

ANEXO II

Revision of the ants of the genus *Simopelta* Mann

Mackay W.P. and Mackay E.

Mann described *Simopelta* as a subgenus of *Belonopelta* in 1922. Wheeler raised it to generic rank in 1935, where it remained until Baroni Urbani considered it a synonym of *Belonopelta* in 1975. Hölldobler and Wilson revived it from synonymy in 1990, and it has been considered as a valid genus since (Bolton, 1995). There have been several revisions of the genus (Wheeler, 1935; Gotwald and Brown, 1966; Baroni-Urbani, 1975).

The mandible of the worker has two apical teeth, which are approximately equal in size, and have acute tips. In most cases, there is a long diastema, or toothless gap, followed by a single basal tooth. Some species have three teeth, some four or five distinct teeth and one species has approximately six teeth. The species that have three or four teeth may have tiny denticles in the diastema. The tips of the teeth are often truncated. The maxillary palps are composed of two segments, the labial palps of two or three segments. The antenna has 12 segments, without a defined club (Figure 1), but the segments are usually larger toward the apex. The frontal lobes form a raised platform, fused with the medial part of the clypeus, which overhangs the remainder of the clypeus, or the apron (Figure 14). This medial part of the clypeus is usually angulate, and may even form a spine, which may be reduced in some members of a series or possibly broken. The eyes are small, and apparently composed of a single ommatidium in the workers.

The mesosoma of the worker is elongated, and the anterior edge of the mesonotum is often lower than

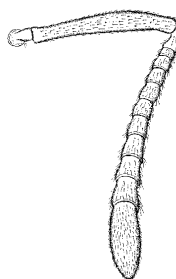


Figure 1

Antenna of a worker of *S. oculata*
(from Gotwald and Brown, 1966).

the posterior edge of the pronotum. The dorsal outline of the mesosoma is usually broadly concave; the metanotal suture is usually distinct and impressed. The propodeum is usually higher than the mesonotum and broadly rounded posteriorly (without spines). The anterior and posterior faces of the petiole are usually straight and vertical, and the apex may form a horizontal face. The subpetiolar process is well developed, and often triangular, with a concave posterior face, but may be quadrate. Each of the tibiae has a single, pectinate spur.

Fine, silver hairs are present on most surfaces of the worker, and may be appressed, decumbent, or even erect. Appressed, fine pubescence is sparse.

The workers of most species are coarsely sculptured, often with poorly defined striae or rugulae, which may be transverse on the dorsum of the head, as well as the dorsum of the mesosoma. The petiole generally has horizontal striae. The gaster is usually smooth and glossy. There is some variation in the sculpturing of the species, which is helpful in separating them.

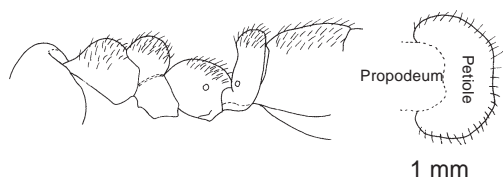


Figure 2

Side view of a female of *S. pergandei*.
The inset shows the petiole as seen from the front.

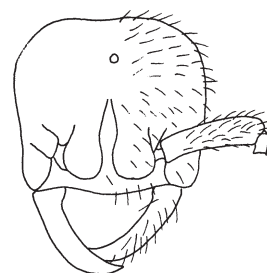


Figure 3

Head of a female of *S. pergandei*

Most workers are dark reddish-brown to black, occasionally the workers are medium brown to nearly yellow.

The females are known from only 3 species (*S. oculata*, *S. pergandei*, and *S. transversa*). Based on these three species, they are very unusual specimens, and do not resemble the workers, but are only slightly larger. They are dichthadiiform (Figure 2), with sickle-shaped mandibles (Figure 3), and broad, subquadrate heads, with reduced eyes (only slightly larger than the eyes of the workers), the ocelli are absent, or only the anterior ocellus is present, the antennae are shorter than those of the worker (both scape and funicular segments). The mesosoma is very unusual, with both the scutum (Figure 2) and scutellum (reduced in *S. pergandei*) being swollen and convex, when the mesosoma is viewed in profile (Figure 2). They are wingless. The petiole is narrow in profile, and greatly widened in frontal view (Figure 2), wider than the mesosoma, with a median sulcus, an emargination, or at least somewhat concave medially. The gaster is relatively large. The females are much less coarsely sculptured than the corresponding worker.

The male is unknown.

The larvae of *Simopelta* (based on *S. pergandei* and two unidentified species) can be ranked with those of *Leptanilla* and *Proceratium* as being the most aberrant and bizarre among the ants (Wheeler and Wheeler, 1957, 1964, 1986, 1989). They appear to be somewhat dipterous, and the presence of numerous tubercles appears to be the only

resemblance they have to other members of the tribe Ponerini. They are unique among the known ant larvae in the general shape of the body and shape of the thorax in particular, the partial retractability of the prothorax, complete absence of hairs, and the shape and position of the mandibles (Wheeler and Wheeler, 1957).

The relationship of this genus to other ant genera is difficult to discern. Wheeler (1935) considered it to be closely related to *Ponera*. Some larval characteristics, including the head shape, high antennae, and the lack of hairs on the head, suggest a relationship to *Leptogenys* (Wheeler and Wheeler, 1957). The shape of the mesosoma of the workers of most species is similar to that of the workers of *Leptogenys*. The poison apparatus of *Simopelta oculata* is distinctly like the army ants in appearance, and suggests a close relationship (Hermann, 1968). Specifically, the anterior end of the sting bulb extends anteriorly, as it does in most New World members of Ecitoninae. No other Ponerinae species are reported to possess this characteristic (Hermann, 1968). The paired gonostyli are also similar to those found in army ants (Hermann, 1968). The females are also dichthadiiform (Brady, 2003) and wingless, similar to those of the Ecitoninae, although this is probably due to convergence (Borgmeier, 1950; Gotwald and Brown, 1966). There is considerable question as to the evolutionary origin of these females (Peeters, 1991), although they are apparently not derived from the worker caste, based on morphological and theoretical evidence (Villet, 1989). Hopefully, the males will be discovered soon, and may help to

Table 1A comparison of the genera *Belonopelta* and *Simopelta* (modified from Brown, unpublished)

Characteristic	<i>Belonopelta</i>	<i>Simopelta</i>
Frontal lobes	Not raised	Raised
Eye	Ommatidia discernible in eye	Eye single convex facet
Mandible	With 4 - 5 large teeth in uninterrupted series, all intervals V-shaped	With 3 - 8 teeth, sizes irregular, largest gap round-bottomed
Maxillary palp	3-segmented	2-segmented
Metatibial spurs	Large spur plus small lateral spur	One pectinate spur
Arolium	Absent or undeveloped	Present, with bladder
Female	«Normal» alate, similar to worker	Dichthadiiform, very different from worker
Form of larva	Slender, <i>Ponera</i> -like in form (Wheeler and Wheeler, 1964), tuberculate, with paired viscidia on abdominal terga; mandible normal, with two teeth	Stout, with papillae or no tubercles; paired large viscidia absent; mandibles falcate, without medial teeth
Pupae	Enclosed in cocoons	Apparently lack cocoons
Colony size	Small, less than 30 workers	Large, reaching 1000 or more
Predatory behavior	Solitary predators on soft bodied arthropods	Act like army ants, raiding colonies of other ants.

place this genus in a proper relationship with the other genera of Ponerinae.

The genus has been traditionally considered closely related to *Belonopelta* (Borgmeier, 1950, Baroni-Urbani, 1975). It can be separated from *Belonopelta* by a number of characteristics (Table 1), including the shape of the mandibles and the lack of the small mesotibial and metatibial lateral spurs (Borgmeier 1950). The medial part of the clypeus extends as a lobe over the remainder of the clypeus, which is absent in *Belonopelta deletrix*. The petiole is either narrow, or very broad, with the anterior and posterior faces being nearly parallel, not with a broadly rounded anterior face, and a broad, slightly concave posterior face, outlined with carinae, as in *Belonopelta deletrix*. They also have erect or suberect hairs on many of the bodily surfaces, or at least decumbent hairs, whereas *Belonopelta deletrix* is nearly hairless. There are other similarities between the two genera, such as the angulate medial border of the clypeus, small eyes, relatively small frontal lobes, and small propodeal spiracle.

