

Microscopy and Spiders

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North America is home to approximately 3,700 species of spiders in 68 families (Reference 1). Spiders are common in my area and fortunately not all 3,700 occur here. At present I am quite happy to be able to place a spider in its correct family; getting into the correct genus is an added bonus.

This winter, January 2013, I found 2 tiny female spiders, A & B, that require some microscope work to even attempt identifications. The following sequence of alternate couplets is based on the keys in Reference 1.

Although this article is rather technical and deals with spiders I really just want to convey the message that very small animals, particularly Arthropods (insects, spiders, crustacea, etc.), make wonderful subjects for microscopy imaging. Also, examination via a microscope is often necessary to get an identification.

The Spiders

Spider A (Figure 1A) was collected on Jan. 9 and Spider B (Figure 1B) on Jan. 13.

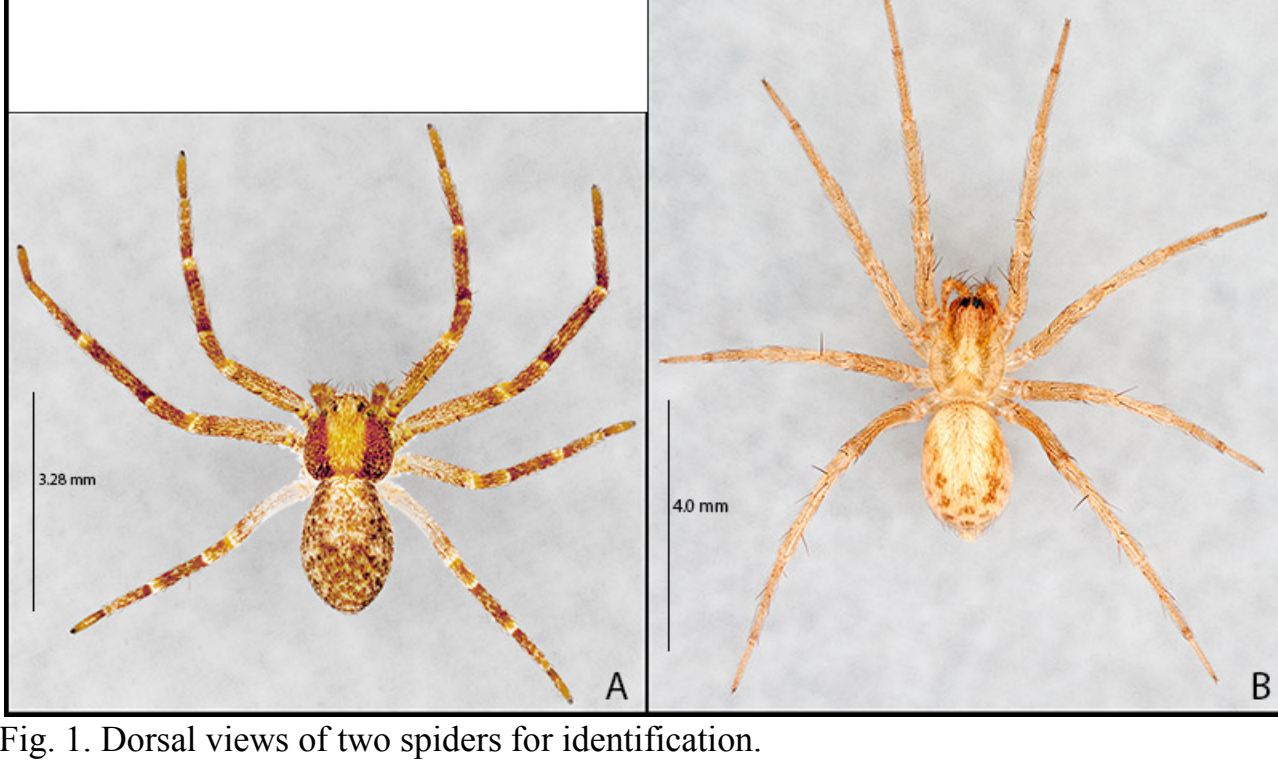


Fig. 1. Dorsal views of two spiders for identification.

Couplet 1:

a- fangs opposing each other; legs stout or slender....Araneomorphae...2

b- fangs parallel; legs stout.....

Both A & B are small spiders with slender legs (Figure 1), indicating placement in couplet 1a. Both have their fangs opposing rather than parallel (Figures 2 and 3), indicating 1a.

