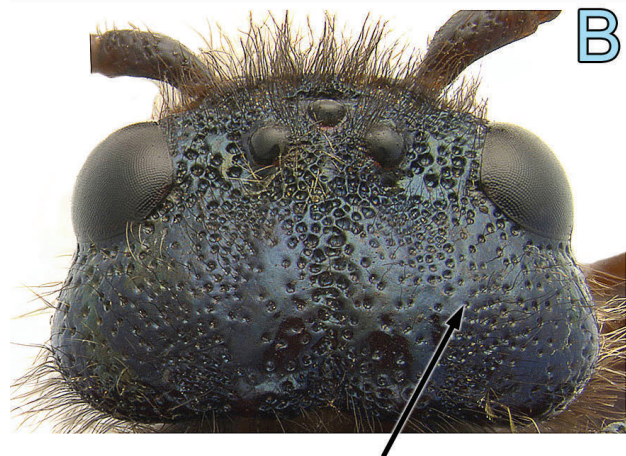
B2.115: *S. californicus* ♂



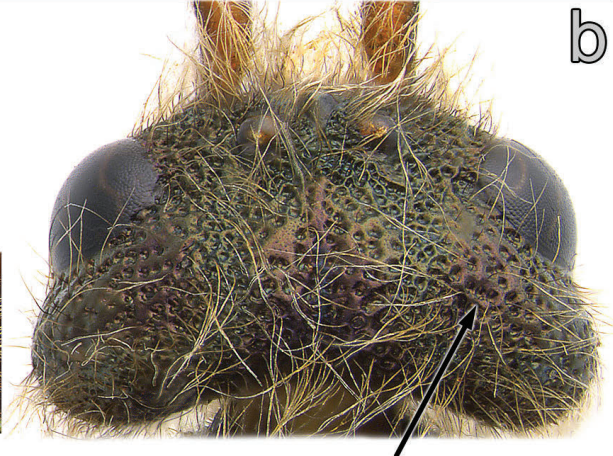
B2.116: *S. californicus* ♂



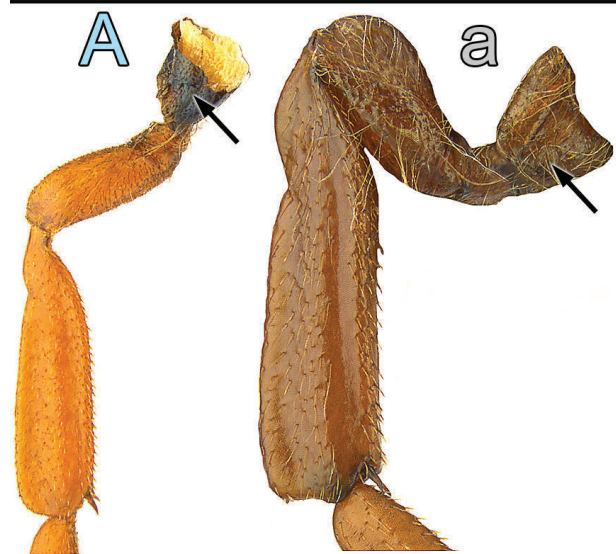
B2.117: *S. mexicanus* ♂



B2.118: *S. californicus* ♀

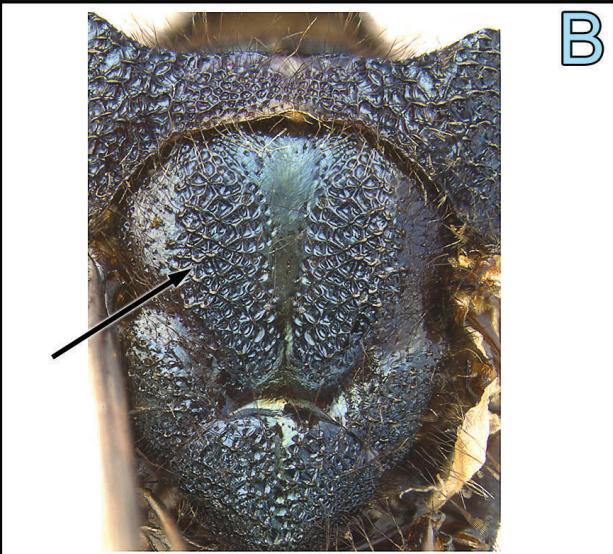


B2.119: *S. mexicanus* ♂

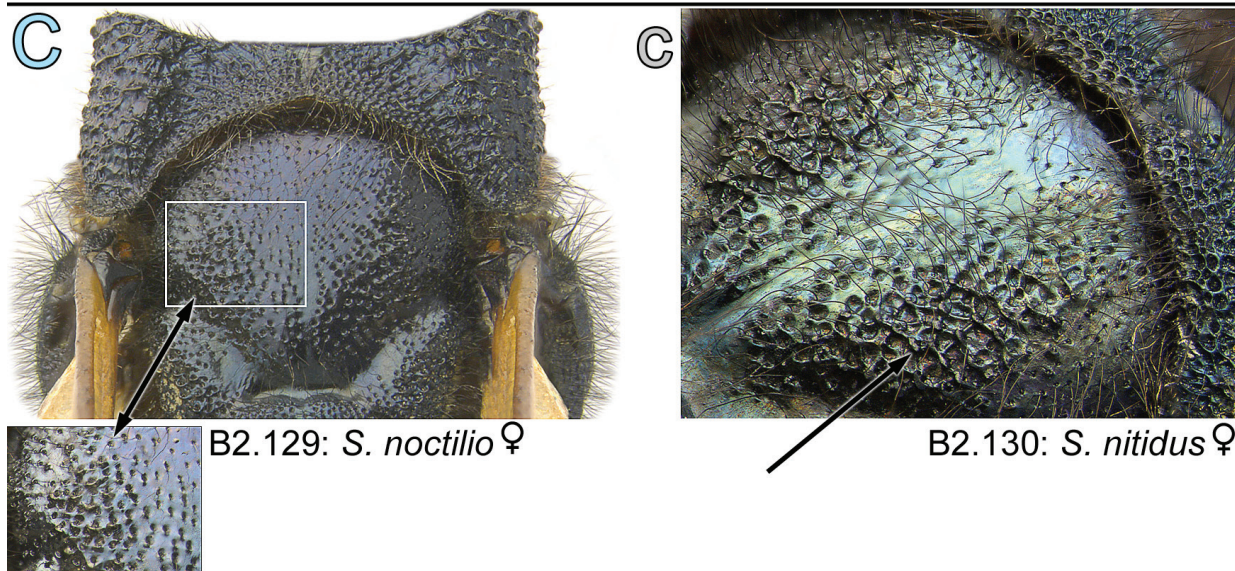
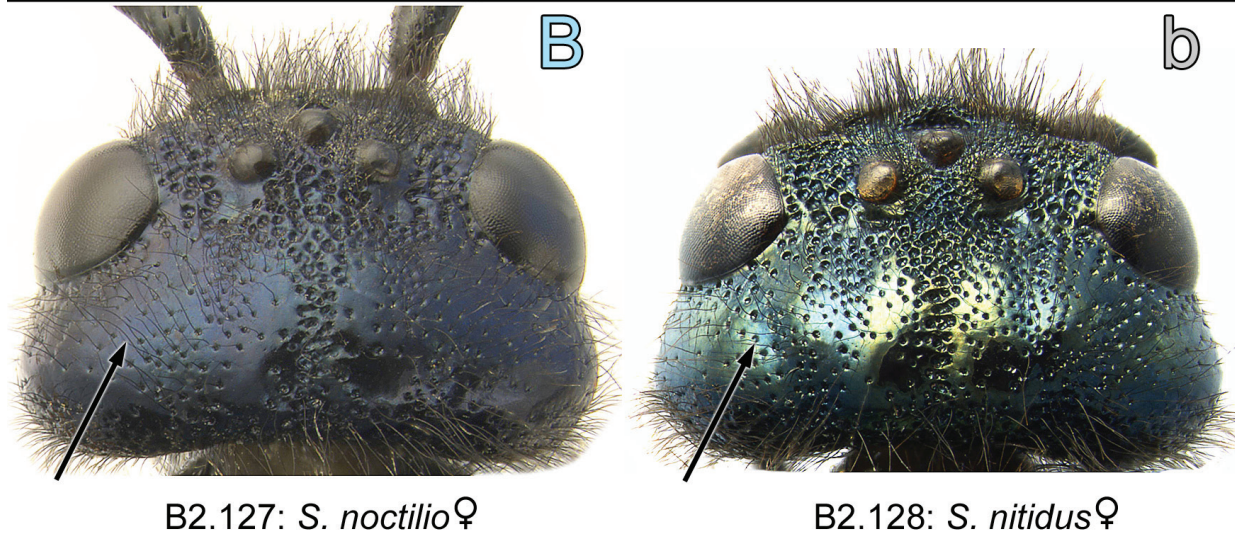
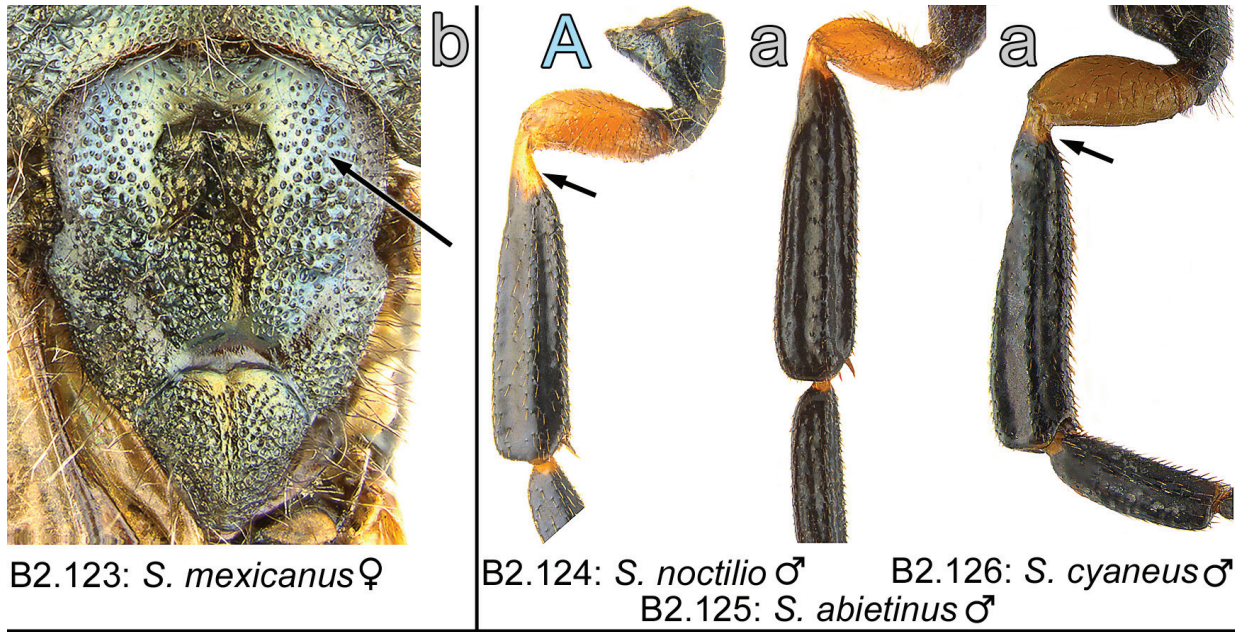