Once *Belonopelta* and *Simopelta* are separated, *Simopelta* becomes a relatively homogeneous group of ants, with a similar structure of the mandibles (numbers of teeth vary), diameter of eyes, and structure of the mesosoma (usually with dorsal outline concave, and propodeum rounded posteriorly). The species of *Simopelta* are easily separated into the two species complexes, *curvata*, with a narrow petiole, and *williamsi*, with a broad petiole (both as seen from the side).

Simopelta is interesting biologically. It is one of the few Ponerinae that lay an odor trail (Gotwald and Brown, 1967). It is one of the few genera of Ponerinae to exhibit group raiding behavior (Hermann, 1968), which is a definite army ant like behavior (Wilson, 1958; Djiéto-Lordon et al., 2001; Miyata et al., 2003), but also similar to that of the mass foraging *Leptogenys* species of the *diminuta* complex. Wheeler (1935) suggested that *Simopelta* may feed on small, soft-bodied insect larvae, or subterranean termites. *Simopelta oculata* is a predator on other ants, especially *Pheidole* species.

The nest population may reach 1000 or more workers, and probably does not exceed 2000 (Gotwald and Brown, 1966). There is generally only a single female, but one colony also had a callow queen (Borgmeier, 1950), which suggests that *Simopelta* reproduces by swarming (Gotwald and Brown, 1966). Most specimens are collected from litter or soil extractions, although they are occasionally collected in hollow twigs or branches, especially those laying on the soil surface. It may produce brood in phases, as do the army ants (Ravary and Jaisson, 2002).

In this anex, we divide the species of *Simopelta* into two species complexes, provide a key for the identification of workers, include illustrations and maps of all of the species, describe the female of *S. transversa*, and describe eleven new species, including *S. andersoni*, *S. breviscapa*, *S. fernandezi*, *S. laevigata*, *S. longinoda*, *S. longirostris*, *S. mayri*, *S. pentadentata*, *S. quadridentata*, *S. transversa*, and *S. vieirai*, with the total of the species in the genus now being twenty-one.

The museums used in the study, together with the associated curators (if applicable) are:

AMNH American Museum of Natural History, James Carpenter.

CASC California Academy of Science, Robert Zuparko.

CWEM Collection of William and Emma Mackay.

IAvH Collection of the Humboldt Institute, Villa de Leyva, Colombia, Tania Arias and Fernando Fernández.

INBio Institute for Biodiversity, San José, Costa Rica, Manuel Solís.

GBFM Graham Fairchild Museo de Invertebrados, Universidad de Panamá, Roberto Cambra, Diomedes Quintero.

LACM Los Angeles County Museum of Natural History, California, Weiping Xie, Roy Snelling.

MCZC Museum of Comparative Zoology, Harvard University, Stefan Cover.

MHNG Muséum d'histoire naturelle, Genève, Daniel Burckhardt.

MIZA Instituto de Zoología Agrícola, Maracay, Venezuela, John Lattke.

MZSP Museu de Zoologia da Universidade de São Paulo, Roberto Brandão.

NHMB Naturhistorisches Museum, Switzerland, Bernard Merz.

NHMW Naturhistorisches Museum, Wien, Stefan Schödl and Herbert Zettel.

QCAZ Museo de Zoología, Pontificia Universidad Católica del Ecuador, Juan Vieira.

USNM United States National Museum, Ted Schultz.

The measurements are as follows:

HL - Head length, from the anterior edge of the clypeus (disregarding the spine, if present) to the medial posterior border of the head.

HW - Head width, maximum.

Eye Length - maximum diameter.

Scape length - excluding basal condyle.

Total Length - maximum length, with the head in a vertical position and the mesosoma and gaster in a straight line.

Weber's length - length from anterior border of pronotum to posterior border of lobe of metapleural gland.

Lectotypes and paralectotypes were named in order to stabilize the nomenclature of members of this genus.

Species complexes

Members of *Simopelta* can be divided into two species complexes:

curvata species complex

The workers in this species complex are mostly small, with the total length usually being less than 4 mm (*S. mayri* is larger). The anterior medial border of the clypeus nearly always has an elongated spine or at least forms a sharp point. The dorsum of the mesosoma is slightly depressed, and the petiole is narrow.

Members of this species complex include *S. bicolor*, *S. curvata*, *S. mayri*, *S. minima*, and *S. pergandei*. *Simopelta bicolor*, a southeastern Brazilian species, can be recognized, as the mandibles have more than four teeth, and the two apicalmost teeth are not

noticeably separated from the other teeth. *Simopelta minima* is a tiny (Total Length 2.5 mm), southeastern Brazilian species. The other three species, *S. curvata*, *S. mayri*, and *S. pergandei* are larger (total length usually over 3 mm) and are found in Central America and South America. *Simopelta mayri* (Colombia) is larger (total length greater than 4 mm) and dark brown. *Simopelta curvata* (SE Brasil) is smaller (TL 3.5 mm) and has four mandibular teeth. *Simopelta pergandei* (Central and northern South America) is smaller (TL ~ 3 mm), medium brown, and has three mandibular teeth.

williamsi species complex

The workers of these ants are relatively large (total length approximately 4 - 5 mm). The anterior medial margin of the clypeus may be rounded, or slightly angulate, and may even have a spine. The mesosoma is broadly and strongly depressed between the pronotum and the propodeum, when viewed in profile. The petiole is relatively thick, when viewed in profile, and with the dorsal face sloping downwardly anteriorly.

Members include *S. andersoni*, *S. breviscapa*, *S. fernandezii*, *S. jeckylli*, *S. laevigata*, *S. laticeps*, *S. longinoda*, *S. longirostris*, *S. manni*, *S. oculata*, *S. paeminosa*, *S. pentadentata*, *S. quadridentata*, *S. transversa*, *S. vieirai* and *S. williamsi*.

Three of the species (*S. breviscapa*, *S. fernandezii*, and *S. longinoda*) have a relatively short mesosoma, with the length of the mesonotum being about 2/3 of the length of the dorsal face of the propodeum. The petiolar node (seen from above) is longer than broad, and noticeably narrowed anteriorly.

Simopelta longinoda from Costa Rica can be separated from the others by the relatively smooth and glossy dorsal face of the petiole. The node of the petiole of the southern Colombian *Simopelta fernandezii*, and Panamanian *S. breviscapa* is roughly sculptured. The short antennal scapes, which barely extend past the posterior lateral corners of the head, separate *S. breviscapa* from *S. fernandezii* (caution, *S. longinoda* also has short antennal scapes). The antennal scapes of *S. fernandezii* extend at least the first funicular segment past the posterior lateral corner.

The other species have a longer mesosoma, with the mesonotum being about the same length as the dorsal face of the propodeum. Two of these species are mostly smooth and shining. Of these, *S. manni* from northern Ecuador has coarse, dense punctures on at least the posterior part of the head; *S. laevigata* (Colombia) has only a few scattered, fine punctures in the same position. All of the other species are roughly sculptured, including the head.

Simopelta jeckylli (Ecuador and Brasil) has tiny, insignificant eyes, which are much smaller in diameter than punctures on the head; the other species all have larger, noticeable eyes (but still small). *Simopelta oculata* from Costa Rica has relatively large eyes (diameter 0.1 mm), and a coarsely and densely punctated head, *S. paeminosa* (Costa Rica and Panamá) has either a granulated head or the head is covered with poorly defined, longitudinal striae, and the dorsum of the postpetiole (first gastral tergum) is covered with coarse punctures. The remainder of the species have transverse striae on at least the posterior part of the dorsum of the head.