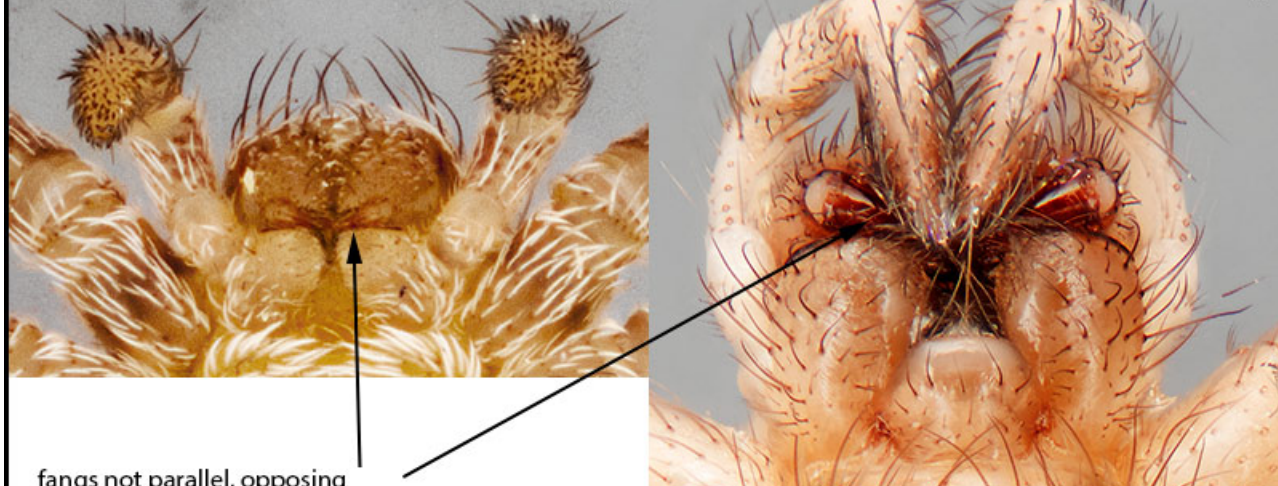


Fig. 2. Ventral views of anterior prosoma showing the chelicerae fangs with opposing tips.

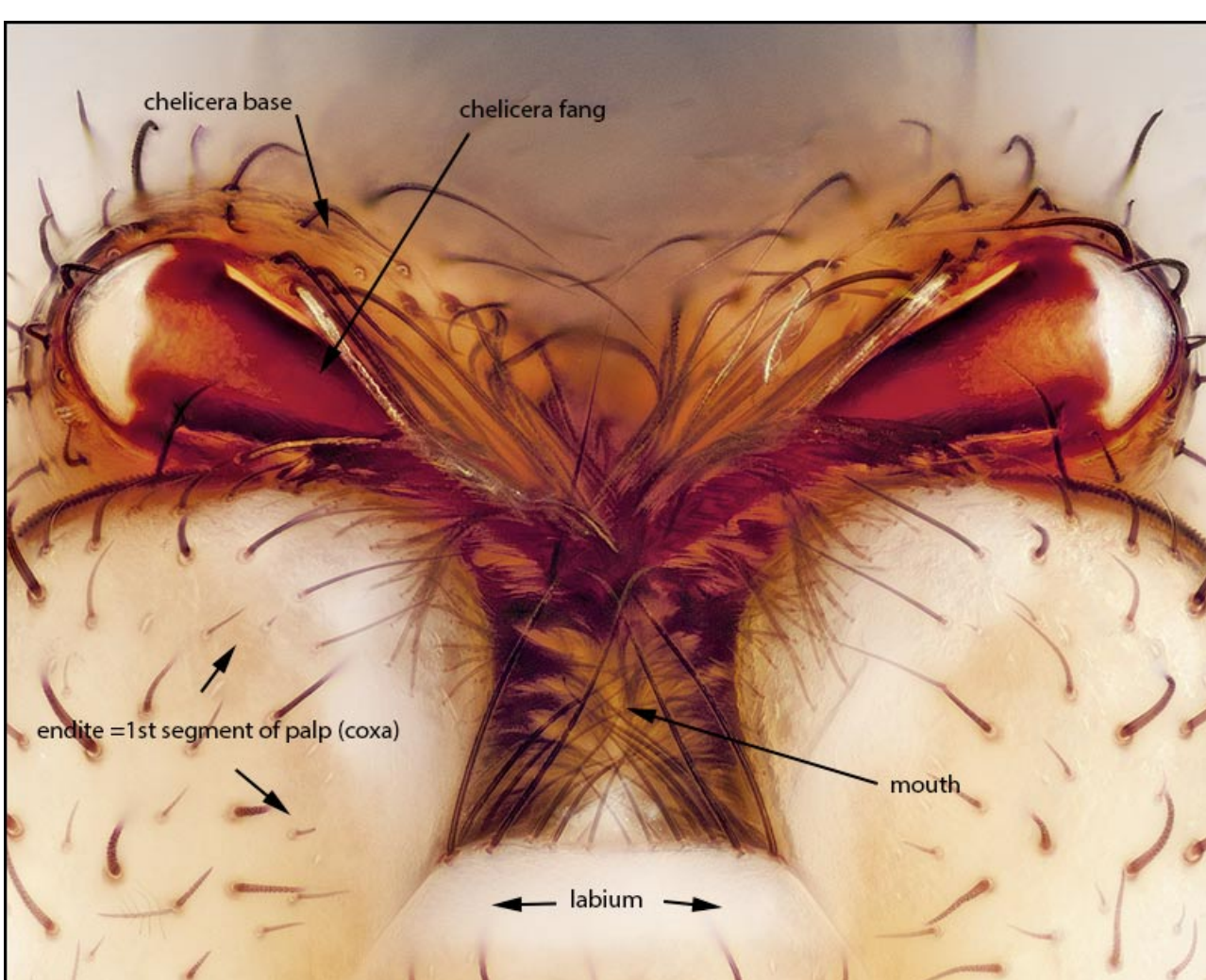


Fig. 3. Close-up of fangs of spider B, ventral view as Fig. 2B.

Couplet 2:

a- with a broad flat plate (cribellum) anterior to the spinnerets; a row of curved thick setae (calamistrum) on the dorsal surface of the one-from-last leg segment of leg 4 (metatarsus IV) for combing silk.....

b- lacking both the above features.....3

Both spiders lack cribella (Figure 4) and calamistra (Figure 5), both spiders go to couplet 3.