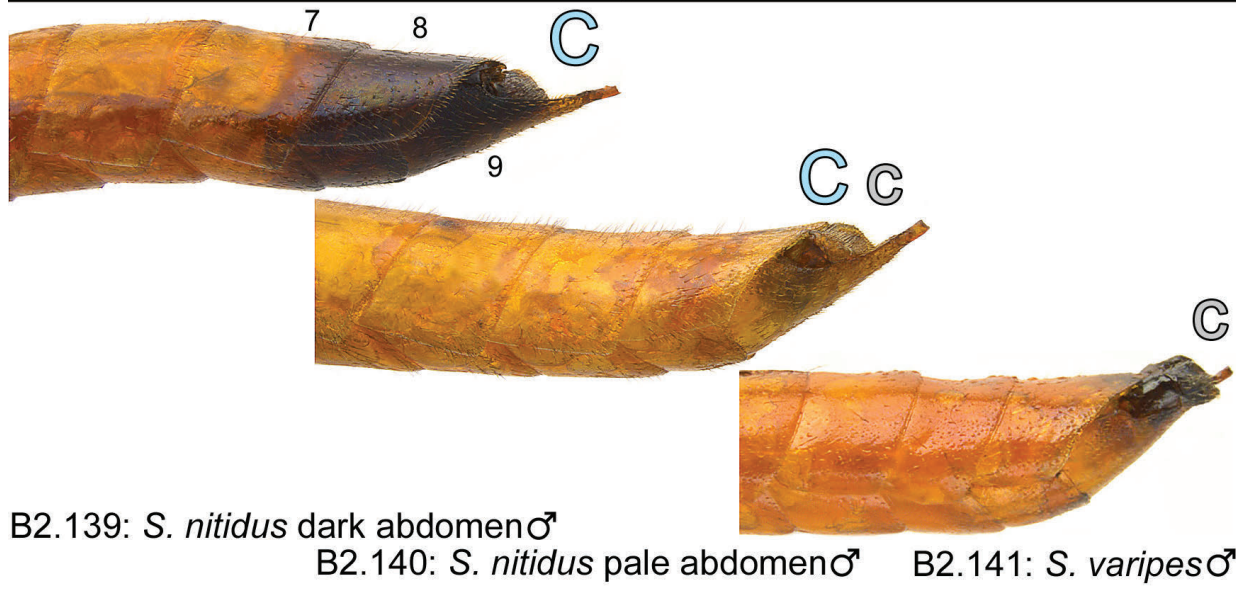
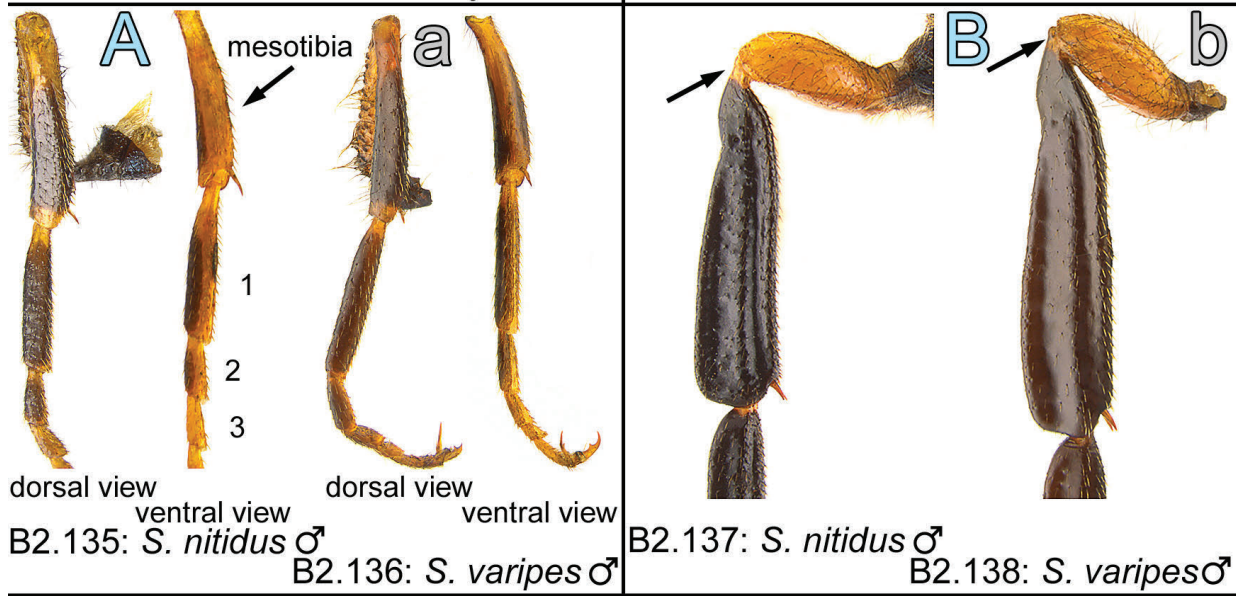
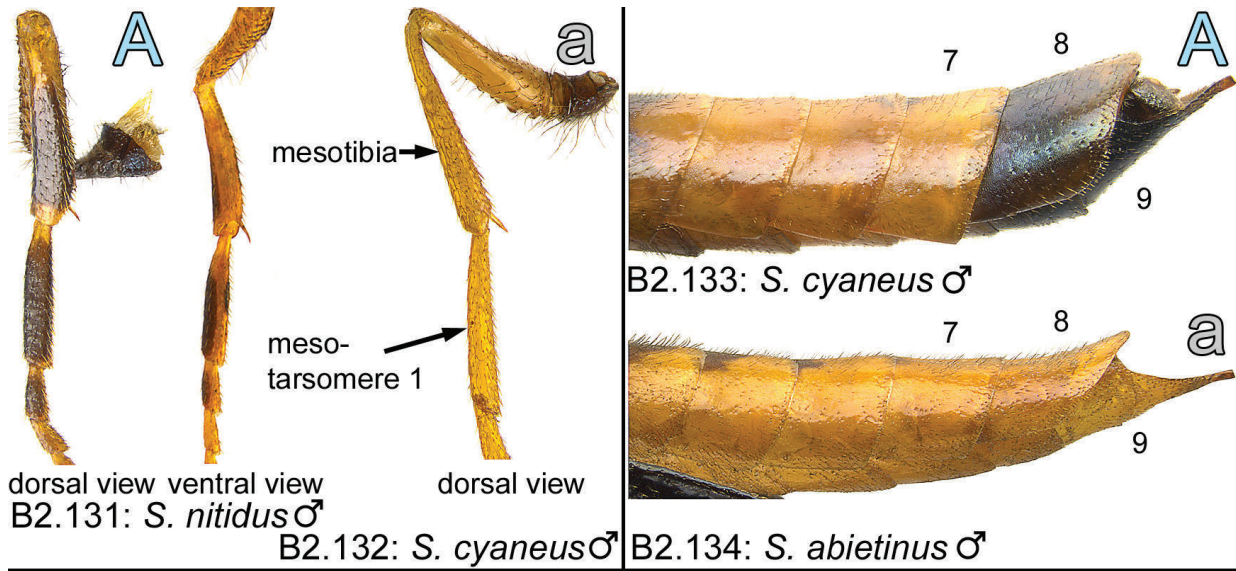
B2.120: *S. californicus* ♂

B2.121: *S. mexicanus* ♂



B2.122: *S. xerophilus* ♀







B3.1: *T. columba* ♀



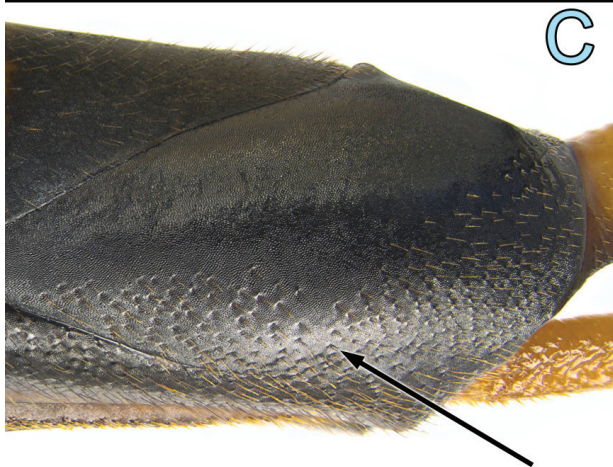
B3.2: *T. fuscicornis* ♀



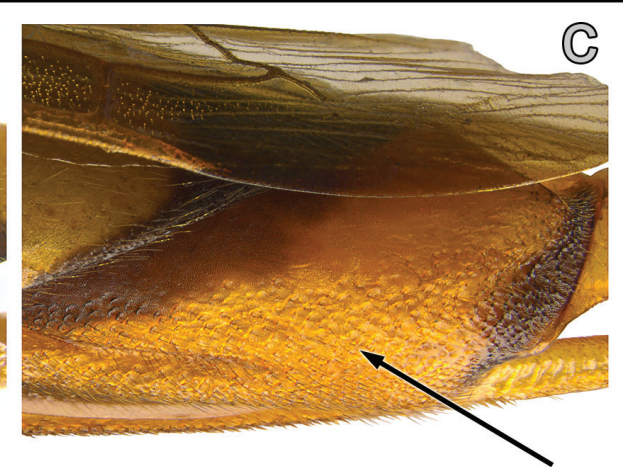
B3.3: *T. columba* ♀



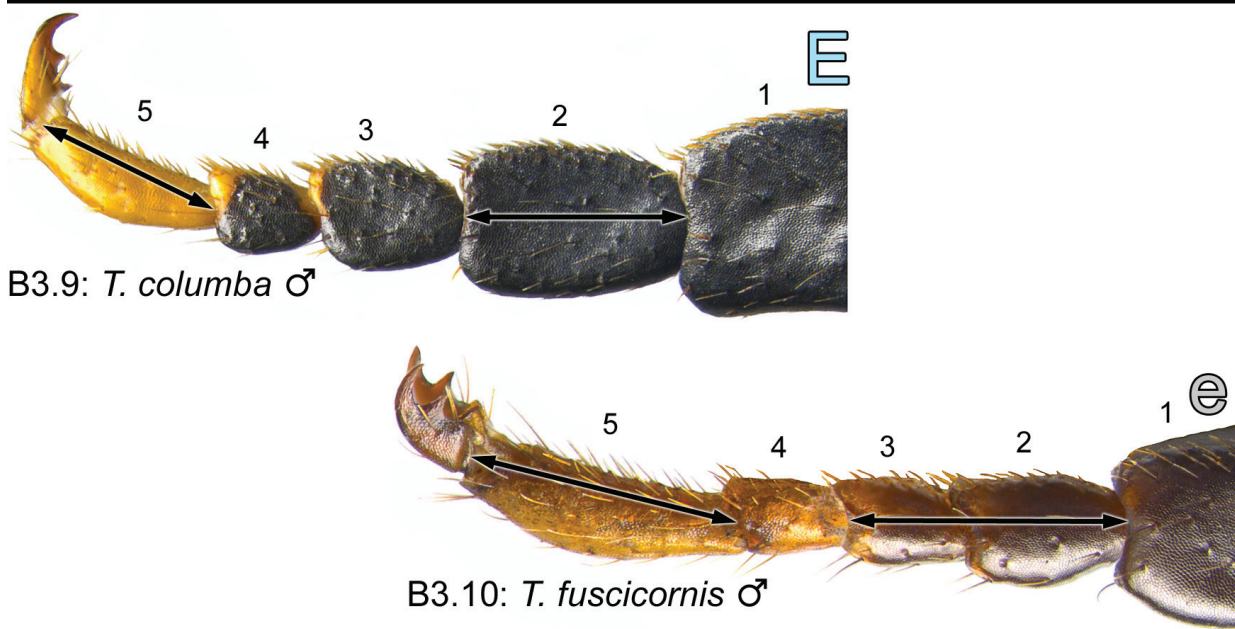
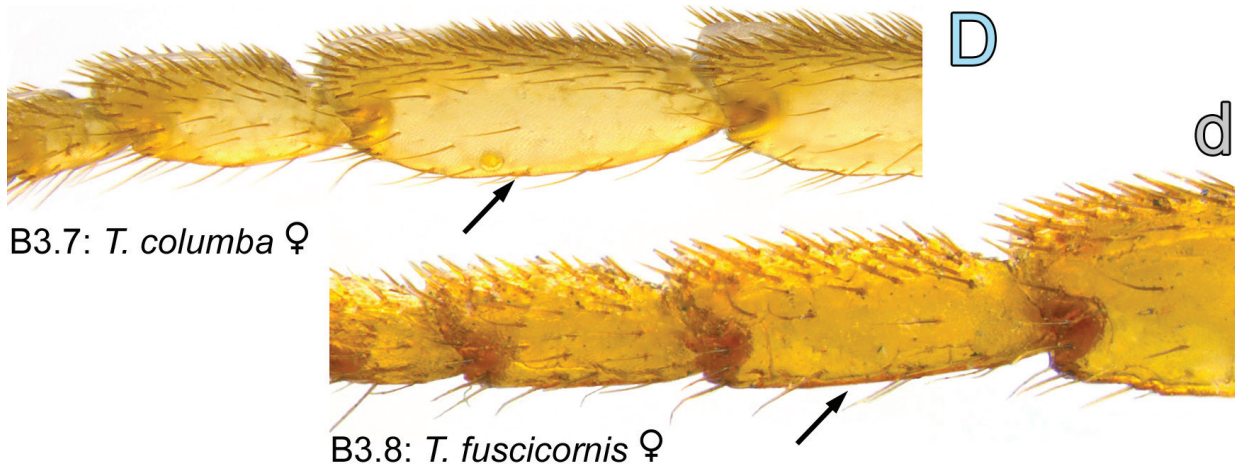
B3.4: *T. fuscicornis* ♀