One of the remaining species in this complex, the Costa Rican *S. pentadentata*, has five mandibular teeth. Three of the species (*S. laticeps*, *S. andersoni* and *S. quadridentata*) have four mandibular teeth. Of these three, only *S. laticeps* (SW Colombia and N Perú) has a medial spine on the clypeus. Of the

remaining two Costa Rican species, *S. andersoni* has a relatively large eye (diameter 0.1 mm), *S. quadridentata* has a smaller eye.

Of the four remaining species (*S. transversa*, *S. longirostris*, *S. vieirai*, and *S. williamsi*), only one, the Colombian *S. transversa*, has long, suberect or erect hairs on the posterior tibia, some of which are as long as the greatest diameter of the tibia. The other three species have much shorter hairs, which are nearly appressed to the surface. The medial clypeal process of the southern Colombian and Ecuadorian *S. longirostris* is greatly elongated, and extends well past the remainder of the clypeus as a narrow lobe; the medial border of the clypeus in the other two species is broadly rounded. The sides and top of the petiole (seen from above) of *S. vieirai* from Colombia and Ecuador is barely sculptured, and mostly smooth and glossy, the same surfaces of *S. williamsi* are roughly sculptured with striae.

Key to *Simopelta* workers

1. Mandible with 6 or more teeth (Figure 4); bright ferruginous red, appendages, petiole, and gaster yellow; Brasil (Espírito Santo).....
..... *bicolor* Borgmeier
- Mandible with 3 - 5 teeth (Figure 5 and 6); usually dark, nearly black; widely distributed2
- 2(1). Mandible with 5 teeth (Figure 5), two apicalmost teeth well developed, remaining 3 teeth smaller (some may be broken or missing); Costa Rica
..... *pentadentata* Mackay and Mackay
- Mandible with 3 or 4 teeth (Figure 6), all approximately equal in size, if additional tooth is present, it is much smaller than others; widely distributed.....
.....3

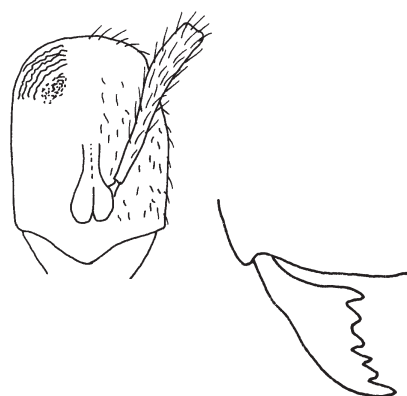


Figure 4
Head and mandible of a paratype worker of *S. bicolor*. Only a small portion of the sculpturing is shown on the head.

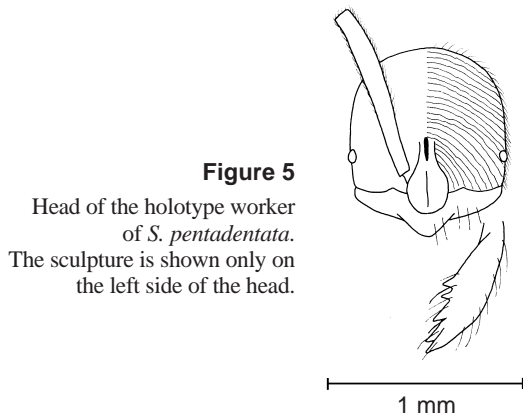


Figure 5
Head of the holotype worker
of *S. pentadentata*.
The sculpture is shown only on
the left side of the head.

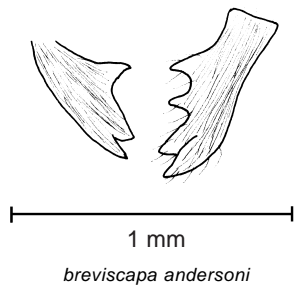


Figure 6
Mandibles of holotype workers
of *S. breviscapa* and *S. andersoni*.



Figure 7
Side view of a worker of *S. manni* (from Wheeler, 1935).

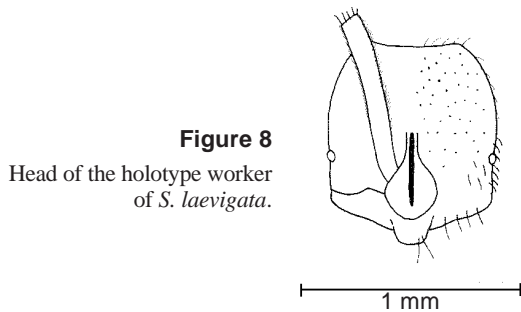


Figure 8
Head of the holotype worker
of *S. laevigata*.

- 3(2). Mandible with 3 teeth, approximately equal sized (Figure 6, left); relatively common..... 4
- Mandible with 4 teeth, approximately equal sized (Figure 6, right); rarely collected..... 17
- 4(3). Pronotum mostly smooth and shining, as are large part of anterior dorsum of head and various other parts of mesosoma (Figure 7); background may be punctated (Figure 8) or otherwise sculptured; black5
- Head and mesosoma, including pronotum, mostly roughly sculptured and more or less opaque (Figure 9); usually dark reddish-brown6
- 5(4). At least posterior ¼ of head punctated, pronotum with weak punctures; northern Ecuador *manni* Wheeler
- Head glossy and shiny from frontal lobes to posterior border of head (Figure 8); pronotum glossy; Colombia..... *laevigata* Mackay and Mackay
- 6(4). Eye (single ommatidium, maximum diameter ~ 0.1 mm) relatively large and conspicuous (Figure 9), greatest diameter greater than or equal to antennomere 4; dark brown; head densely and evenly punctate; dorsum of postpetiole (first segment of gaster) smooth and glossy; Costa Rica *oculata* Gotwald & Brown
- Eyes smaller (Figure 10), greatest diameter (usually less than 0.08 mm) distinctly less than greatest width of antennomere 4, if eyes larger, dorsum of postpetiole punctate, or head with transverse costulae or granulated..7
- 7(6). Posterior part of head, front of pronotum, mesonotum and propodeum more or less

- distinctly transversely striate or rugulose (Figure 5); median clypeal lobe without slender tooth or process (Figure 10); blackish brown8
- Head and mesosoma as seen from above uniformly and densely punctate or granulose, if striae are present, they are mostly longitudinal; tooth or process may be present on clypeus; color varies but often reddish...14
- 8(7). Suberect hairs on outer surface of posterior tibia (Figure 11) of two distinct lengths: shorter hairs 0,07 mm, longer hairs 0.13 mm; petiolar node wider than long (seen from above - Figure 13); western Colombia.....*transversa* Mackay and Mackay
- Suberect hairs on outer surface of tibia (Figure 12) all approximately same length (usually shorter than 0.07 mm), or absent.....9
- 9(8). Third tooth (basalmost) nearly always bluntly truncated (Figure 10); petiolar node usually square-shaped or circular (as seen from above); mesonotum approximately as long as dorsal face of propodeum (Figure 7) 10
- Third tooth (basalmost tooth) nearly always sharply pointed (Figure 14); petiolar node usually longer than broad (Figure 17) and narrowed anteriorly (seen from above); mesonotum shorter than propodeum (as seen from side - Figure 17).....12
- 10(9). Clypeal lobe elongated, projecting above clypeal apron (Figure 14); extreme southwestern Colombia and north central Ecuador.....*longirostris* Mackay and Mackay
- Clypeal lobe not elongated, rounded or slightly angulate (Figure 15), not greatly extending over clypeal apron..... 11

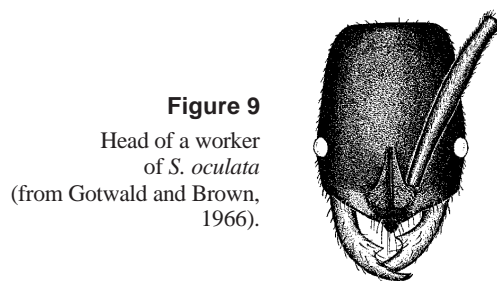


Figure 9

Head of a worker of *S. oculata* (from Gotwald and Brown, 1966).