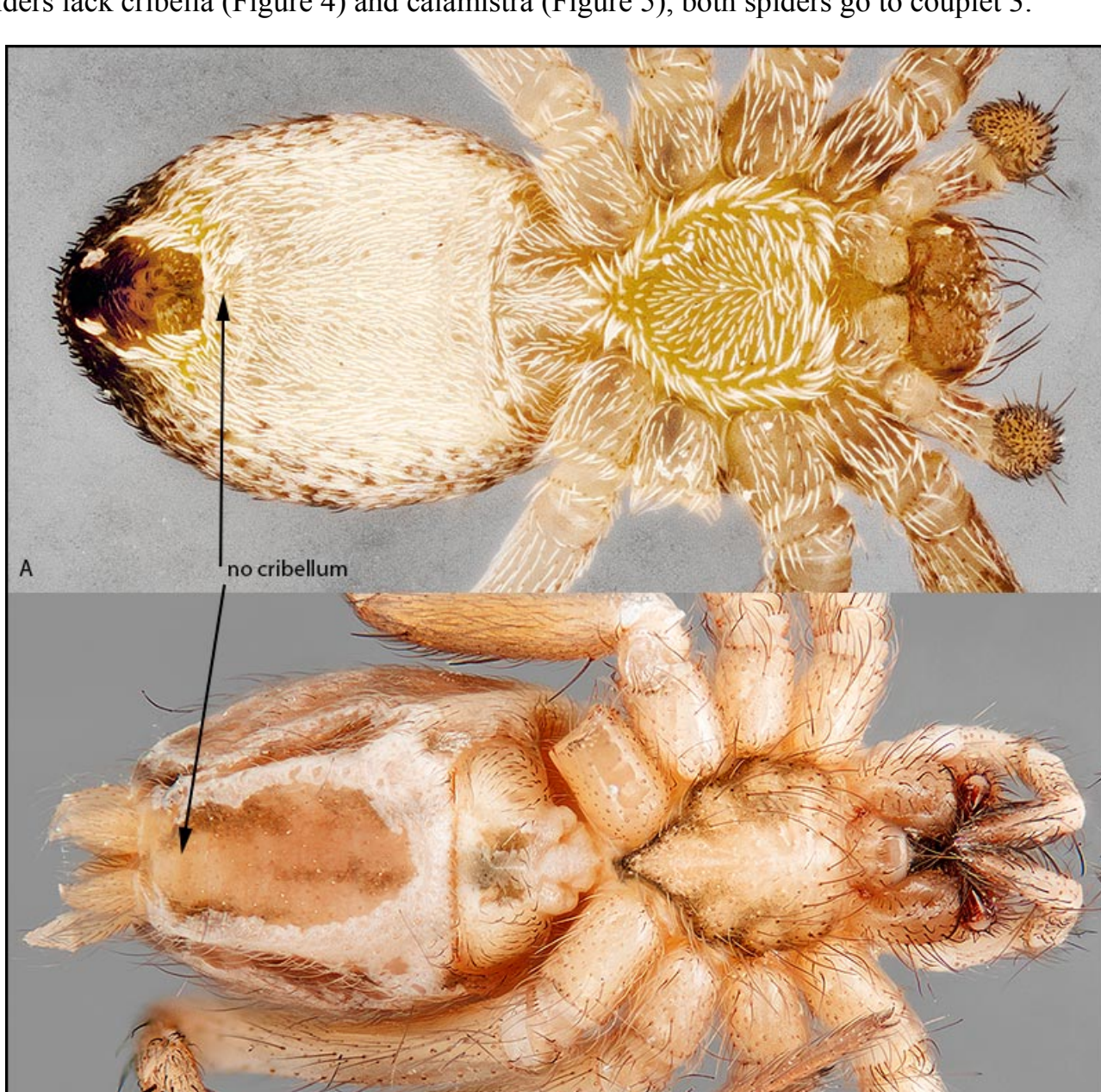


Fig. 4. Ventral views of bodies showing spinnerets and no cribella anterior to them.



Fig. 5. Side view of metatarsus IV of Spider A showing absence of calamistrum.

Couplet 3:

a- with 8 eyes...4

b- with fewer than 8 eyes....

An easily observed character, both specimens have 8 eyes (Figure 6).