B3.5: *T. columba* ♀



B3.6: *T. fuscicornis* ♀



4. Key to Species of *Urocerus*

Females

- 1 A) Abdomen black with light reddish brown transverse bands on at least segment 2 and anterior half of segment 8 (Fig. B4.1).
 B) Protarsomeres 2–5 reddish brown (Fig. B4.4).
 [Additional character. Flagellum completely light reddish brown.]
 2
- a) Abdomen black with or without white lateral spot on tergum 8 (Fig. B4.2), or partly to completely reddish brown but without light reddish brown transverse bands (Fig. B4.3).
 b) Protarsomeres 2–5 black (Fig. B4.5).
 4
- 2(1) A) Abdominal segment 7 light reddish brown (may be black at side) and segment 9 black (Fig. B4.6) or almost completely light reddish brown.
 B) Pronotum black (Fig. B4.8).
 C) Metatibia almost completely light reddish brown except for brownish spot on median surface in apical 0.2 (Fig. B4.10).
 D) Vertex covered with densely spaced pits (Fig. B4.12).
 3
- a) Abdominal segment 7 black and segment 9 with light reddish brown transverse band in apical 0.5 (Fig. B4.7).
 b) Pronotum reddish brown (Fig. B4.9).
 c) Metatibia mostly black except for a yellowish transverse band in basal 0.3 (Fig. B4.11).
 d) Vertex mostly smooth with few pits except along posterior edge of eye, just behind ocelli and on median longitudinal furrow (Fig. B4.13).
 *Urocerus sah* (Mocsáry, 1881)
- 3(2) A) Tergum 8 entirely, tergum 9 in posterior half and tergum 10 entirely (except posterolateral corners in some specimens) light reddish brown (Fig. B4.14).
 B) Sheath with apical section more than 1.52 times as long as basal section (if between 1.31 and 1.52, use A).
 *Urocerus gigas* (Linnaeus, 1758)
- a) Tergum 8 in basal half and only cornus on tergum 10 light reddish brown; (tergum 8 rarely completely black) (Fig. B4.15).
 b) Sheath with apical section less than 1.31 times as long as basal section (if between 1.31 and 1.52, use a).
 *Urocerus flavicornis* (Fabricius, 1781)
- 4(1) A) Antenna with at least basal 0.25–0.7 black, the remaining antennomeres white but brown to black at apex of last segment (Fig. B4.16).
 B) Cornus completely reddish brown to light reddish brown (Fig. B4.18).
 C) Tergum 8 sublaterally with microsculpture reticulate between spiracle and pitted sculpticells dorsally and sculpticells clearly scale-like (Fig. B4.20).
 5
- a) Antenna with at most the three to four basal antennomeres black, the remaining antennomeres white, or remaining antennomeres white except for 3–7 apical antennomeres brown (Fig. B4.17).
 b) Cornus usually black, rarely partly light reddish brown (Fig. B4.19).
 c) Tergum 8 sublaterally without (at most suggested) microsculpture between spiracle and pitted sculpticells dorsally (Fig. B4.22) or reticulation outlined and sculpticells flat and scarcely elevated posteriorly (Fig. B4.21).
 6

- 5(4) A) Abdomen reddish brown at least in apical half (including cornus) (Fig. B4.23).
- B) Tergum 9 with dorsal surface lateral to tergum 8 entirely smooth and without reticulation, lateral surface reticulate but sculpticells flat and scarcely elevated posteriorly (best seen in posterior view of segment) (Fig. B4.25).
- C) Metatarsomere 2 in lateral view about 2 times as long as high (Fig. B4.27), and in ventral view tarsal pad about half as long as tarsomere.
- D) Sheath with length of apical section less than 1.39 times basal section (**if between** 1.39 and 1.45, use A–C).

..... *Urocerus cressoni* Norton, 1864

- a) Abdomen black, except cornus light reddish brown (Fig. B4.24).
- b) Tergum 9 with dorsal surface lateral to tergum 8 smooth only medially near segment 8 and median basin, otherwise clearly reticulate laterally and sculpticells clearly scale-like (best seen in posterior view of segment) (Fig. B4.26).
- c) Metatarsomere 2 in lateral view about 3 times as long as high (Fig. B4.28), and in ventral view with tarsal pad more than 0.7 times as long as tarsomere.
- d) Sheath with length of apical section greater than 1.45 times basal section (**if between** 1.39 and 1.45, use a–c).

..... *Urocerus taxodii* (Ashmead, 1904)

- 6(4) A) Flagellum completely yellowish to light reddish brown (Fig. B4.29).
- B) Wings clearly yellow tinted (Fig. B4.31).
- C) Metatarsomere 2 about 4.0 times as long as high (Fig. B4.33).
- D) Tergum 8 sublaterally without microsculpture between spiracle and pitted sculpticells dorsally, the surface shiny (Fig. B4.35).

..... *Urocerus californicus* Norton, 1869

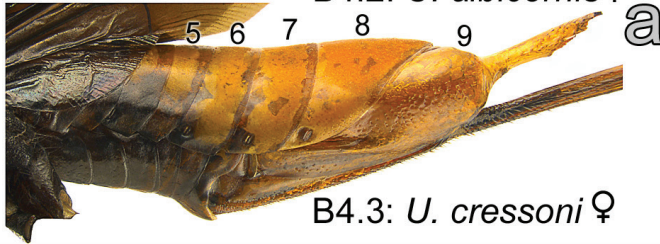
- a) Flagellomere 1 or 1 and 2 black, except for brown apical flagellomeres 3–7, remaining flagellomeres white to light reddish brown (Fig. B4.30).
- b) Wings darkly tinted (Fig. B4.32).
- c) Metatarsomere 2 about 2.5 times as long as high (Fig. B4.34).
- d) Tergum 8 sublaterally with microsculpture and with clearly outlined meshes between spiracle and pitted sculpticells dorsally (Fig. B4.36).

..... *Urocerus albicornis* (Fabricius, 1781)