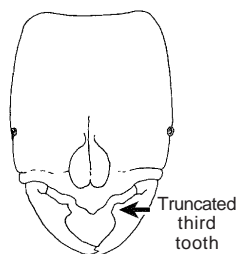


Figure 10

Head of a worker of *S. williamsi* (modified from Wheeler, 1935), showing the truncated mandibular tooth.

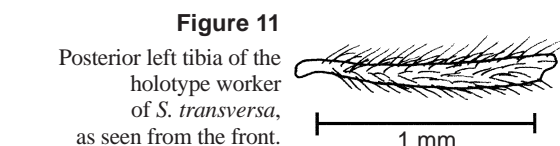


Figure 11

Posterior left tibia of the holotype worker of *S. transversa*, as seen from the front.

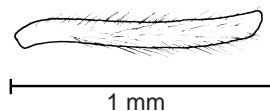


Figure 12

Posterior left tibia of a paratype worker of *S. breviscapa*, as seen from the front.

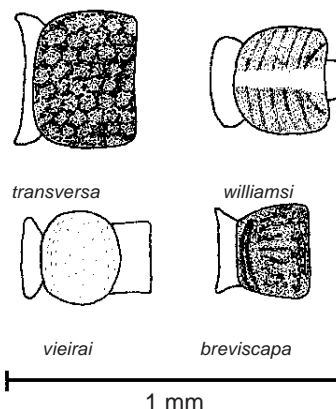


Figure 13

Petioles of workers of *S. transversa* (holotype), *P. williamsi* (Puntarenas, Costa Rica), *S. vieirai* (holotype) and *S. breviscapa* (paratype) as seen from above.

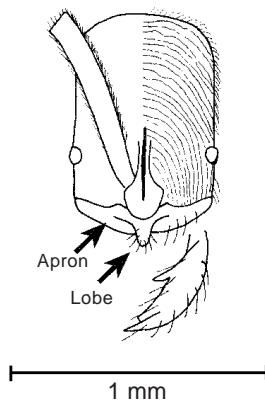


Figure 14
Head of the holotype worker
of *S. longirostris*.

Figure 15
Head of the holotype worker
of *S. fernandesi*.

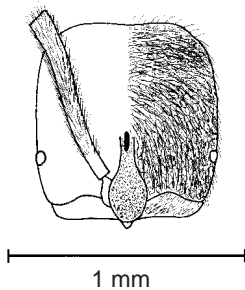
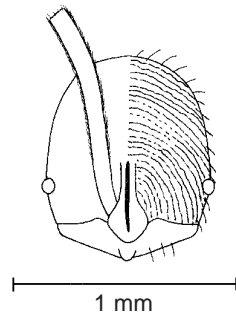


Figure 16
Head of the holotype worker
of *S. breviscapa*

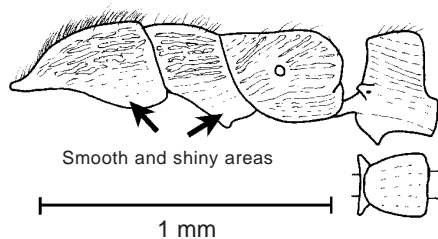
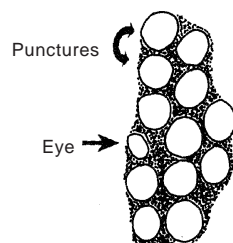


Figure 17

Mesosoma and petiole of the holotype worker
of *S. longinoda*, and the petiolar node as seen from above.

Figure 18
Side view of the eye and
surrounding region of
the head of a paralectotype
worker of *S. jeckylli*.



11(10).Side and top (Figure 13) of petiolar node
with distinct striae or rugulae; Costa Rica
south to Ecuador
.....*williamsi* Wheeler

- Side and top (Figure 13) of petiolar node
nearly smooth and glossy; Colombia and
Ecuador.....
.....*vieirai* Mackay and Mackay

12(9).Antennal scape elongate (Figure 15),
extending about 0.25 mm (more than length
of first 2 funicular segments) past posterior
lateral corner; southern Colombia.....
.....*fernandesi* Mackay and Mackay

- Antennal scape less elongate (Figure 16),
extending about 0.12 mm past posterior
lateral corner (less than length of first
funicular segment); Costa Rica and
Panamá.....
..... 13

13(12). Node of petiole (seen from above)
approximately as long as broad (Figure 13);
lower third of pronotum and mesopleuron
sculptured and moderately shining; dorsal
surface of propodeum covered with
transverse or longitudinal striolae; top of
petiolar node coarsely sculptured; Panamá
.....*breviscapa* Mackay and Mackay

- Node of petiole much longer than broad
(Figure 17); lower third of pronotum and
mesopleuron polished and shiny; dorsal
surface of propodeum granulated; dorsum
of petiole nearly smooth and glossy (Figure
17); Costa Rica
.....*longinoda* Mackay and Mackay

14(7).Larger species (head width usually > 0.66
mm, total length > 4 mm); punctures of head,
mesosoma and node of petiole coarse,
separate punctures of head larger than eye
(Figure 18); color ferruginous red to black,
with contrasting yellow, red or brown gaster
and appendages; anterior medial clypeal
margin with sharp tooth; Ecuador (Orellana);
Brasil (Rondônia).....*jeckylli* (Mann)

- Usually smaller species (head width often < 0.66 mm; total length usually less than 4 mm); punctuation fine and shallow, separate punctures of head about 1/3 size of eye (Figure 19), or head granulose, or with predominantly longitudinal striae; color yellowish-brown to dark brown; clypeus with or without tooth; Central America south to Brasil.....15

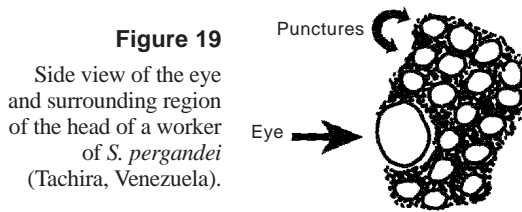


Figure 19
Side view of the eye and surrounding region of the head of a worker of *S. pergandei* (Tachira, Venezuela).

- 15(14). Yellowish to reddish brown; head finely punctate; petiole narrow as seen from side (Figure 20); dorsum of postpetiole (first tergum of gaster) with tiny, sparse punctures16

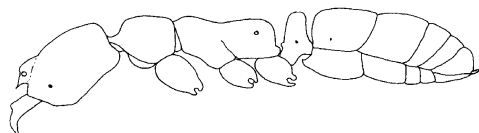


Figure 20
Side view of a worker of *S. pergandei* (from Wheeler, 1935)

- Dark reddish black; head granulose, or with poorly defined, longitudinal striae or rugae; petiole thick as seen from side (Figure 21); Dorsum of postpetiole (first gastral tergite) punctate (Figure 21); Costa Rica and Panamá*paeminosa* Snelling

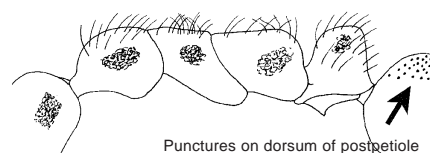


Figure 21
Mesosoma, petiole and part of the postpetiole (first gastral tergum) of a paratype worker of *S. paeminosa*. The sculpture is shown only on small portions of the body.

- 16(15). Small (total length less than 2.5 mm); head elongate ($0.73 \geq HW/HL \geq 0.78$); dorsal surface of mandibles smooth and glossy; Bahia, Brasil *minima* (Brandão)

- Larger (TL > 3 mm); head less elongate ($HW/HL > 0.8$, excluding spine); dorsal surface of mandibles dull, covered with striolae; Guatemala south to Venezuela (Tachira) and Colombia (Magdalena) *pergandei* (Forel)

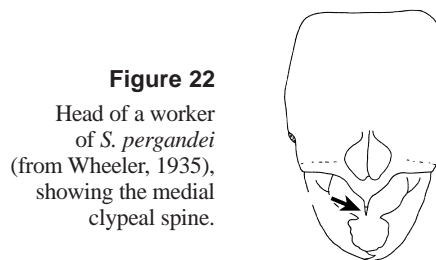


Figure 22
Head of a worker of *S. pergandei* (from Wheeler, 1935), showing the medial clypeal spine.