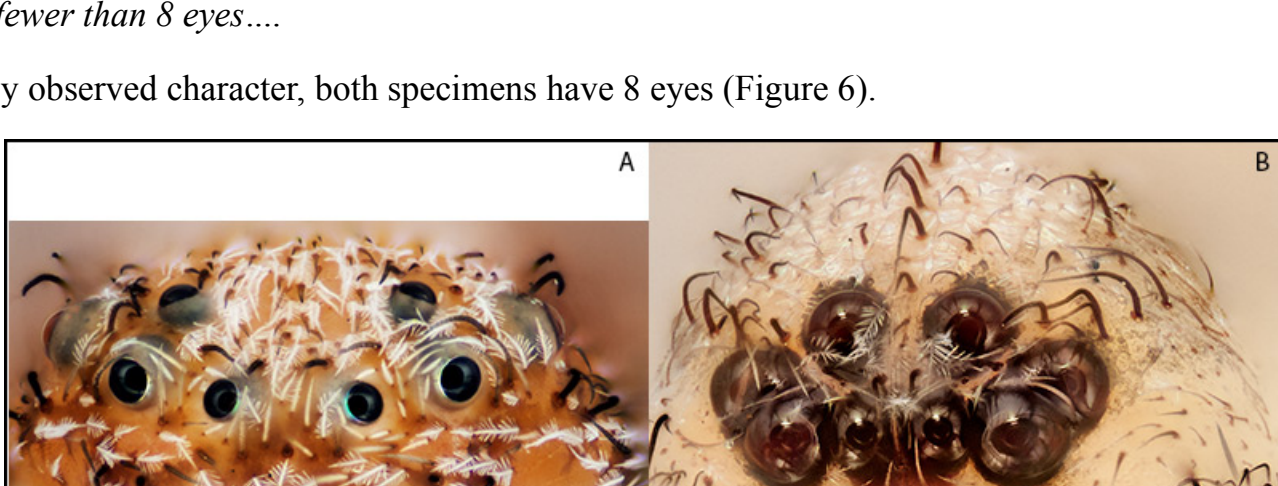


Fig. 6. Face view showing 8 eyes in each spider.

Couplet 4:

a- tarsi with 2 claws and tufts of dense hairs (claw tuft)....SPIDER A

b- tarsi with 3 claws, lacking claw tuft.....SPIDER B

Paired claws are found at the tip of the leg tarsi of all spiders. A third claw, unpaired, is found in some families and is a useful character for identification. On these small spiders relatively high magnification, *i.e.* 50x and 100x, was needed to see the claws (Figure 7). Spider A is a 2-spiders relatively high magnification, *i.e.* 50x and 100x, was needed to see the claws (Figure 7), whereas Spider B has 3-claws and no claw tuft (Figure 8).



Fig. 7. Tarsal claws on Spider A.

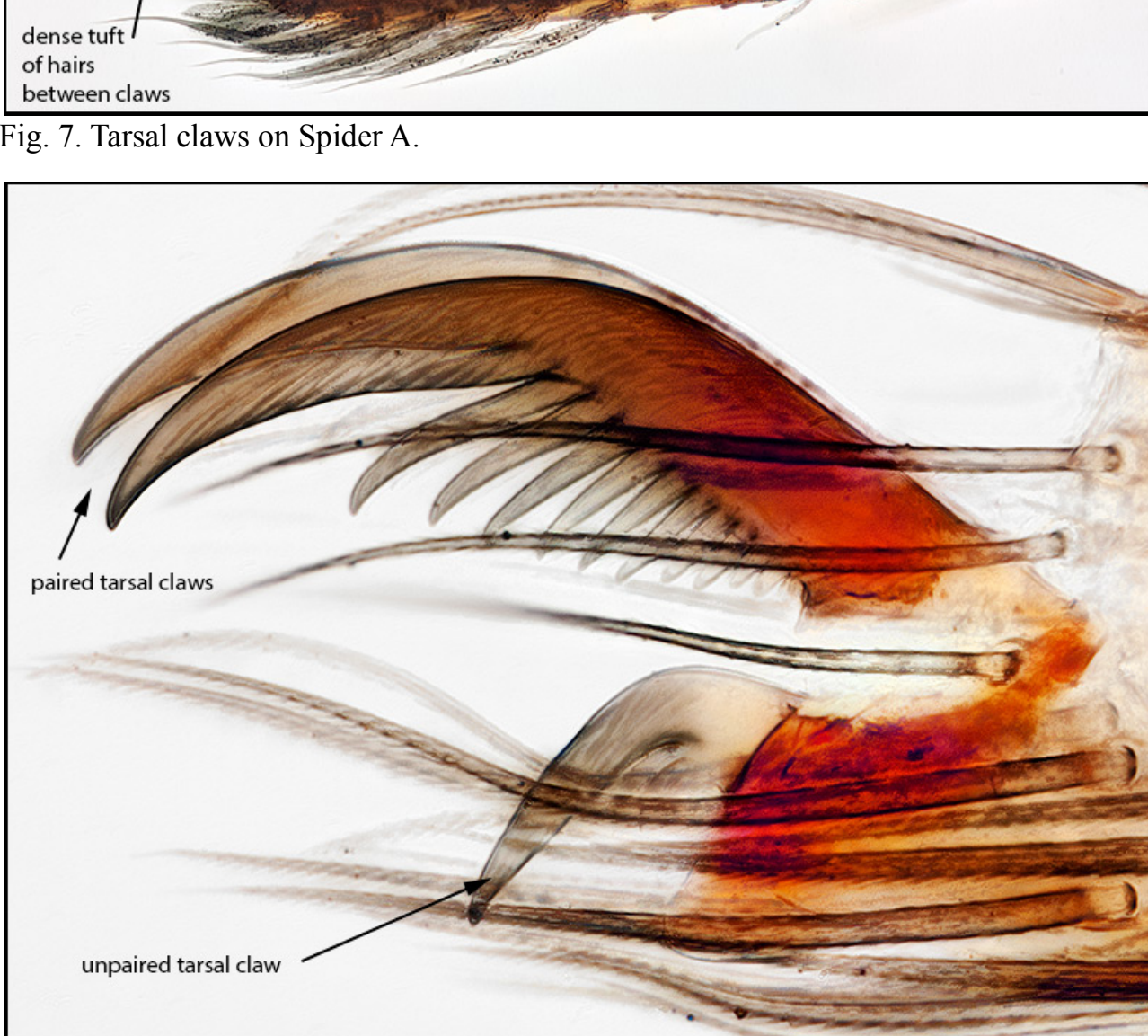


Fig. 8. Tarsal claws of Spider B.

SPIDER A

A Couplet 1:

a- legs extending laterally from body....A2

b- anterior legs directed forward, posterior legs directed backward ...