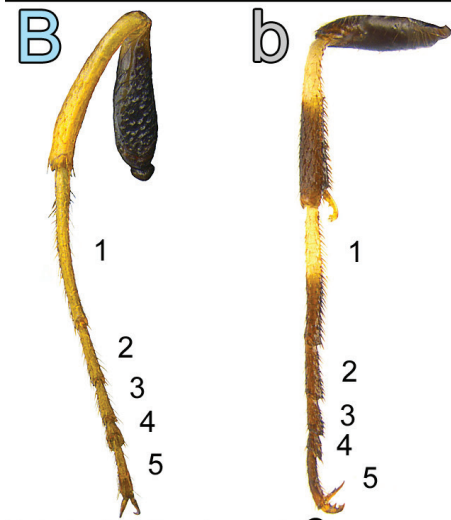


B4.1: *U. flavicornis* ♀

B4.2: *U. albicornis* ♀



B4.3: *U. cressoni* ♀



B4.4: *U. flavicornis* ♀

B4.5: *U. albicornis* ♀



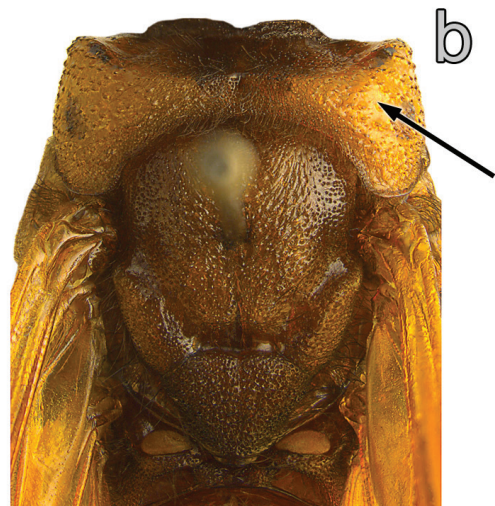
B4.6: *U. flavicornis* ♀



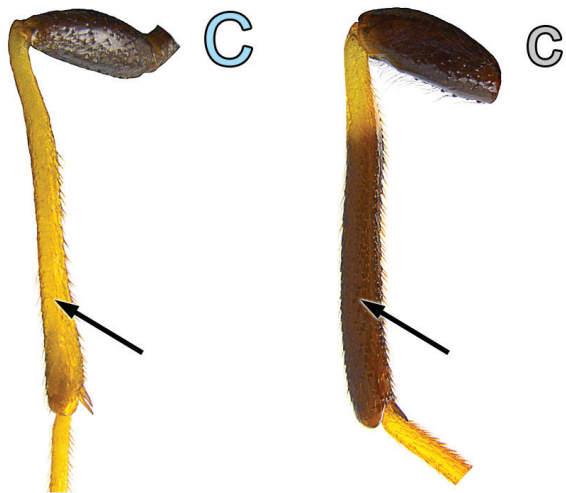
B4.7: *U. sah* ♀



B4.8: *U. flavicornis* ♀



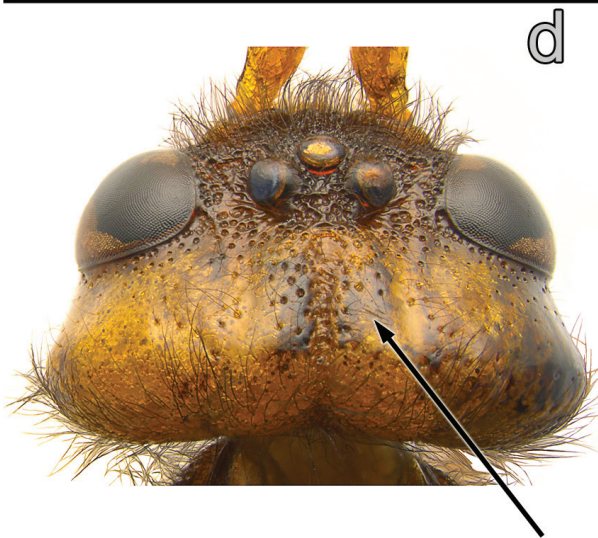
B4.9: *U. sah* ♀



B4.10: *U. flavicornis* ♀ B4.11: *U. sah* ♀



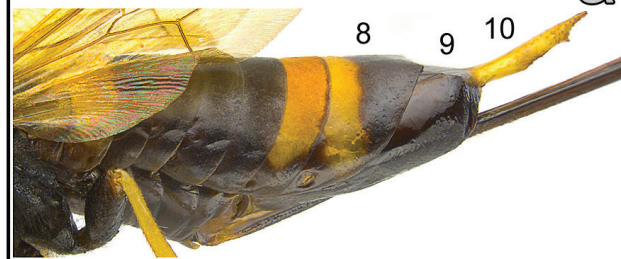
B4.12: *U. flavicornis* ♀



B4.13: *U. sah* ♀



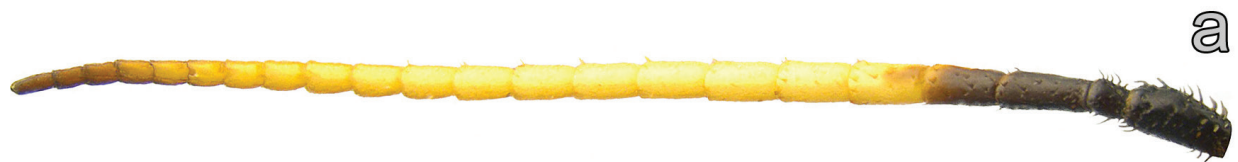
B4.14: *U. gigas* ♀



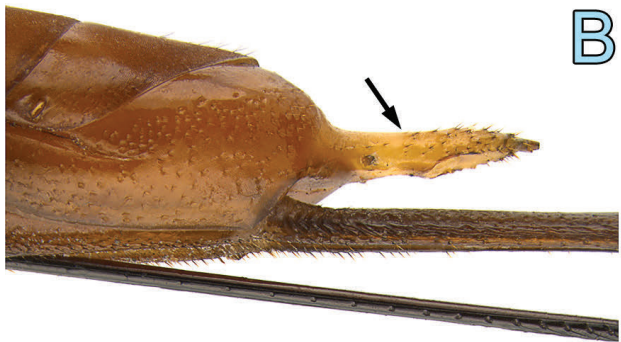
B4.15: *U. flavicornis* ♀



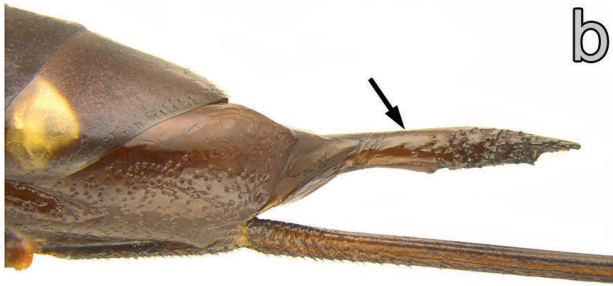
B4.16: *U. cressoni* ♀



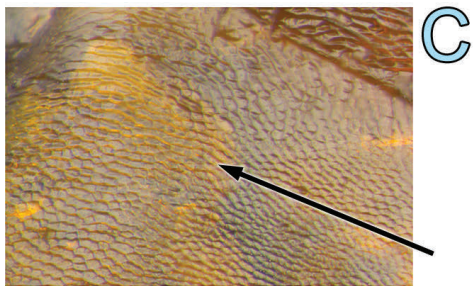
B4.17: *U. albicornis* ♀



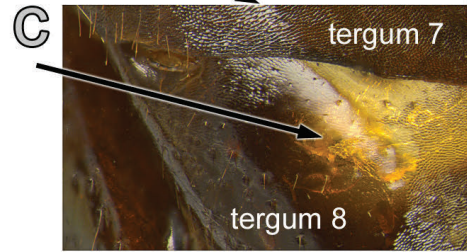
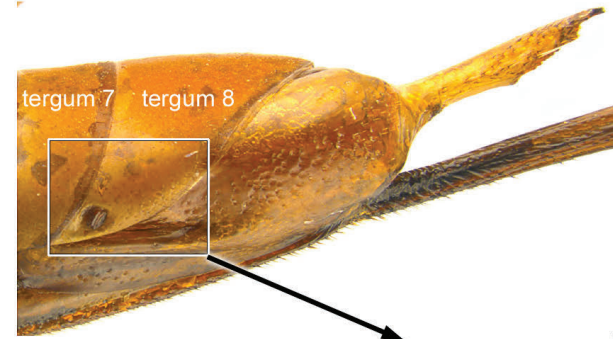
B4.18: *U. cressoni* ♀



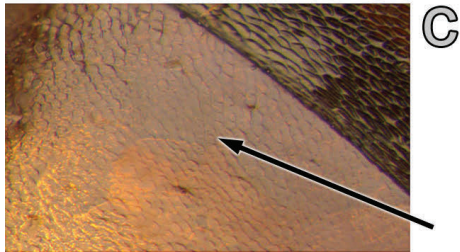
B4.19: *U. albicornis* ♀



B4.20: *U. cressoni* ♀



B4.22: *U. californicus* ♀



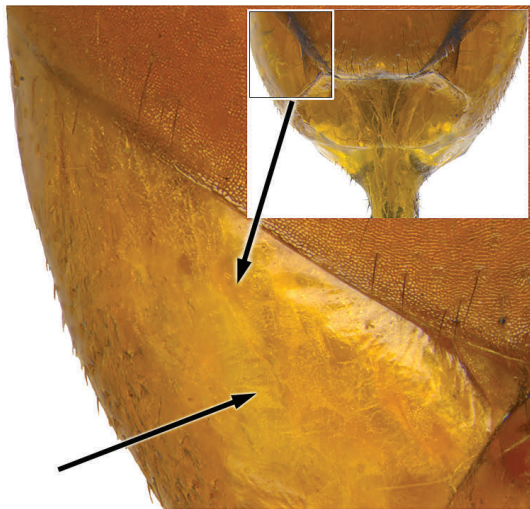
B4.21: *U. albicornis* ♀



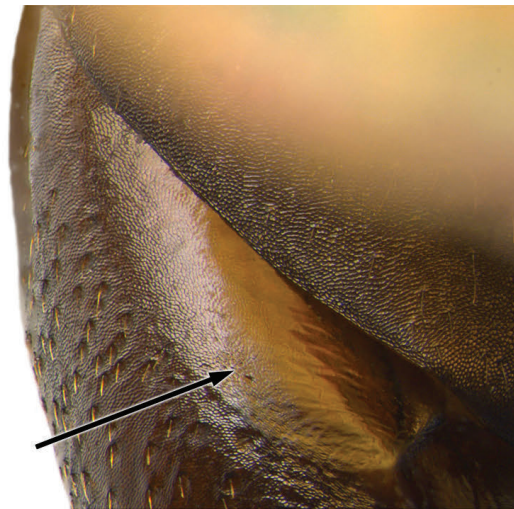
B4.23: *U. cressoni* ♀



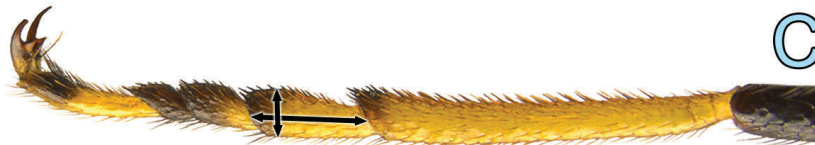
B4.24: *U. taxodii* ♀



B4.25: *U. cressoni* ♀



B4.26: *U. taxodii* ♀



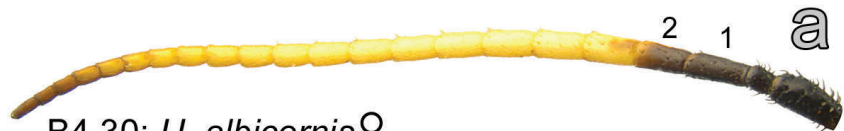
B4.27: *U. cressoni* ♀



B4.28: *U. taxodii* ♀



B4.29: *U. californicus* ♀



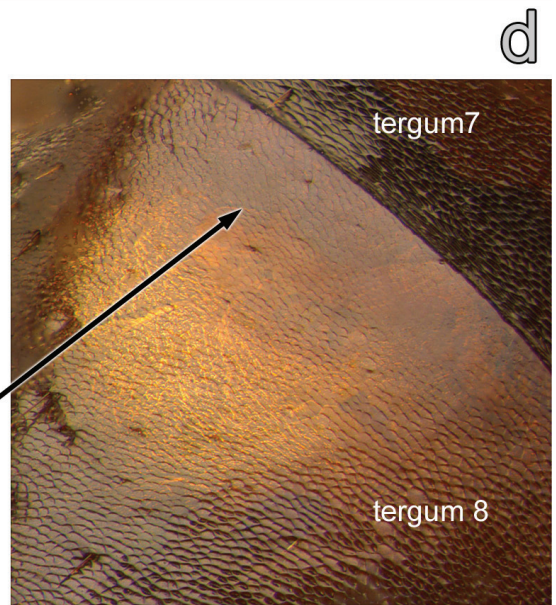
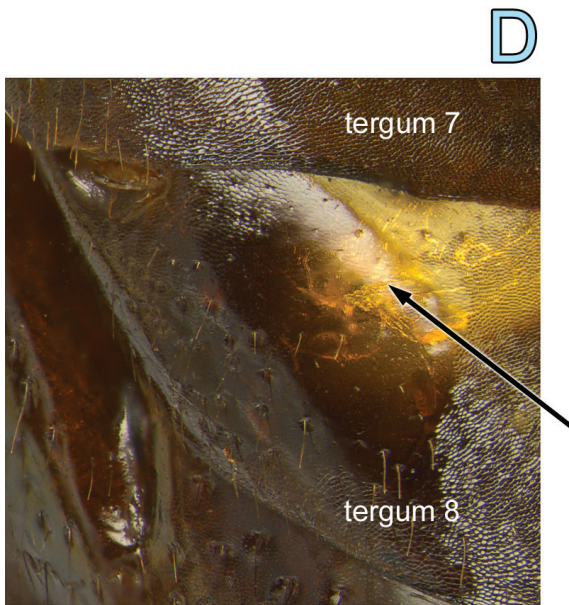
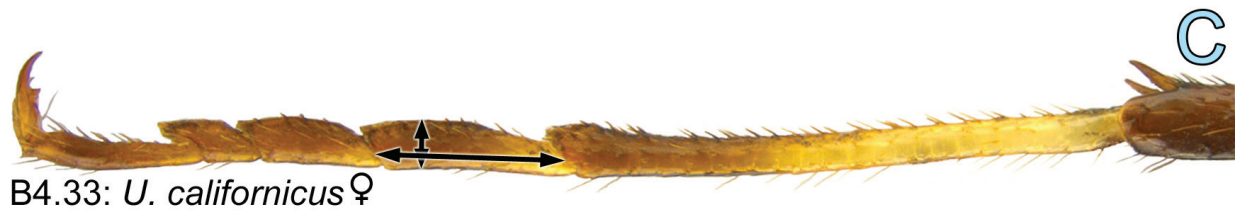
B4.30: *U. albicornis* ♀



B4.31: *U. californicus* ♀



B4.32: *U. albicornis* ♀



Males

- 1** A) Antenna black at base and sharply white to light reddish brown in apical half (Fig. B4.37).
B) Abdomen with apical segments light reddish brown (Fig. B4.41) **and** metatibia mainly to completely black (Fig. B4.43).
..... **2**
- a) Antenna black (Fig. B4.38), black and light reddish brown at base (pale and dark portions not sharply divided) (Fig. B4.39), or completely light reddish brown (Fig. B4.40).
b) Abdominal segments 7–9 or 8 and 9 black (Fig. B4.42) and metatibia mainly black (Fig. B4.44), **or** apical abdominal segments light reddish brown and metatibia reddish brown **or** mainly black (**if the latter**, use a).
..... **3**
- 2(1)** A) Femora, tibiae, tarsi, head capsule except yellow genal spot, and thorax completely black (Figs. B4.45 & B4.47).
..... *Urocerus cressoni* Norton, 1864
- a) Femora black except reddish brown at apex; metatibia in basal 0.25, protarsus mesotarsus and mesotibia, metatarsomeres 1 and 2 at base, and head capsule ventrally light reddish brown; pronotum reddish brown (Figs. B4.46 & B4.48).
..... *Urocerus taxodii* (Ashmead, 1904)
- 3(1)** A) Head mainly to completely reddish brown (Fig. B4.49) **or** genal white spot extending dorsally to median area.
B) Antenna light reddish brown (Fig. B4.51).
..... **4**
- a) Head completely or mainly black in dorsal half, and with white genal spot restricted to area behind eye (Fig. B4.50).
b) Antenna black (Fig. B4.53), pale at base shifting to brown or black at apex (Fig. B4.52), **or** very rarely completely light reddish brown (**if the latter**, use a).
..... **5**
- 4(3)** A) Head without pits on much of dorsal surface except pits usually present and usually small near posterior edge of eye, behind ocelli and along longitudinal median furrow (Fig. B4.54).
B) Head capsule black in at least ventral half (Fig. B4.56).
C) Metafemur black and reddish brown in apical third, metatibia brown except basal fifth, metatarsomere 1 brown except for reddish brown base and apex (Fig. B4.58); mesofemur black except apex; mesotibia and mesotarsomeres 1 and 2 light reddish brown; abdominal segments 7 (totally or partly), 8 and 9 black (Fig. B4.60).
..... *Urocerus sah* (Mocsáry, 1881)
- a) Head with large pits on much of dorsal surface except pits absent on genal spot behind eye (Fig. B4.55).
b) Head capsule completely light reddish brown (Fig. B4.57).
c) Femora, tibiae (except light reddish brown basal third of mesotibia, most of protibia and all of protarsus) and at least tarsomeres 1 and 2 of middle and hind legs reddish brown (Fig. B4.59); abdominal segments 7–9 light reddish brown (Fig. B4.61).
..... *Urocerus californicus* Norton, 1869
- 5(3)** A) Metatarsomere 1 in lateral view 5.5–8.2 times as long as high (**if between** 5.5 and 6.3, use B) and its base with light reddish brown area about twice as long as high (Fig. B4.62).
B) Metatibia generally more than 7.0 times as long as high (**if between** 6.8–8.5, use A) (Fig. B4.64).
[Additional characters. Apex of metatarsomere 1 with narrow reddish brown transverse band. Head (except for white spot on gena) and pronotum black.]
..... *Urocerus flavicornis* (Fabricius, 1781)
[Note. If specimen from North America, then the character “A” range is 5.5–8.0 for *U. flavicornis* and 4.0–5.2 for *U. albicornis*, and the character “B” range is 5.5–7.0 for *U. albicornis* and 6.8–9.0 for *U. flavicornis*.]