- 17(3). Clypeus with well developed medial tooth (Figure 24); Perú and Brasil..... 18

- Clypeus without medial tooth, broadly rounded anteriorly (Figure 26); Costa Rica (Puntarenas)20

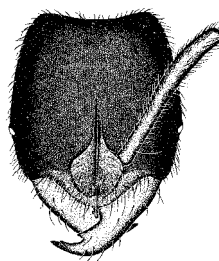


Figure 23
Head of a worker of *S. laticeps* (from Gotwald and Brown, 1966).

Figure 24
Head of a worker of *S. curvata*, showing the clypeal tooth.
The inset shows the mandible as seen from the front.

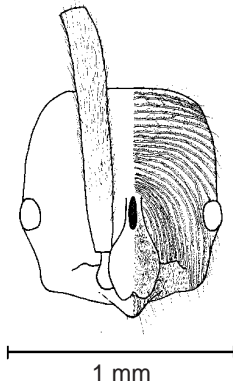
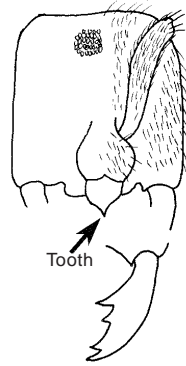


Figure 25
Head of the holotype worker of *S. andersoni*.

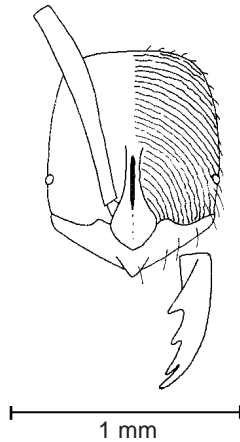


Figure 26
Head of the holotype worker of *S. quadridentata*, with the mandible.

- 18(17).Posterior margin of head distinctly concave in middle, as seen in full-face view (Figure 23); southwestern Colombia and northern Perú
.....*laticeps* Gotwald & Brown
- Posterior margin of head nearly straight, as seen in full-face view (Figure 25); Colombia (Nariño), southern Brasil (Mato Grosso, Santa Catarina)
..... 19
- 19(18).Larger (Total length 5 mm); posterior dorsal region of head with distinct, transverse striolae; southern Colombia (Nariño).....
..... *mayri* Mackay and Mackay
- Smaller (TL < 3.5 mm); posterior dorsal region of head punctate, without evidence of striolae; southern Brasil (Mato Grosso, Santa Catarina).....
.....*curvata* Mayr
- 20(17).Eye (Figure 25) relatively large (maximum diameter ≥ 0.1 mm); hairs on scape slightly elevated from surface
.....*andersoni* Mackay and Mackay
- Eye (Figure 26) smaller (< 0.07 mm); hairs on scape appressed to surface.....
.....*quadridentata* Mackay and Mackay.

Species account

Simopelta andersoni new species

Figures 6 (mandible), 25 (head), 27 (mesosoma), 28 (tibia); Map 1

williamsi species complex

Discussion and description

The worker of this species can be characterized by the large eye (maximum diameter 0.10 - 0.14 mm), composed of a single ommatidium, and located about 1½ diameters from the anterior margin of the head, and the four toothed mandible. It is a moderately large (total length about 5 mm), dark reddish brown species, with transverse rugulae on the dorsum of the head. The head length ranges from 0.99 - 1.03 mm, the head width 0.74 - 0.82. The anterior margin of clypeus is moderately acute, but does not form a spine. The scape (0.96 - 1.06 mm) extends about 1/3 length past the posterior lateral corner of the head. The anterior border of the mesonotum is distinctly lower than the posterior edge of pronotum; the mesonotum to the anterior part of propodeum is concave. The anterior and posterior faces of the petiole are nearly parallel, and straight, and a well-developed, flattened, dorsal face is present. The spiracular horns (Figure 27) of the petiole are well developed. The subpetiolar process is rectangular shaped; the posterior face of the process is only slightly concave.

Erect hairs are sparse, and are present on the clypeus, mandibles, and gaster, the remaining hairs are suberect to decumbent, and present on the head, scape, dorsum of the mesosoma, petiole, and the legs, including the tibiae.

The mandibles are longitudinally striate, the dorsum of head has transverse rugulae, or striae, which curve anteriorly between the eyes and frontal carinae, and on the sides of head. The rugulae on the ventral surface of the head curve obliquely and extend anteriorly. The dorsum of the pronotum has transverse striae, which form concentric circles laterally, the mesonotum has transverse striae, the

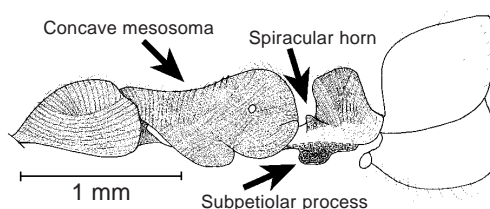


Figure 27

Side view of the mesosoma, petiole and postpetiole (first gastral segment) of the holotype worker of *S. andersoni*.

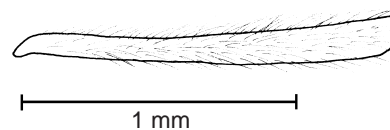


Figure 28

Posterior left tibia of the holotype worker of *S. andersoni*, as seen from the front.

propodeum has transverse striae, which curve obliquely anteriorly and align with the striae present on the mesopleuron. The side of the petiole has a mixture of transverse (posteriorly) to obliquely vertical (anteriorly striae), the striae on the dorsum of the petiole are transverse, the postpetiole and the remainder of the gaster have fine, coriaceous sculpture, and are mostly smooth and glossy. The female and male are unknown.

The large eye and the four mandibular teeth would separate this species from all of the others in the genus *Simopelta*. It would be most likely confused with the large eyed *S. oculata*, which only has three

mandibular teeth. The transverse striae or rugulae on the dorsum of the head could result in confusion with *S. transversa* and similar species, all of which have three mandibular teeth. Additionally, the top of the petiolar node has distinct, transverse striae, the top of the node of *S. transversa* has an indistinct, granulate sculpture.

It is closely related to *S. quadridentata*, but differs in a number of consistent characteristics. The eye is larger, the subpetiolar process is more elongated (length at bottom of lobe > 0.1 mm, versus < 0.1

mm in *S. quadridentata*) and the same depth over the length (wider posteriorly in *S. quadridentata*). The upper part of the node of the petiole has vertical striae, which then pass transversely over the top of the node. The node of *S. quadridentata* has mostly horizontal striae, which encircle the node and isolate the similar transverse striae. The long, lobed process over the clypeal apron could cause confusion with *S. longirostris*. They can be easily separated, as *S. andersoni* has four mandibular teeth, *S. longirostris* has three.

Distribution

Known only from the type series in the state of Puntarenas, Costa Rica.

Habitat

Wet montane forest.

Biology

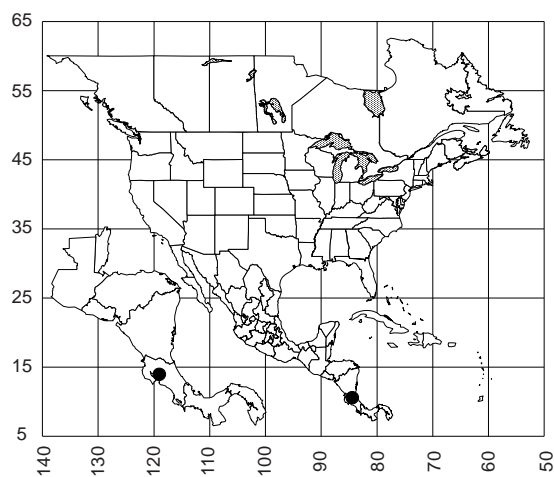
All of the specimens were extracted from leaf litter.