Compared with Spider B whose 1st and 2nd pair of legs are directed forward (Figure 1 B) those of Spider A have their bases extending more laterally from the body (Figure 1A); A couplet 1a.

A Couplet 2:

a- anterior median eyes (AME) similar in size to other eyes...A3

b- AME greatly enlarged, much larger than other eyes...

Figure 6A shows the AME of regular size, not greatly enlarged; A couplet 2a

A Couplet 3:

a- small spiders, less than 10 mm; posterior margins of chelicerae lack teeth....Family: **Philodromidae**...A 4

b- larger spiders (>10 mm); posterior margins of chelicerae with teeth....

Spider A has a body length of 3.8 mm, *i.e.*, small; posterior margins of chelicerae lack teeth (Figure 9); A couplet 3a.

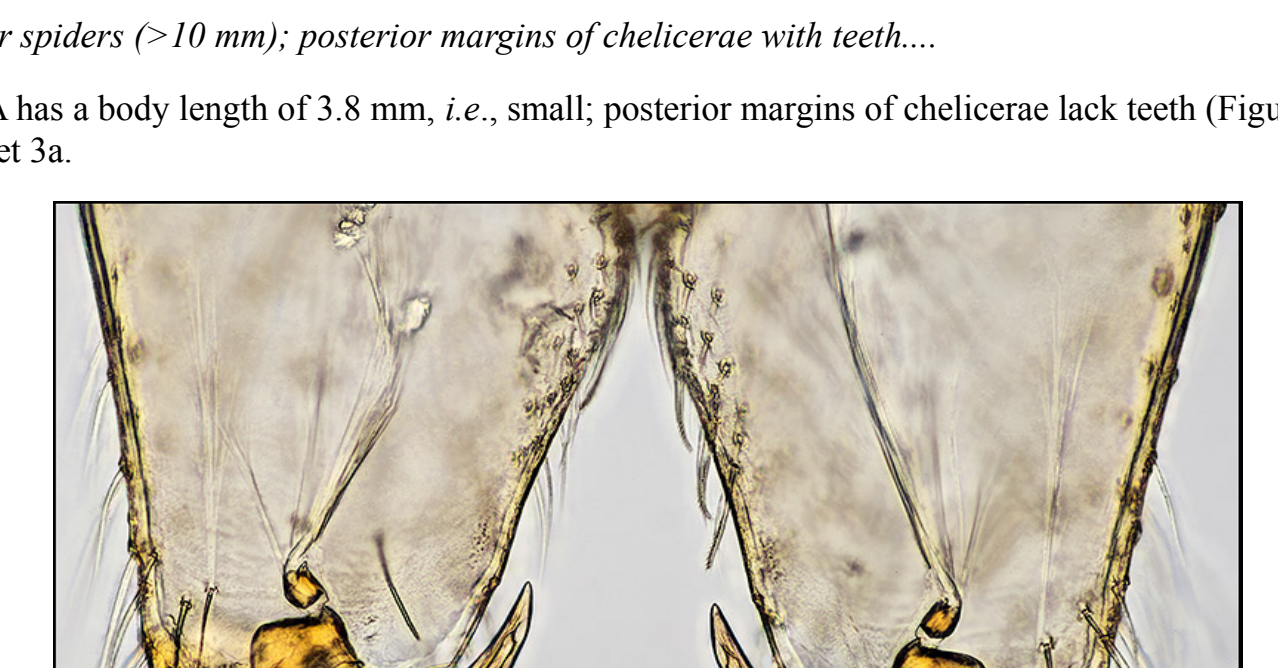


Fig. 9. Chelicerae tips from posterior, no marginal teeth. Compare with Fig. 10.