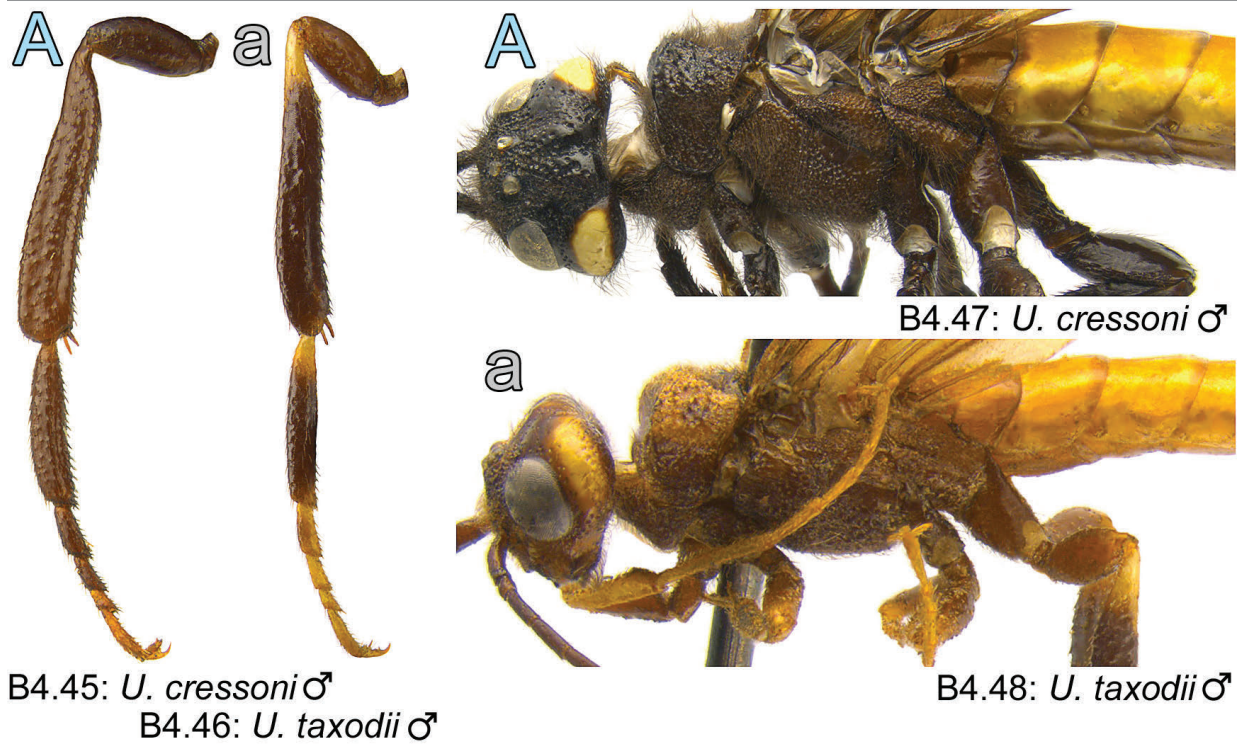
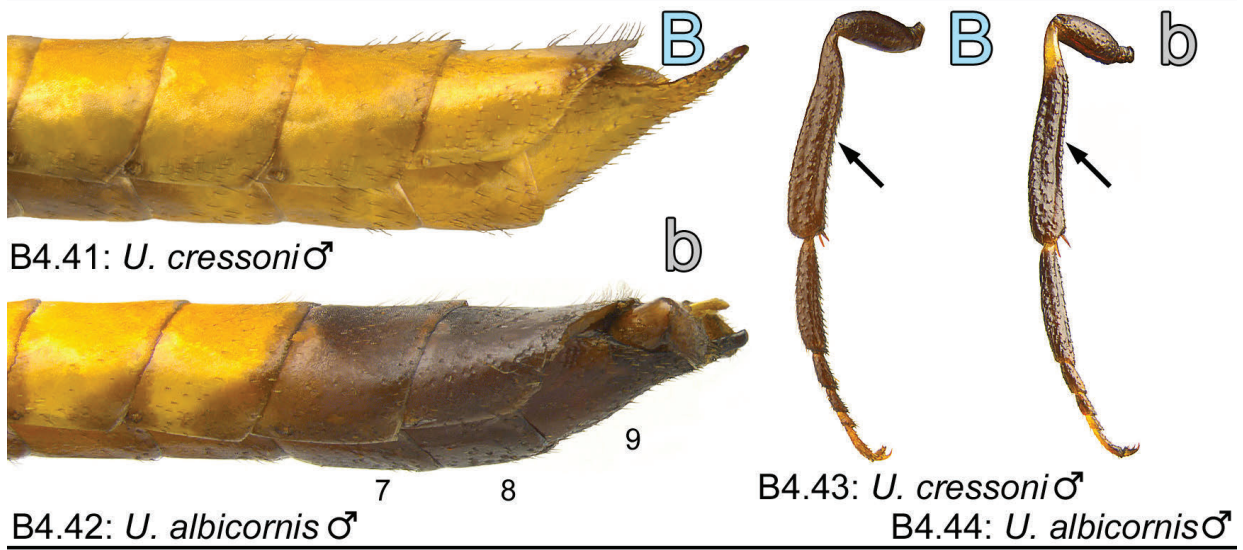
- a) Metatarsomere 1 in lateral view 4.0–5.5 times as long as high (**if between 5.5–6.3**, use b) and its base with light reddish brown area about 1.0 or 1.5 times as long as high (Fig. B4.63).
 - b) Metatibia generally less than 6.8 times as long as high (**if between 6.8–8.5**, use a) (Fig. B4.65).
- 6

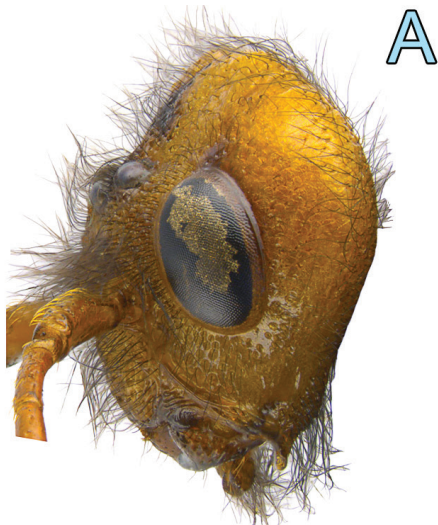
6(5) A) Abdominal tergum 7 at least mainly black (Fig. B4.66).
 B) Metatarsomere 1 in lateral view 4.0–4.4 times as long as high (**if between 4.5–5.2**, use A), its base with light reddish brown area about as long as high and its apex black or dark brown (Fig. B4.68).
 [Additional characters. Abdomen with tergum 2 usually black; antenna usually black at least apically; pronotum dorsally usually partly to mostly reddish brown, rarely entirely black; head usually partly or mostly reddish brown ventral to antennal sockets.]

..... *Urocerus albicornis* (Fabricius, 1781)

- a) Abdominal tergum 7 mainly or completely reddish brown (Fig. B4.67).
 - b) Metatarsomere 1 in lateral view 5.3–6.3 times as long as high (**if between 4.5–5.2**, use a), its base with light reddish brown area about 1.5 times as long as high and its apex reddish brown (Fig. B4.69).
- [Additional characters. Abdomen with tergum 2 reddish brown, rarely black; antenna usually entirely white, rarely darkened in apical 0.25; pronotum black dorsally, rarely with white area laterally on vertical surface ventral to anterolateral corner; head rarely with reddish brown spots ventral to antennal sockets.]

..... *Urocerus gigas* (Linnaeus, 1758)





B4.49: *U. californicus* ♂



B4.50: *U. albicornis* ♂



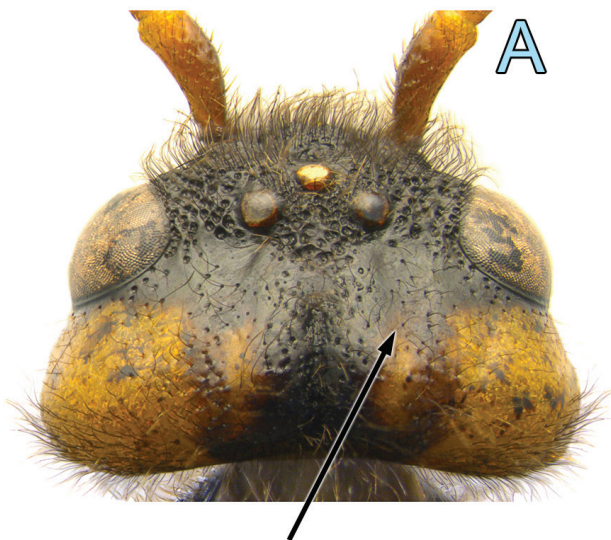
B4.51: *U. californicus* ♂



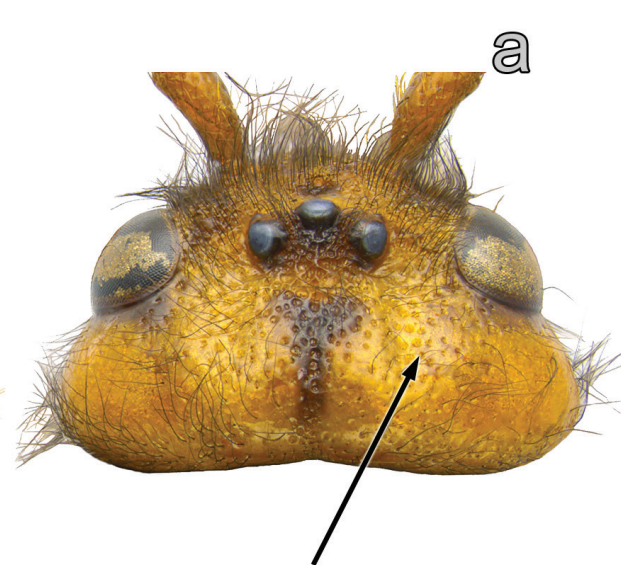
B4.52: *U. albicornis* ♂



B4.53: *U. albicornis* ♂



B4.54: *U. sah* ♂



B4.55: *U. californicus* ♂



B

B4.56: *U. sah* ♂



b

B4.57: *U. californicus* ♂



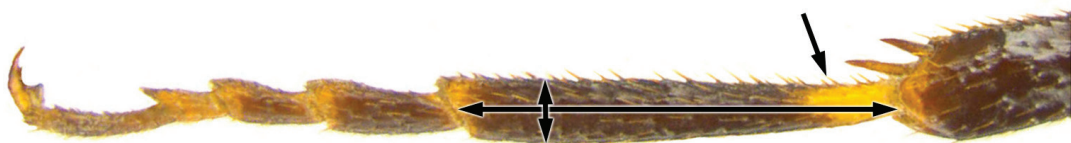
B4.58: *U. sah* ♂
B4.59: *U. californicus* ♂