Type series

Holotype worker (MCZC), 6 paratype workers (CASC, CWEM, INBio, MCZC, MZSP, USNM) Costa Rica, Punt., Las Cruces 4 kS San Vito, 19-vi-1998, R. Anderson # 18662.

Etymology

Named in honor of the collector, Bob Anderson, who has given us thousands of tropical ants.



Map 1

Simopelta andersoni

Simopelta bicolor Borgmeier

Figures 4 (head & mandible), 29 (mesosoma); Map 2

curvata species complex

Simopelta bicolor Borgmeier, 1950:377-380, Figures 13-20, worker, Brasil: Espírito Santo: Santa Teresa [paratype seen, MCZC]; *Belonopelta*

bicolor: Baroni-Urbani, 1975:299; *Simopelta bicolor*: Gotwald & Brown, 1966:273; Bolton 1985:383.

Discussion

The worker of this species is easily recognized, as the mandible has six or more teeth. The clypeus lacks a spine. All other species in the genus have three - five mandibular teeth. The mesosoma is only slightly depressed at the promesonotal and metanotal sutures. It is bright, ferruginous red with a yellow petiole and gaster.

The female and male are unknown.

The narrow petiole (as seen from the side) could cause confusion with the Brazilian *S. minima* and the central and northern South America *S. pergandei*, which also have narrow petioles. It can be separated from both of these species by the number of mandibular teeth: the latter two species only have three teeth.

Distribution

Known only from the type locality in the state of Espírito Santo, Brasil.

Habitat

Unknown.

Biology

Unknown.

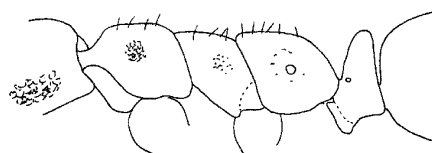
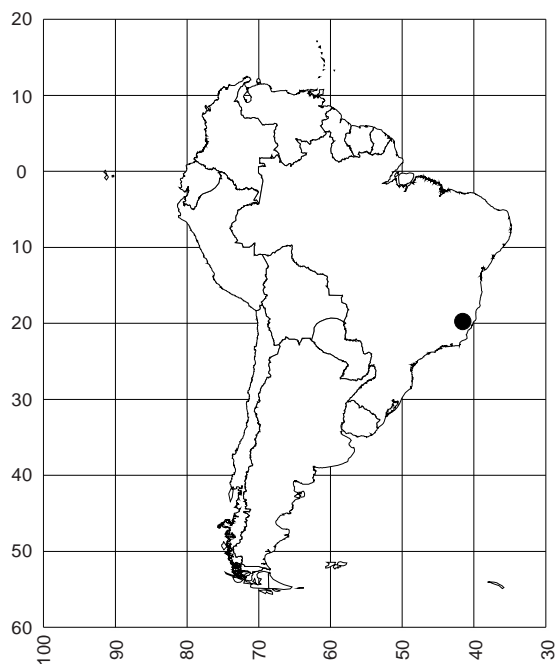


Figure 29

Mesosoma of a paratype worker of *S. bicolor*. Only a small portion of the sculpturing is shown.



Map 2

Simopelta bicolor

Simopelta breviscapa new species

Figures. 6 (mandible), 12 (tibia), 13 (top of petiole), 16 (head), 30 (mesosoma); Map 3

williamsi species complex

Discussion and description

This is a relatively small species (total length about 3.5 mm), black, with brown mandibles, antennae, and legs, which are pale brown at the extremities. The mandible has three teeth, the basalmost tooth is often obliquely truncated and dull. The head length ranges from 0.89 - 0.90 mm, the head width ranges

from 0.74 - 0.76 mm. The eye is small (maximum diameter 0.06 - 0.07 mm). The antennal scape (0.79 - 0.83 mm) barely surpasses the posterior lateral margin of the head. The mesonotum is broadly convex, and shorter in length than the dorsal face of the propodeum. The anterior and posterior faces of

the petiole are nearly parallel, forming a well-developed, horizontal apex, which has a broadly convex surface. The spiracular horns are well developed, and the subpetiolar process is triangular-shaped, with a slightly concave posterior face.

Short (0.03 mm), erect and suberect hairs are present on most surfaces, including the dorsal and ventral surfaces in the head, dorsum of the mesosoma, and dorsum of the petiole. Longer erect hairs are sparse, and mostly restricted to the mandibles, ventral surface of the head, and the gaster.

The mandibles are finely striated, the dorsum of the head is covered with granulated sculpture, forming poorly defined, transverse rugulae (at least near the posterior edge), which become longitudinal on the sides and anterior half of the head. The pronotum is granulated, with poorly defined, transverse rugulae. The posterior part of the side of the pronotum is smooth and glossy, the remainder of the pronotum has longitudinal rugulae. The mesonotum and dorsum of the propodeum have poorly defined, transverse striolae; the striae on the sides of the mesosoma are mostly longitudinal. The sides of the petiolar node have striolae, which encircle the node, the apex of the node has transverse rugulae. The gaster is smooth and glossy.

Distribution

Known only from state of Chiriquí, Panamá

Habitat

Upper montane cloud forest, at 700 - 1520 m elevation.

Biology

Most workers were extracted from leaf litter.

Type series

Holotype worker (MCZC), 4 paratype workers (CASC, CWEM, GBFM, IAVH), Panamá, Chiriquí, Fortuna Area, Finca La Suisse, 11-vi-95, R. Anderson # 17826.

Etymology

From Latin, *brevis* meaning short, and *scapus*, meaning staff, referring to the relatively short antennal scape.

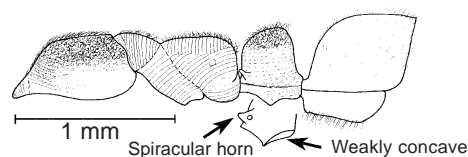
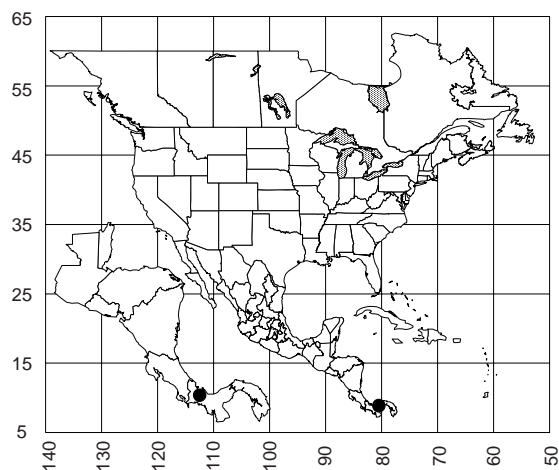


Figure 30

Side view of the mesosoma, petiole and postpetiole (first gastral tergum) of the holotype worker of *S. breviscapa*. The inset shows the bottom of the petiole as seen obliquely from the side.

The male and female are unknown.

This small species could be confused with *S. williamsi* and *S. fernandesi*. It can be easily distinguished by the short antennal scapes. The transverse striae on the posterior half of the head are not as well defined as they are in *S. fernandesi*, and especially in *S. williamsi*. It could also be confused with *S. longirostris*, from which it differs in having a less developed lobe on the clypeus. It could also be confused with *S. longinoda*, the other species in which the antennal scape barely exceeds the posterior lateral corner of the head. It differs in having a wider petiolar node (length 0.23 mm, maximum width 0.25 mm; versus length 0.23 mm, maximum width 0.20 mm in *S. longinoda*). Additionally, the lower parts of the pronotum and mesopleuron are sculptured and only moderately shining, not smooth and glossy as in *S. longinoda*.