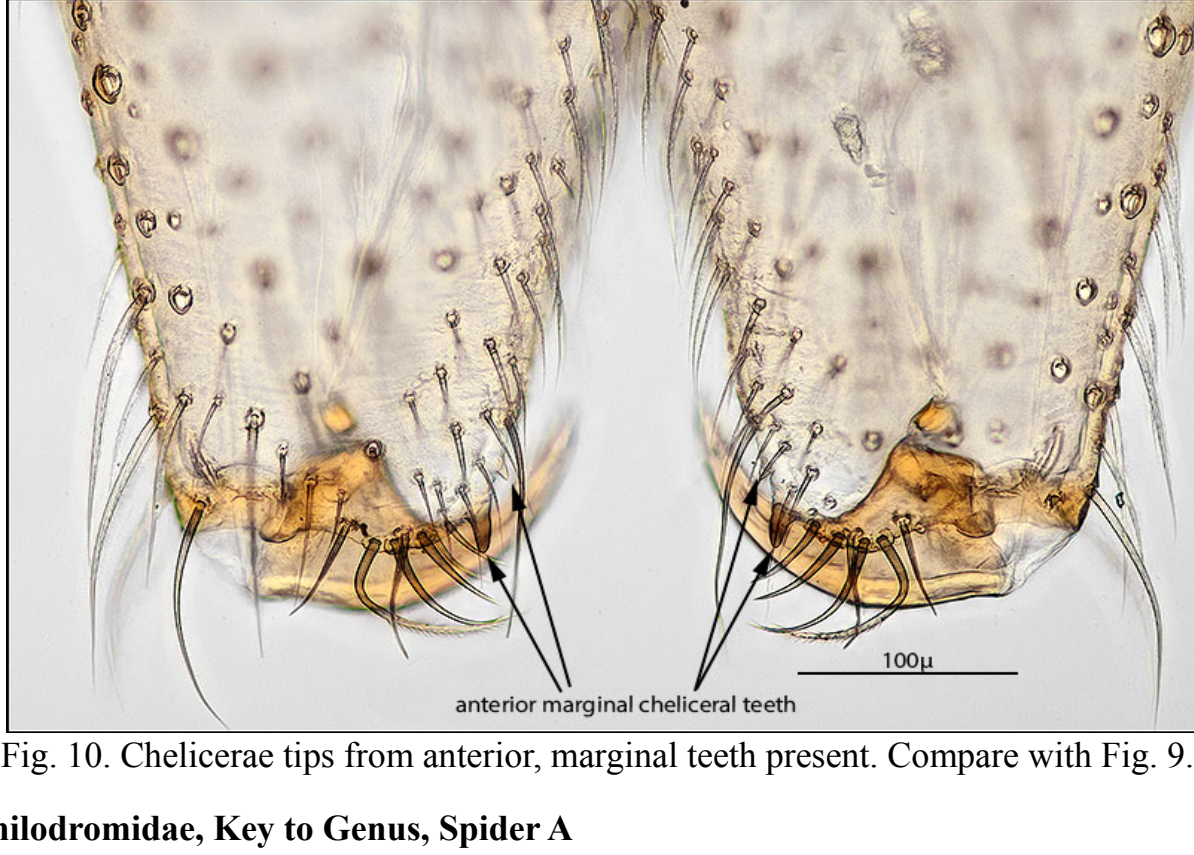


Fig. 10. Chelicerae tips from anterior, marginal teeth present. Compare with Fig. 9.

Family: Philodromidae, Key to Genus, Spider A

A Couplet 4

- a- posterior median eyes (PME) closer to posterior lateral eyes (PLE) than to each other...A5
- b- posterior median eyes as far from posterior lateral eyes as from each other...

Spider A has a large gap between the posterior median eyes such that they are much closer to the posterior lateral eyes than to each other (Figure 11, see also Fig. 6A); A couplet 4a.

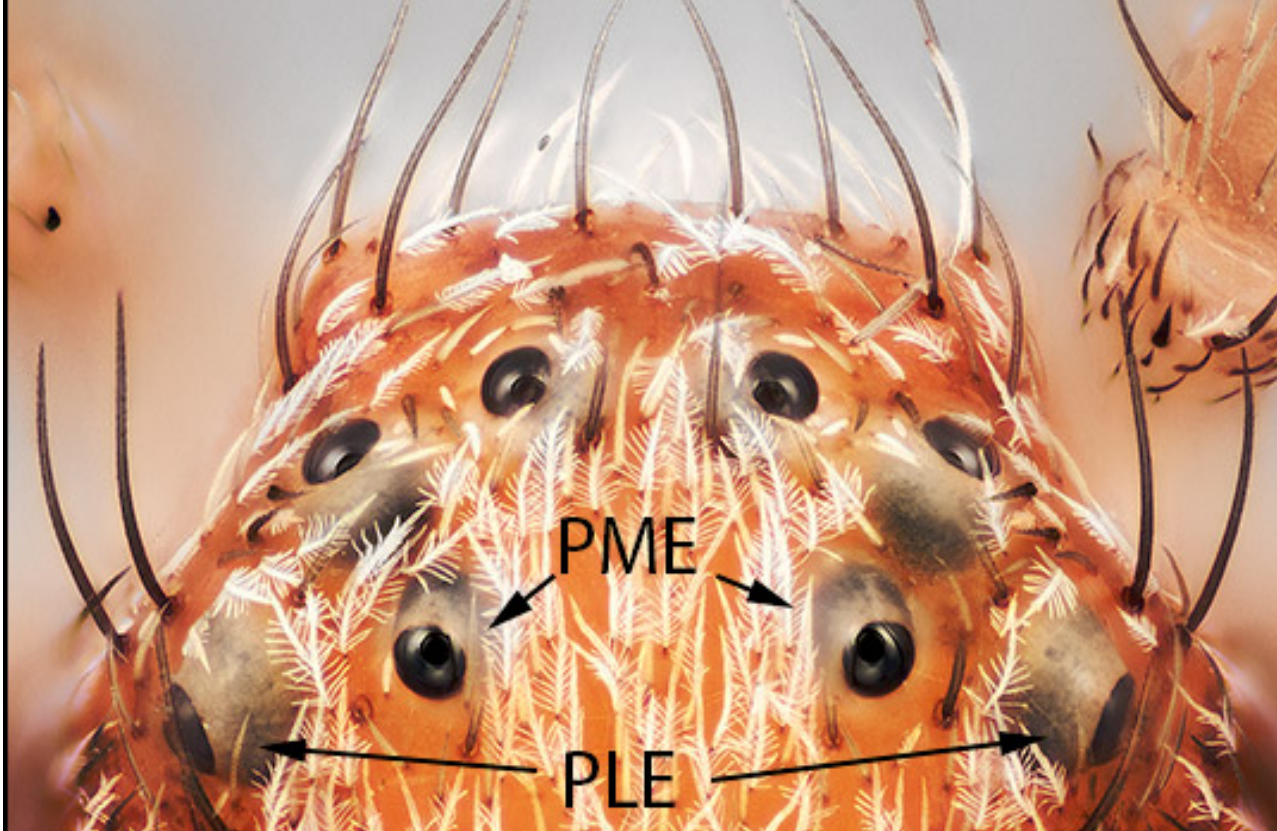


Fig. 11. Dorsal view of head of Spider A; note the posterior median eyes (PME) are closer to the posterior lateral eyes (PLE) than to each other.