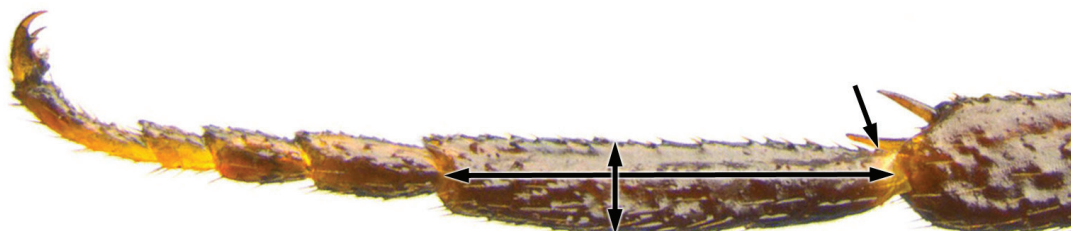
B4.60: *U. sah* ♂



B4.61: *U. californicus* ♂



B4.62: *U. flavicornis* ♂



B4.63: *U. albicornis* ♂



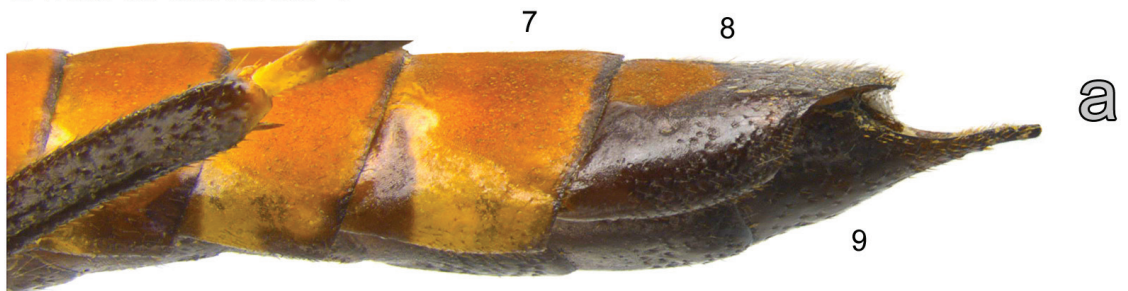
B4.64: *U. flavicornis* ♂



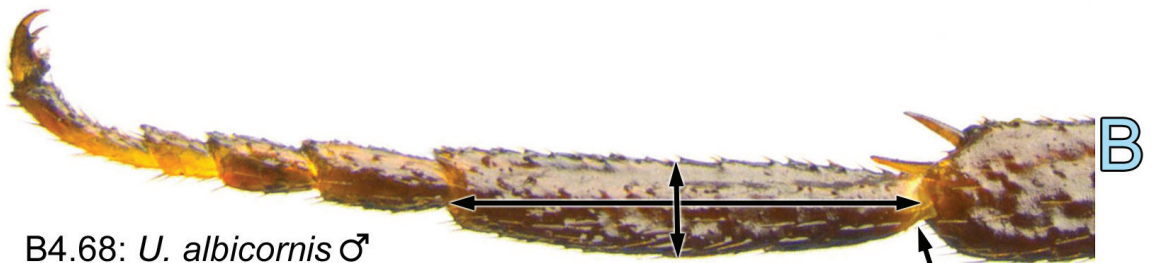
B4.65: *U. albicornis* ♂



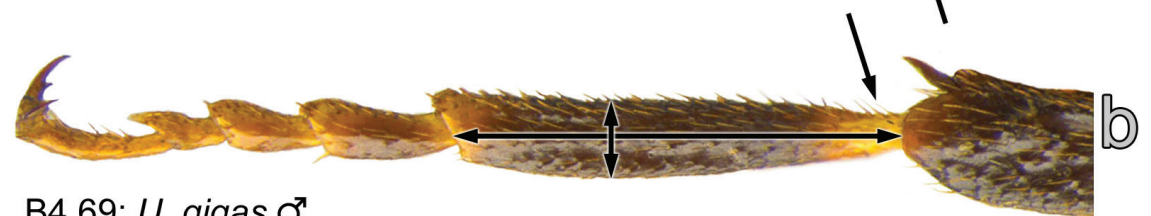
B4.66: *U. albicornis* ♂



B4.67: *U. gigas* ♂



B4.68: *U. albicornis* ♂



B4.69: *U. gigas* ♂

5. Key to Species of *Xeris*

- 1
 - A) Gena in dorsal view with lateral angle not prominent (Fig. B5.1), the maximum distance between outer genal edges at most about as wide as maximum distance between outer edges of eyes (Fig. B5.3).
 - B) Maximum eye height in lateral view 0.53–0.61 times maximum head height (measured from genal ridge) (Fig. B5.5).
 - C) **Female:** tibiae black and tarsi light reddish brown (Fig. B5.8).
 - D) **Female:** sheath with length of basal section about 0.5 times length of apical section (Fig. B5.11); apical section without longitudinal ridge between dorsal and ventral edges (Fig. B5.11, insert).
 - E) **Female:** ovipositor with pit on each annulus anterior to teeth annuli at apex (Fig. B5.14) and each pit with anterior apex extending toward preceding annulus as a shallow furrow (as in middle and end Fig. B5.14); sheath with junction of basal and apical sections aligned between annuli 8 and 9 of ovipositor.
 - *Xeris tarsalis* (Cresson, 1880)
- - a) Gena in dorsal view with lateral angle more prominent (Fig. B5.2); the maximum distance between outer genal edges at least slightly wider than maximum distance between outer edges of eyes (Fig. B5.4).
 - b) Maximum eye height in lateral view at most 0.51 times maximum head height (measured from genal ridge) (Figs. B5.6 and B5.7).
 - c) **Female:** tibiae and tarsi similar in color: black (Fig. B5.8) **or** light reddish brown (Fig. B5.10).
 - d) **Female:** sheath with length of basal section at most 0.46 times length of apical section (Figs. B5.12 and 13); apical section with longitudinal ridge between dorsal and ventral edges (insert in Fig. B5.13).
 - e) **Female:** ovipositor with pit only on apical 5–7 annuli anterior to teeth annuli (very small pit may be present on one or more additional annuli anteriorly) (Fig. B5.14); each pit with anterior end sharp and round, and shorter than 0.5 times annulus length (as in end Fig. B5.15); sheath with junction between of basal and apical sections aligned between 2 and 3, 3 and 4, or 4 and 5 annuli.
 - 2
- 2(1)
 - A) Wings darkly tinted over most or all of surface (Fig. B5.16).
 - 3
- - a) Wings very lightly tinted or clear except for lightly tinted apical 0.25 (Fig. B5.17).
 - [Note. Some specimens of *X. indecisus* could key through either alternate of this couplet.]
 - 5
- 3(2)
 - A) Gena below eye and genal ridge (including adjacent occiput) densely pitted (Fig. B5.18).
 - B) Gena with transverse ridge dorsal to mandible, broadly rounded and coarsely pitted (Fig. B5.20).
 - C) **Female:** legs black (Fig. B5.22).
 - D) **Female:** sheath with basal section 0.4 times as long as apical section (Fig. B5.24).
 - *Xeris tropicalis* Goulet, n. sp.
 - [Note. Male not known, but character A and B will help recognition.]
- - a) Gena below eye and genal ridge (including adjacent occiput) with or without a few pits, the surface shiny (Fig. B5.19).
 - b) Gena with transverse ridge dorsal to mandible narrow, sharp and mainly smooth (Fig. 5.21).
 - c) **Female:** at least tibiae and tarsi light reddish brown (Fig. B5.23).
 - d) **Female:** sheath with basal section at most 0.35 times as long as apical section (Fig. B5.25).
 - 4
- 4(3)
 - A) Gena narrow, its maximum length from eye to genal ridge at most 0.50 times as long as maximum eye length (Fig. B5.26).
 - B) **Female:** coxae and femora black (Fig. B5.28).
 - C) **Female:** flagellum brown or black in basal 0.3, gradually becoming light reddish brown in apical 0.6 (Fig. B5.30).
 - *Xeris morrisoni* (Cresson, 1880)

- a) Gena wide, its maximum length from eye to genal ridge at least 0.50 times as long as maximum eye length (Fig. B5.27).
- b) **Female:** coxae brown usually becoming reddish brown apically, and femora light reddish brown (Fig. B5.29).
- c) **Female:** flagellum entirely light reddish brown (Fig. B5.31).

.....*Xeris indecisis* (MacGillivray, 1893)

[Note. Only females with reddish brown abdomen have darkly tinted wings and all are from southwestern United States or South Dakota.]

- 5(2) A) Vertex between eye and postocellar furrows with large, densely spaced pits over most of surface (many pits polygonal) (Fig. B5.32).
- B) Gena below eye and genal ridge (including adjacent occiput) densely pitted; clypeus, face, frons and vertex with setae about 2.0 times as long as posterior ocellus (Fig. B5.34).
- C) **Female:** coxae black and rest of legs light reddish brown (Fig. B5.36).
- D) **Male:** metatibia with dorsal edge in lateral view very deeply indented in basal 0.3 (Fig. B5.39).

[Additional character. Pronotum in dorsal view with broad white longitudinal band along the lateral margin between anterior and lateral angles.]

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

- a) Vertex between eye and postocellar furrows with mostly small, more sparsely spaced pits over most of surface (pits round) (Fig. B5.33).
- b) Gena below eye and genal ridge (including adjacent occiput) with or without a few pits, the surface shiny; clypeus, face, frons and vertex with setae at most as long as posterior ocellus (Fig. B5.35).
- c) **Female:** coxae either completely light reddish brown (Fig. B5.37) **or** brown shifting to reddish brown apically (Fig. B5.38).
- d) **Male:** metatibia with dorsal edge in lateral view shallowly indented in basal 0.3 (Fig. B5.40).

..... 6

- 6(5) A) Gena with white spot behind eye (very rarely absent) not extending to genal ridge (Fig. B5.41).
- B) Gena with few, small pits between dorsal and ventral limits of genal ridge (Fig. B5.43).
- C) **Female:** abdomen black and coxae completely light reddish brown except near articulation of coxa to thorax (Fig. B5.45).
- D) **Female:** flagellum black, at most dark brown in apical 0.25 (Fig. B5.48).
- E) **Male:** femora mainly or completely light reddish brown (Fig. B5.51).

[Additional character. Pronotum in dorsal view with broad longitudinal band along lateral margin between anterior and lateral angles.]

..... 7

- a) Gena with white spot behind eye large, extending to genal ridge (Fig. B5.42).
- b) Gena with numerous, larger pits between upper and lower limits of genal ridge (Fig. B5.44).
- c) **Female:** abdomen black and coxae mainly brown laterally, becoming reddish brown near apex (Fig. B5.47) **or** abdomen mainly reddish brown and coxae reddish brown or procoxae at least brown laterally, becoming reddish brown apically (Fig. B5.46).
- d) **Female:** flagellum black, becoming light reddish brown (in specimens with black abdomen) (Fig. B5.49), **or** completely reddish brown (in almost all specimens with reddish brown abdomen and very rarely with those with black abdomen) (Fig. B5.50).
- e) **Male:** femora or at least metafemur completely or almost completely black (Fig. B5.52).

.....*Xeris indecisis* (MacGillivray, 1893)

[Note. Females with either black or reddish brown abdomens are found together except in southwestern United States where females with black abdomens have not been recorded.]

7(6) A) **Female:** sheath with basal section less than 0.25 times length of apical section (if 0.25–0.27, use B) (Fig. B5.53).

B) Range west of the cordillera from Alaska and British Columbia south to mountains of California and Northern Mexico, and east of cordillera in Alberta and perhaps as far east as north central Saskatchewan.

