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First description of the male of *Sphecotypus niger* (Perty, 1833), with notes on behavioral and morphological mimicry (Araneae: Corinnidae: Castianeirinae)

MATTHEW LEISTER & KELLY MILLER
Museum of Southwestern Biology, Division of Arthropods, MSC03 2020, University of New Mexico, Albuquerque, NM, USA 87131-0001. E-mail: mleister@unm.edu, kbmiller@unm.edu

The genus *Sphecotypus* O. Pickard-Cambridge, 1895, is currently represented by three species: *S. birmanicus* (Thorell, 1897) from Myanmar and Borneo, *S. taprobanicus* Simon, 1897 from Sri Lanka, and *S. niger* (Perty, 1833) from Central and South America. Of the three currently known species, only *S. birmanicus* has both sexes described, whereas the other two species are known from female specimens only, including the type species of the genus, *S. niger* (Deeleman-Reinhold 2001). Material recently examined from Costa Rica and Nicaragua included several specimens, including a male of *S. niger*, which is described here. The northern-most documented distribution of *S. niger* was Panama (Reiskind 1969; Platnick 2014). Thus, the specimens from Nicaragua extend the known range of these spiders further north.

Material and methods

Descriptions and terminology follow Reiskind (1969). All specimens were illustrated, examined and measured using Olympus SZ60 and Zeiss SteREO Discovery V8 dissecting microscopes equipped with ocular micrometers. Several ratios are also reported to provide an index of shape, including the following: carapace index = carapace width / carapace length × 100; sternum index = sternum width / sternum length × 100; abdominal index = abdominal width / abdominal length × 100. Ants typically exhibit a thinner, more elongate body than spiders; therefore, elongations of features often contribute to spider mimicry (Reiskind 1969, 1970; Rubio *et al.* 2013). Shape indices can also be used to help with species identification. Whereas overall size often varies within a species, shapes are often relatively stable (Reiskind 1969). Cephalic width was measured as the distance across the dorsal carapace at the level of the posterior eye row. All leg and pedipalp measurements were taken from left appendages and measured with the leg in lateral aspect. Leg lengths are reported in the text as: total length (coxa, trochanter, femur, patella, tibia, metatarsus, tarsus); pedipalp lengths are reported in the text as: total length (trochanter, femur, patella, tibia, tarsus). Tibia I ventral spination is denoted by two numbers, the first the number of prolateral ventral spines and the second the number of retrolateral ventral spines. The female epigynum was dissected using a #11 blade scalpel and cleared with lactic acid at room temperature until internal features were visible. Abbreviations used in the text and figures are: AER = anterior eye row; ALE = anterior lateral eyes; AME = anterior median eyes; CCon = Carapace constriction; CR = cephalic region; DS = dorsal sclerite; Em = embolus; ES = epigastric sclerite; ImS = inframamillary sclerite; PER = posterior eye row; PLE = posterior lateral eyes; PME = posterior median eyes; RTA = retrolateral tibial apophysis; SePr = setal projection; TAF = transverse abdominal folds; ThR = thoracic region; VS = ventral sclerite. The male specimen is deposited in the Museum of Southwestern Biology, Albuquerque, New Mexico (MSBA, K.B. Miller, curator). Female and juvenile specimens were examined from the Museum of Comparative Zoology, Cambridge, Massachusetts (MCZC, G. Giribet, curator). Co-ordinates for the female specimen were not available, and were estimated using Google Maps (maps.google.com).

Corinnidae Karsch, 1880

Sphecotypus O. Pickard-Cambridge, 1895

Sphecotypus O. Pickard-Cambridge, 1895: Type species, *Sphecotypus formicarius* O. Pickard-Cambridge, 1895 = *S. niger* (Perty, 1833).