A Couplet 5

- a- 2nd pair of legs less than twice as long as the 1st pair of legs....genus: *Philodromus*
- b- 2nd pair of legs twice as long as 1st pair...

Figure 1A, shows the 2nd pair of legs about equal in length to 1st pair; couplet 5a, genus *Philodromus*.

SPIDER B – I am unable to proceed any further with an identification even though I ran it through the keys and made the following images, in addition to those made earlier (Figures 1B, 2B, 3, 4B, 6B, 8), of characters that are used in the dichotomous keys:

chelicerae not fused at base...

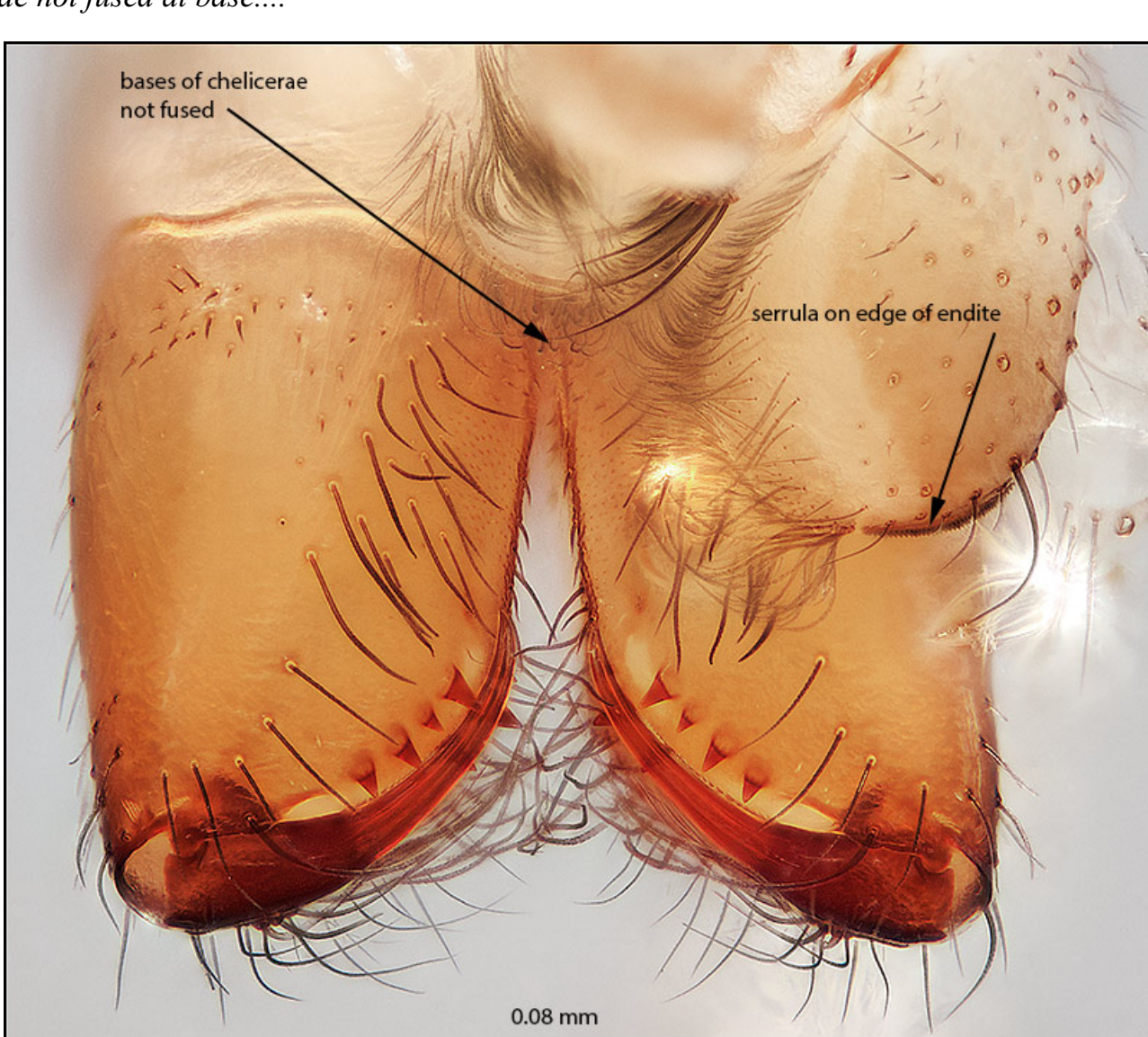


Fig. 12. Ventral (posterior) view of chelicerae, Spider B.

tarsi (last leg segments) with 2 or more trichobothria, trichobothria in dorsal row increasing in length distally....