.....*Xeris caudatus* Cresson, 1865

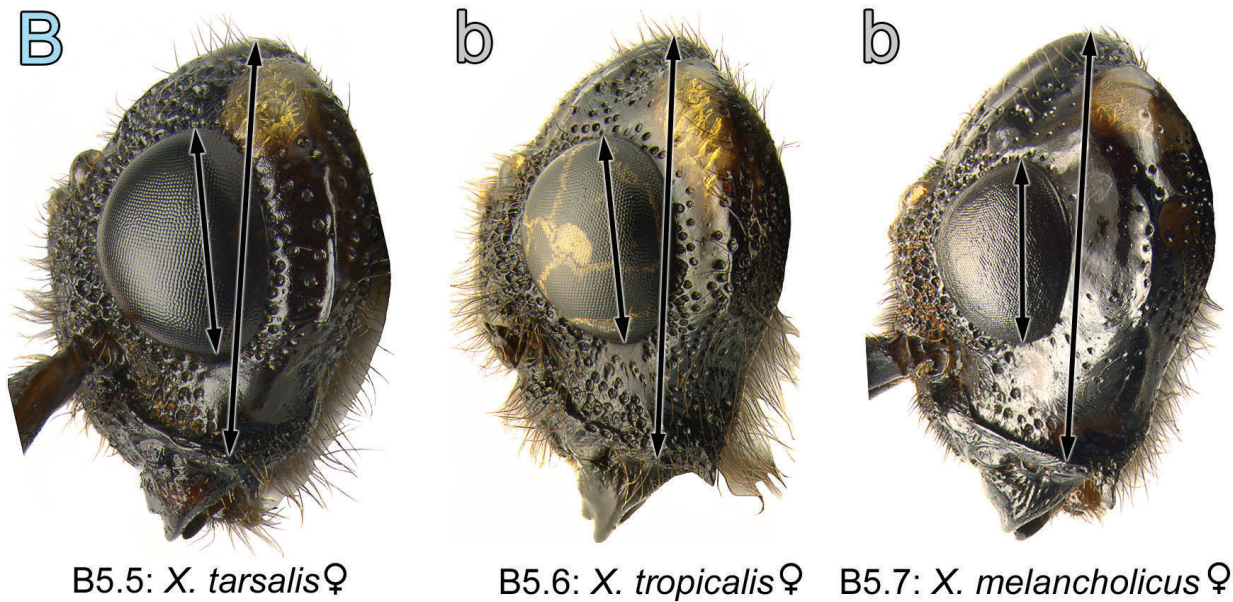
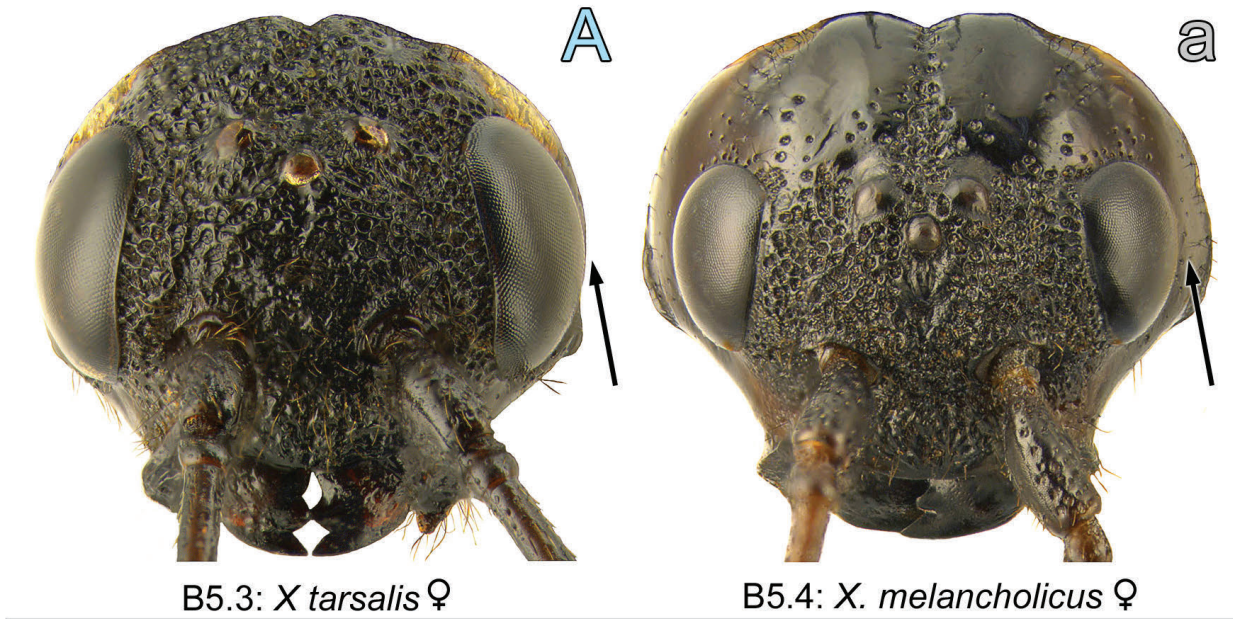
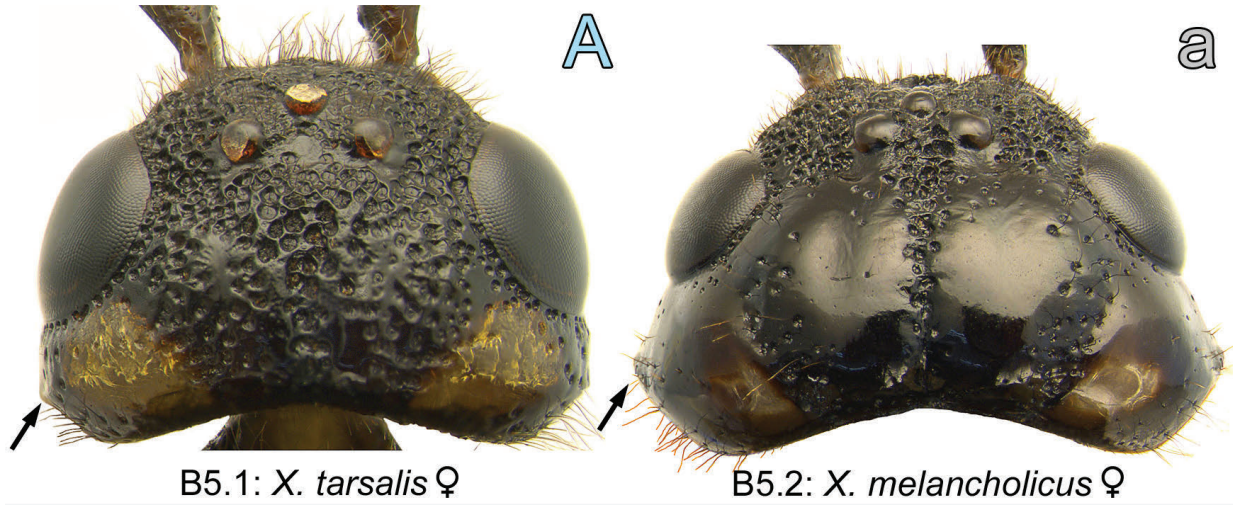
[**Note.** Both sexes are difficult to recognize on morphological features, but can be distinguished by the CO1 barcode sequence. The general range is a good indication. This species occurs in the Rocky Mountains westward. East of the Rocky Mountains, in central Alberta, both species occur sympatrically.]

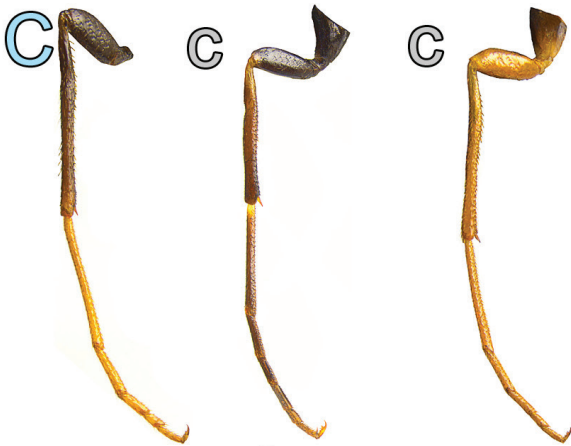
– a) **Female:** sheath with basal section more than 0.27 times length of apical section (if 0.25–0.27, use b) (Fig. B5.54).

b) Range from Alberta to Nova Scotia and south east of the prairie region Michigan to Maine.

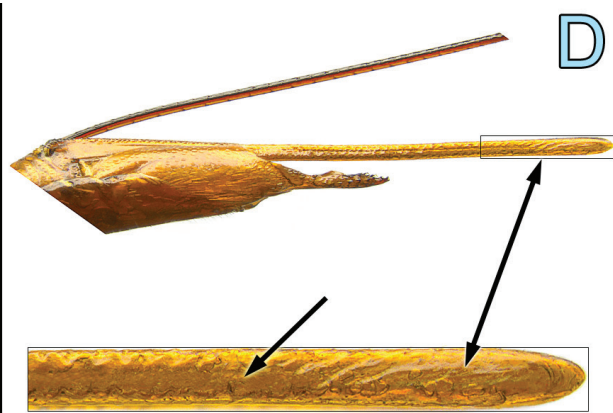
.....*Xeris melancholicus* (Westwood, 1874)

[**Note.** Both sexes are difficult to recognize on morphological features, but can be distinguished by the CO1 barcode sequence. The general range is a good indication. This species occurs east of the Rocky Mountains and is sympatric with *X. melancholicus* in central Alberta (perhaps as far east as north central Saskatchewan.)

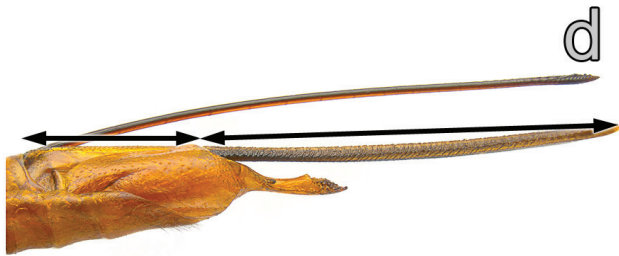




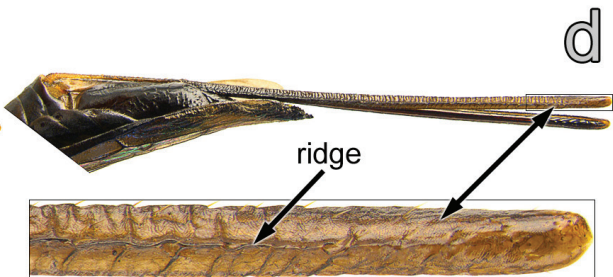
B5.8: *X. tarsalis* ♀
B5.9: *X. tropicalis* ♀
B5.10: *X. indecisus* ♀



B5.11: *X. tarsalis* ♀



B5.12: *X. tropicalis* ♀



B5.13: *X. melancholicus* ♀



base



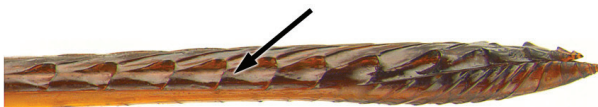
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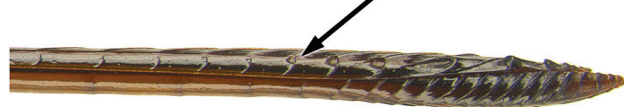
middle