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Measurements. Based on one male specimen: Body length 13.55. Carapace length 7.20, width 2.25; carapace index 31; cephalic width 2.00; sternum length 4.10, width 1.10; sternum index 26. Pedicel length 1.45, width 0.55. Abdomen length 5.20, width 2.20; abdominal index 42; anterior abdominal lobe length 1.85, width 1.85; posterior abdominal lobe length 3.35, width 2.20. Dorsal sclerite length 4.75, width 2.20. Epigastric sclerite length 1.90, width 1.75. Ventral sclerite length 2.15, width 0.90. Inframamillary sclerite length 0.75, width 1.20. Eyes: AME 0.21; ALE 0.15; PME 0.15; PLE 0.15; AME–AME 0.10; AME–ALE 0.10; ALE–ALE 1.00; ALE–PLE 0.50; PME–PME 0.30; PME–PLE 0.55; PLE–PLE 1.70. Leg formula: IV, I, II, III; Leg I, 12.75 (1.20, 0.40, 2.95, 0.80, 3.10, 2.50, 1.80); Leg II, 10.95 (1.10, 0.40, 2.75, 1.00, 2.30, 2.20, 1.20); Leg III, 10.80 (1.35, 0.35, 2.70, 1.00, 2.10, 2.20, 1.10); Leg IV, 15.15 (1.50, 0.40, 4.20, 1.00, 3.20, 3.55, 1.30); Pedipalp, 3.95 (0.30, 1.15, 0.55, 0.70, 1.25).

Female: body, color, shape, form as in male (Total body length 14.80); dorsal sclerite restricted to anterior abdominal lobe; ventral sclerite absent. Pedipalp dark red-brown to black, smooth, setose, terminating in single smooth tarsal claw. Tibia I ventral spination 3 – 3. Epigynum ventrally with two circular openings facing posteriorly; dorsally with spermathecae asymmetrical, medially contiguous, round, sac-like with short thick posterior necks pointing slightly lateral (Fig. 1H, I).

Natural history. A juvenile specimen from Nicaragua was examined that has an overall yellow-orange coloration with dorsal and ventral abdominal patterning of transverse dark bands. Legs are patterned with dark, lateral, longitudinal stripes, and black tarsi. The specimen is smaller (total body length = 4.80) but otherwise nearly identical in shape and form to adult specimens. Based on morphological similarities to adults of *S. niger*, and a known adult specimen from Nicaragua, this specimen most likely represents an immature *S. niger*.

Adult *S. niger* are believed to be batesian mimics using the large ponerine ant, *Pachycondyla villosa* (Fabricius, 1804) as the model (Oliveira 1986, 1988; Cushing 1997). The juvenile has morphological characters that also clearly mimic ants. It shares with the adults the same elongate and constricted carapace and abdomen. The observed patterning of abdominal stripes resembles the abdominal tergites on ants. Evidently, juveniles also mimic ants, but the smaller size and difference in color and pattern suggest a separate, distinct model from the adult, and, therefore, transformational mimicry (Mathew 1934).

The mimicry of *S. niger* is very convincing. When the first author collected the male from the wall of a building in Nicaragua it was initially mistaken for a large ponerine ant. The pedipalps were held anteriorly against the chelicerae, giving the appearance of ant mandibles, and, while at rest, leg I was held forward and bent at the patellar joint above the carapace, giving the distinct geniculate appearance of ant antennae. The constriction between the cephalic and thoracic region gave the impression of a distinct and separate ant head and thorax. The observed specimen was behaviorally similar to ants, also, as it walked in an erratic fashion with legs I raised and with constant alternating movements similar to antennal movements in ants. Similar observations in the field have been made for this species by others (Oliveira 1988). When frightened, however, the spider immediately abandoned the behavioral mimicry and utilized all legs for running. Similar behavior has also been observed in another species of Castianeirinae, *Myrmecotypus iguazu* Rubio & Arbinio, 2009, from Argentina (Rubio *et al.* 2013). In Brazil, *S. niger* was seen in close proximity to *P. villosa*, yet avoided direct contact with them (Oliveira 1988).

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