[trichobothrium: a very slender sensory hair arising from a round pit and projecting vertically from the surface above the other hairs]

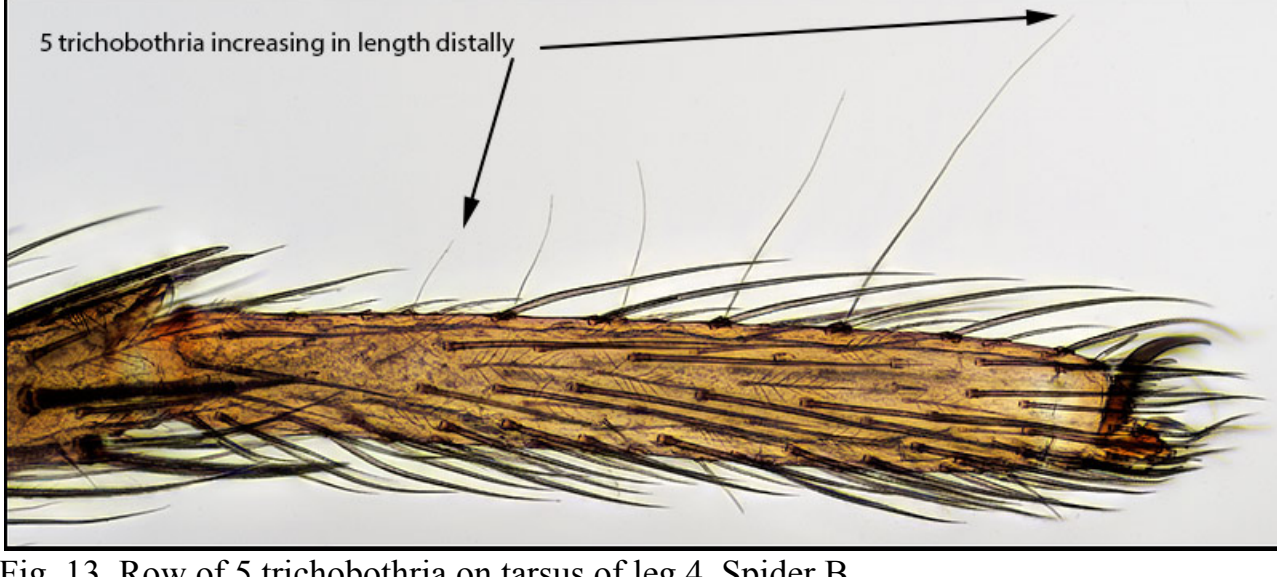


Fig. 13. Row of 5 trichobothria on tarsus of leg 4, Spider B.

endites (bases of the pedipalps) not strongly converging; serrula (a row of tiny teeth along the outer edge of the endite) present....

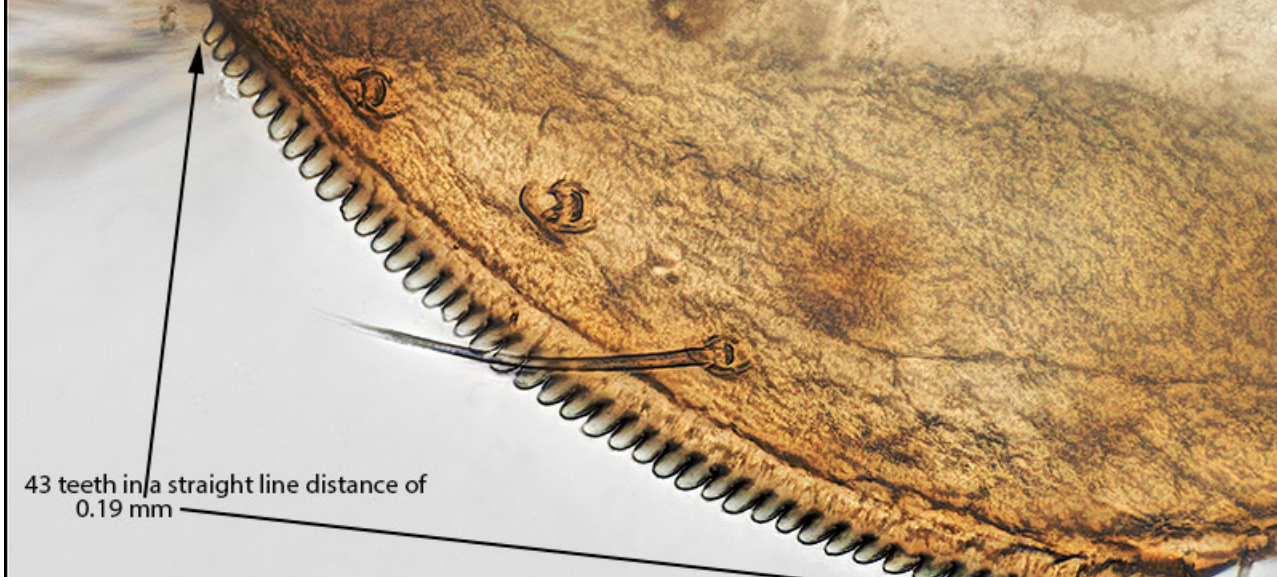


Fig. 14. Row of tiny teeth, serrula, along outer edge of endite, Spider B (40x obj + 3.3x relay lens).

Reference 1

Ubick, D., P. Paquin, P.E. Cushing, and V. Roth (eds). 2005. Spiders of North America: an identification manual. American Arachnological Society, Keene (New Hampshire). 377 pages.

Microscope and Photographic Equipment

My basic equipment is an Olympus BH2-BHS with 2x, 4x, 10x, 20x, 40x, 60x, and 100x objectives; Olympus 2.5x and 3.3x NFK relay lenses. I also have the components for Phase Contrast, DIC and Polarization. Camera is a full-frame Nikon D600 for the microscope; Nikon flash in place of Olympus' halogen lamp. For reflected light images I use Nikon CF objectives, El-Nikkor enlarging lenses, and a MF 105mm Micro Nikkor all on a Nikon PB-6 bellows with a Nikon D90 camera. Most images are stacks of several frames processed by Zerene Stacker.

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