middle



apex



apex

B5.14: *X. tarsalis* ♀

B5.15: *X. melancholicus* ♀



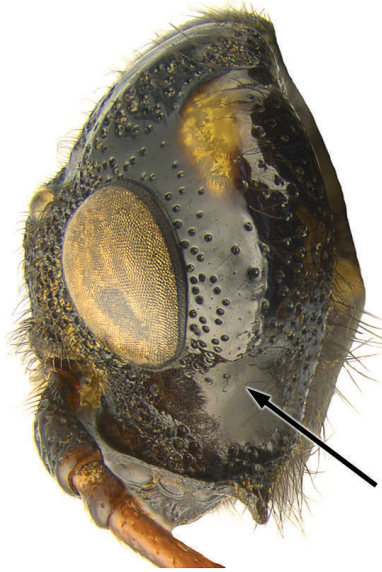
B5.16: *X. indecisus* ♀



B5.17: *X. melancholicus* ♀



B5.18: *X. tropicalis* ♀



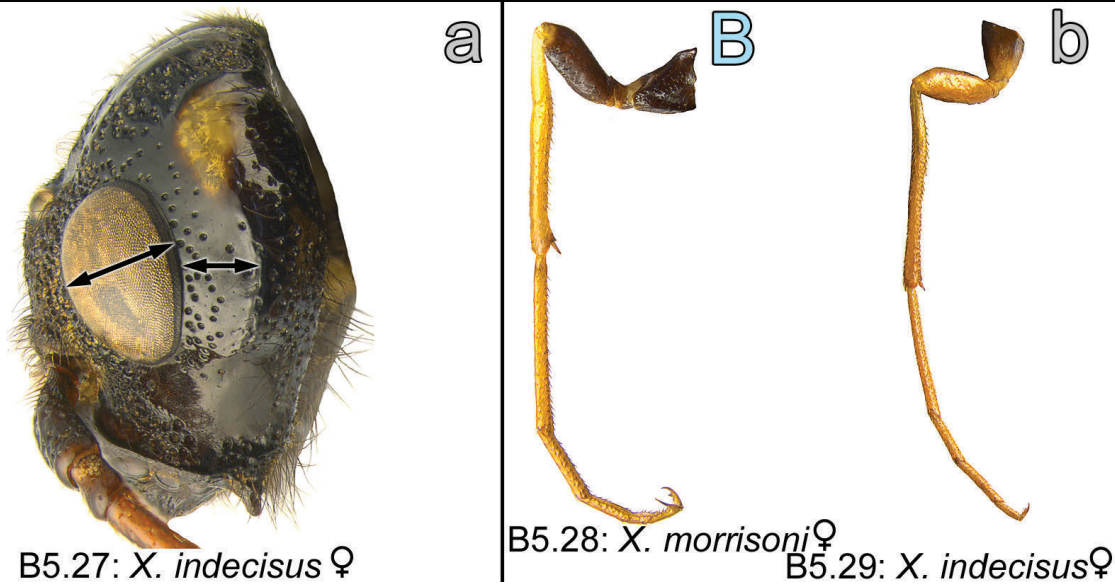
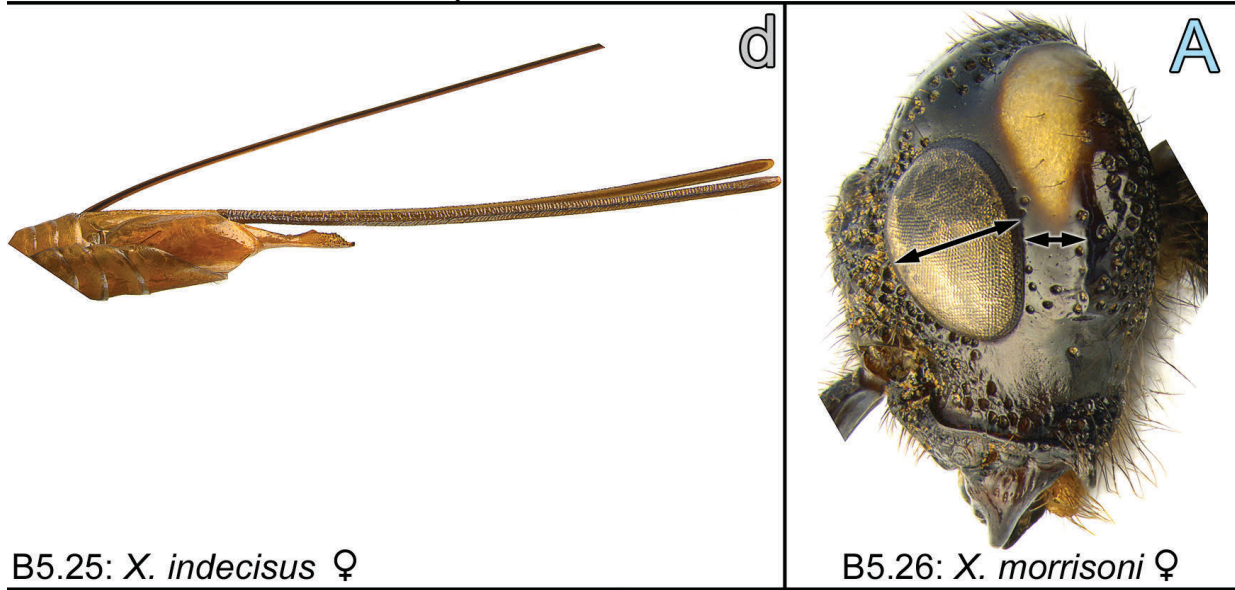
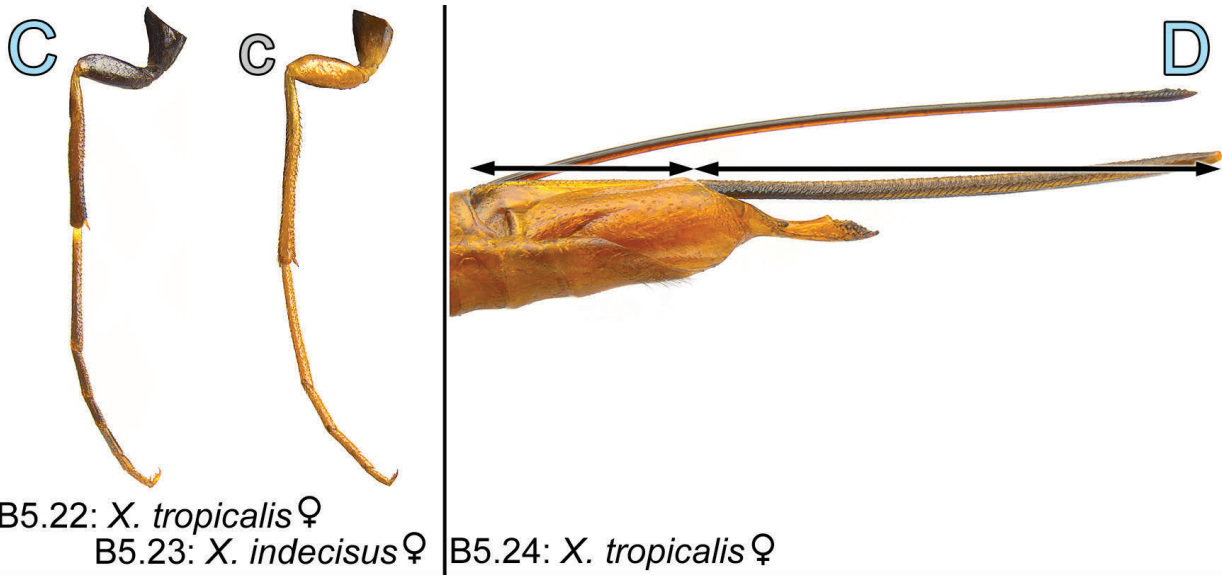
B5.19: *X. indecisus* ♀



B5.20: *X. tropicalis* ♀



B5.21: *X. indecisus* ♀





B5.30: *X. morrisoni* ♀



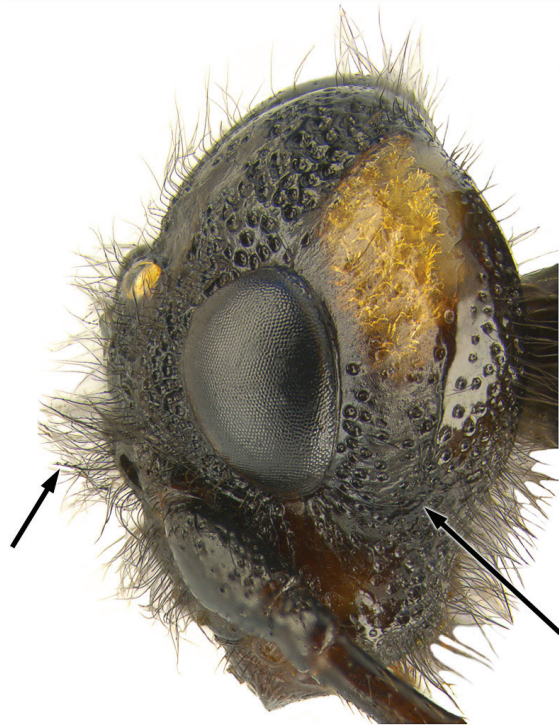
B5.31: *X. indecisus* ♀



B5.32: *X. chiricahua* ♀



B5.33: *X. indecisus* ♀



B5.34: *X. chiricahua* ♀



B5.35: *X. indecisus* ♀



B5.36: *X. chiricahua* ♀



B5.37: *X. indecisus* ♀



B5.38: *X. indecisus* ♀

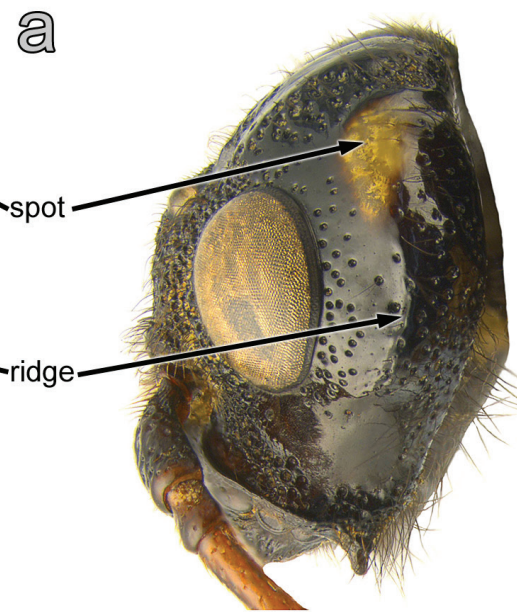


B5.39: *X. chiricahua* ♂

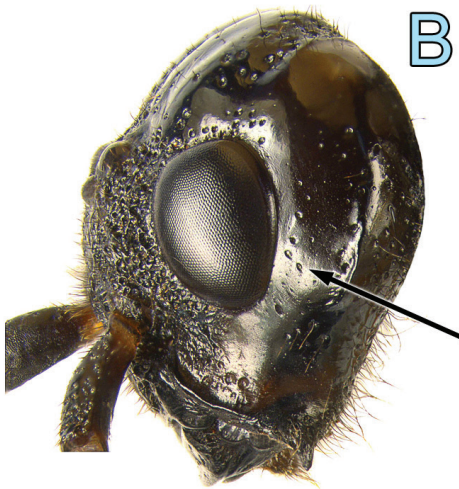
B5.40: *X. indecisus* ♂



B5.41: *X. melancholicus* ♀



B5.42: *X. indecisus* ♀



B5.43: *X. melancholicus* ♀



B5.44: *X. indecisus* ♀



B5.45: *X. melancholicus* ♀



B5.46: *X. indecisus* ♀



B5.47: *X. indecisus* ♀



B5.48: *X. melancholicus* ♀



B5.49: *X. indecisus* ♀

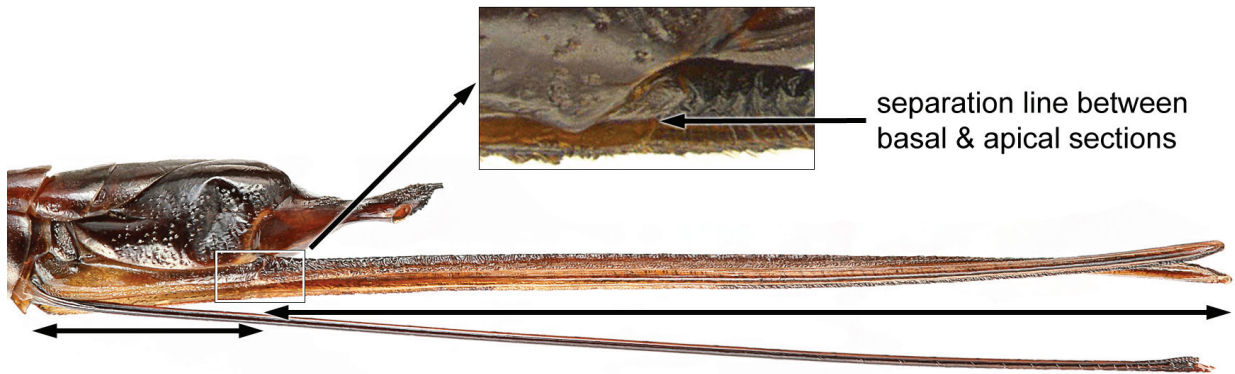


B5.50: *X. indecisus* ♀



B5.51: *X. melancholicus* ♂

B5.52: *X. indecisus* ♂



B5.53: *X. caudatus* ♀



B5.54: *X. melancholicus* ♀