Map 3

Simopelta breviscapa

Simopelta curvata (Mayr)

Figures 24 (head), 31 (mesosoma), 32 (clypeal process; Map 4

curvata species complex

Belonopelta curvata Mayr, 1887:532, worker, Brasil: Santa Catarina (without locality) [lectotype and paralectotype workers seen, NHMW]; *Belonopelta (Simopelta) curvata*: Mann, 1922:10; *Simopelta curvata*: Wheeler, 1935:13-14; *Belonopelta curvata*: Baroni-Urbani, 1975:300; *Simopelta curvata*: Gotwald and Brown, 1966:265; Bolton 1995:383.

Discussion

The worker is a small (total length 3.5 mm), ferruginous red species. The mandibles have four, well-developed teeth. The medial anterior border of the clypeus terminates in a sharp point, or a spatulate spine (Figure 32). The head is slightly widened anteriorly, and the posterior border is nearly straight. The eye is small (maximum diameter 0.03 mm), located about three maximum eye diameters from the anterior edge of the head. The scape is relatively short, and barely reaches the posterior lateral corner of the head. The mesosoma is broadly depressed at the metanotal suture, the petiole is relatively narrow when viewed in profile, with the anterior face being slightly concave.

Long (up to 0.15 mm), erect hairs are present on the mandibles, and on the ventral surface of the gaster. Shorter (0.03 mm) erect hairs are abundant on the head, mesosoma, petiole, and dorsum of the gaster. The hairs on the legs are nearly appressed to the surface.

The surface of the mandible is shiny and glossy, with scattered punctures, the dorsum of the head is covered with fine punctures, which are weakly arranged in transverse rows. The dorsum of the mesosoma has poorly defined, transverse striolae, similar striolae are present on the side of mesosoma, but are predominantly longitudinal. The petiole is finely striolate, and moderately to strongly shining.

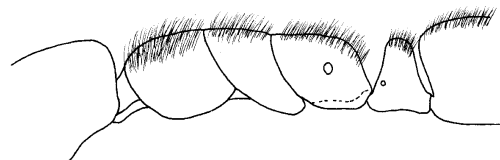


Figure 31

Mesosoma and petiole of the lectotype worker of *S. curvata*, as seen from the side.

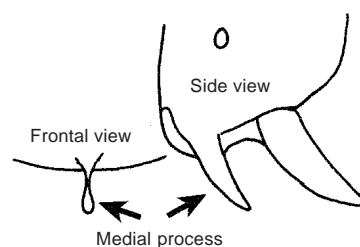


Figure 32

Medial clypeal process of the paralectotype worker of *S. curvata*, as seen from the front and from the side.

The gaster is slightly coriaceous, and shining.

The female and male are unknown.

This species is nearly identical to *S. pergandei*, being the same size and color. It can be separated by the four-toothed mandible (three toothed in *P. pergandei*). It can be separated from many of the other species with four mandibular teeth, by the presence of the narrow process on the anterior medial border of clypeus. It shares this characteristic with *S. laticeps* and *S. mayri*. It can be separated from *S. laticeps* by the nearly straight posterior margin of the head (strongly concave in *S. laticeps*). It is much smaller than *S. mayri*, and lacks the well defined, transverse striolae on the posterior half of the head, that are present in *S. mayri*.

Material examined

Two workers, from type series.

Distribution

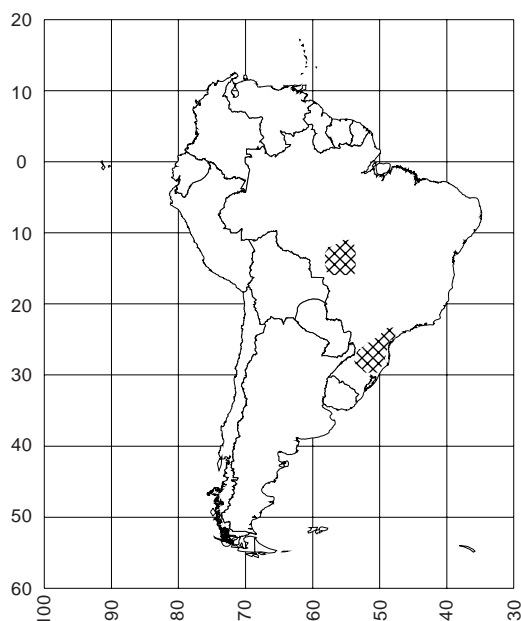
Southern Brasil: Mato Grosso (Kempf, 1972); Santa Catarina (Borgmeier, 1950), interior of southern Brazil, São Paulo (Gotwald and Brown, 1966).

Habitat

Unknown.

Biology

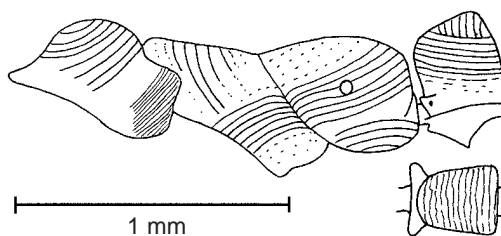
Unknown.

**Map 4***Simopelta curvata****Simopelta fernandesi* new species**

Figures 15 (head), 33 (mesosoma); Map 5

williamsi* species complex*Discussion and description**

The worker is medium sized (total length < 4 mm), dark reddish brown ant, with lighter brown appendages. The head length ranges from 0.86 - 0.94 mm, the head width from 0.66 - 0.70. The anterior medial border of the clypeus is angulate, but does not project significantly from the border. The mandible has three teeth, which are approximately equal in size and all with sharp tips. The eye is relatively small (maximum diameter 0.09 mm) located nearly two maximum eye diameters from the anterior border of the head. The scape (0.90 - 0.99 mm) is relatively long, and extends well past the posterior lateral corner of the head. The anterior border of the mesonotum is noticeably lower than the posterior border of the pronotum, and the outline of the mesosoma is broadly concave. The mesonotum is noticeably shorter in length (0.30 mm, as seen in profile) than the dorsal face of the propodeum (> 0.40 mm). The anterior and

**Figure 33**

Side view of the mesosoma and petiole of the holotype worker of *S. fernandesi*. The inset shows the node of the petiole as seen from above.

posterior faces of the petiole are nearly parallel, and a well defined, horizontal, dorsal face is present. The node is elongate and narrowed anteriorly, as viewed from above. The spiracular horns are developed and the subpetiolar process is developed into a triangular-shaped form. The process can be seen to be thickened and nearly bipartite posteriorly, when viewed from below.

Erect hairs are short (<0.04 mm), sparse, and mostly restricted to the clypeus, the ventral surface of the head, and all surfaces of the gaster. Most of the remainder of the hairs are decumbent or suberect, including the hairs on the legs, and the scapes. The posterior half of the dorsum of the head is covered with reticulated striae, which pass transversely across the head and turn anteriorly along the sides of the head. The anterior half of the dorsum of the head is mostly punctate. The dorsum and sides of the mesosoma have similar sculpture, although the transverse rugulae are more defined on the mesonotum and dorsum of the propodeum. The side of the pronotum has concentric, curved rugulae, those on the mesopleuron and side of the propodeum are longitudinal, and oblique. The striae on the petiole pass around the anterior face, the side and the posterior face, and pass transversely across the top. The gaster is smooth and glossy. The female and male are unknown.

Distribution

Colombia: Caquetá (Parque Nacional Picachos, San Vicente del Caguán [Inspección de Policía Guayabal, PN Picachos, Alto del Río Pato, $2^{\circ}47'51''N$ $74^{\circ}51'18''W$]).

Habitat

High elevation (1770 - 1800 m) tropical forest.

Biology

The three specimens were collected by hand.

Type series

Holotype worker (IAVH), one paratype worker (CWEM), COLOMBIA Caquetá, PNN Picachos $2^{\circ}47'51''N$ $74^{\circ}51'18''W$ 1770m, manual 3h No 6-3.xi.97, F. Escobar E. González.

Etymology

This species is named in honor of our close friend and colleague, Fernando Fernández, tropical myrmecologist, who has done extensive work to further the understanding of Neotropical ants.

This species could be confused with *S. williamsi*, as both have well defined, transverse striae on the posterior half of the head. It can be separated by the relatively short mesonotum (the mesonotum and dorsal face of the propodeum are about equal in length in *S. williamsi*). Additionally the third (basalmost) mandibular tooth is sharp, not truncated as in *S. williamsi*. It could also be confused with *S. breviscapa*, but differs in having an elongated antennal scape. The relatively large eye could cause confusion with *S. oculata*. It can be easily separated by the transverse striae on the dorsum of the head, the head of *S. oculata* is densely punctated.

A few specimens have a relatively long mesonotum, as well as an elongated petiolar node (Colombia: Magdalena, Valle del Cauca, Caquetá, IAVH). The specimens will be considered to be “near williamsi” until more specimens become available.



Map 5

Simopelta fernandezii

Simopelta jeckylli (Mann)

Figures 18 (eye), 34 (side view), 35 (head), 36 (top of petiole); Map 6

williamsi species complex

Belonopelta jeckylli Mann, 1916:415-416, Plate 2, Figures 12, 13, worker, Brasil: Rondônia: E. F. Madeira-Mamoré, km. 284 [lectotype and 48 paralectotypes seen, LACM, USNM]; *Belonopelta (Simopelta) jeckylli*: Mann, 1922:10; *Simopelta jeckylli*: Wheeler, 1935:14, Figure 2; Gotwald and Brown, 1966:267; *Belonopelta jeckylli*: Baroni-Urbani, 1975:300; *Simopelta jeckylli*: Bolton, 1995:383.

Discussion

The worker is a medium to large sized specimen (total length 4 - 5 mm). Color ranges from dark reddish-brown, with a ferrugineous gaster and appendages, to black, usually with lighter colored appendages. The mandibles have 3 teeth, but there may be a bump or a tiny tooth in the diastema. The anterior border of the clypeus is formed into a medial spine. The sides of the head are nearly parallel, but are slightly narrowed posteriorly. The eye is tiny (maximum diameter 0.02 mm) approximately the same size, or slightly smaller than the coarse, surrounding punctures. The antennal scape barely surpasses the posterior lateral corner of the head. The shape of the mesosoma, and petiole are similar to that of other members of the genus.

The head, mesosoma, and petiole are covered with coarse punctures, the mandibles, scapes, and gaster are moderately to strongly shining (the gaster is smooth and glossy).

Erect, mostly short (up to 0.1 mm) hairs are found on the head, scape, mesosoma, legs, petiole, and gaster. The erect hairs on the scapes are sparse, and of varying lengths, but none is over 0.12 mm in length.

The female and male are unknown.

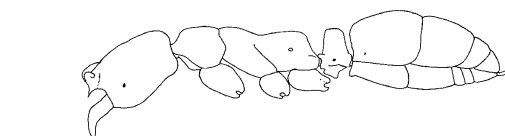


Figure 34

Side view of a worker of *S. jeckylli*
(from Wheeler, 1935).

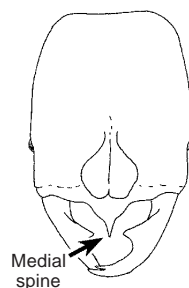


Figure 35

Head of a worker of *S. jeckylli*
(modified from Wheeler, 1935).

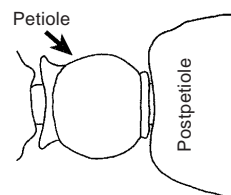


Figure 36

Petiole of a worker of *S. jeckylli*
(from Wheeler, 1935).

The large diameter punctures on the head of this species (larger than the size of the eyes) will separate it from all of the others in the genus. In addition, the spine on the clypeus will separate it from many species, which may have similar sculpture, such as *S. oculata*. It is larger than *S. pergandei*.

Distribution

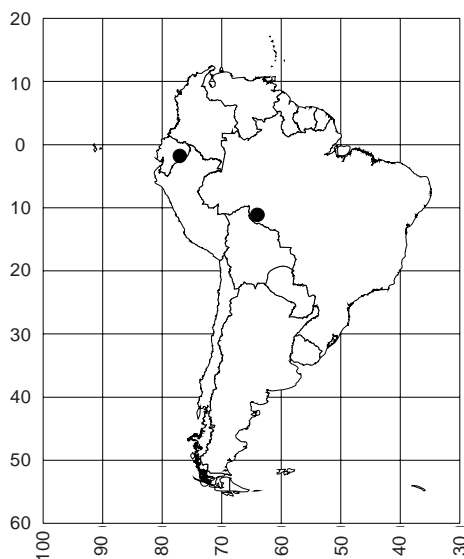
Ecuador: Orellana (Yasuni [00°30'S 75°55'W] QCAZ). Brasil: Rondônia (type series).

Habitat

Unknown, specimens have been collected at 250 m.

Biology

The type collection consisted of workers collected under forest litter, which appeared to be traveling in a definite direction, suggesting a foraging column (Gotwald and Brown, 1966).



Map 6

Simopelta jeckylli

Simopelta laevigata new species

Figures 8 (head), 37 (mesosoma); Map 7

williamsi species complex

Discussion and description

The worker is a medium sized (total length 4 mm), shiny black ant. The mandible has 3 teeth, the two teeth near the apex are sharp and well-developed, the third (basal most) is thickened, with a somewhat rounded apex. The anterior border of the clypeus is broadly rounded. The eye is moderately large (maximum diameter 0.07 mm), and extends past the sides of the head. The antennal scape (0.78 - 0.80 mm) extends about the first funicular segment (0.18 mm) past the posterior lateral corner of the head. The head is relatively wide (head length 0.83 - 0.87 mm, and head width is 0.65 - 0.70 mm). The head is widest near the eye, and posterior border is nearly straight. The mesosoma is broadly depressed dorsally, and reaches the lowest point at the metanotal suture. The petiole is wide when viewed in profile, with well-developed spiracular horns, and a poorly developed subpetiolar process.

Erect hairs are sparse, but are present on the mandibles, the clypeus, dorsum of the mesosoma, petiole, and all surfaces of the gaster. Suberect hairs

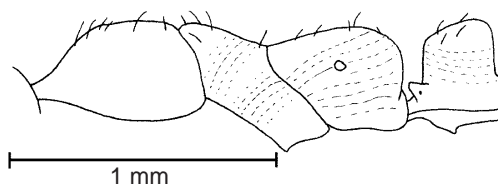


Figure 37

Mesosoma and petiole of the holotype worker of *S. laevigata*.

are abundant, and present on the scapes, dorsal and ventral surfaces of the head, mesosoma, legs, and are sparse on the petiole and gaster.

Most surfaces are smooth and glossy, including the entire dorsal surface of the head (with a few scattered punctures), the dorsum of the mesosoma, the side of the pronotum, the dorsum of the petiole, and gaster (with tiny, indistinct punctures); the mesopleuron and side of the propodeum have oblique striae. The side and both faces of the petiole have poorly defined striolae, and are mostly glossy. The female and male are unknown.

The glossy surfaces of this species would easily separate it from nearly all of the other members of the genus. It could only be confused with *S. manni*, which is also mostly smooth and glossy. It can be distinguished, as usually the entire dorsum of the head of *S. manni* (at least the posterior ¼) is covered with coarse punctures, as is the dorsum of the pronotum. It is also slightly larger (the total length of *S. manni* is less than 4 mm), and has a wider head.

Distribution

Colombia, Chocó, 10 km SW San José del Palmar, Finca los Guadales, (CWEM; IAvH, LACM, MCZC, MZSP, USNM); Huila (Parque Nacional Cueva de los Guácharos); Nariño (Municipio Orito [Territorio Kofán Bosque, 0°30'7"N 77°13'43"W] CWEM).

Habitat

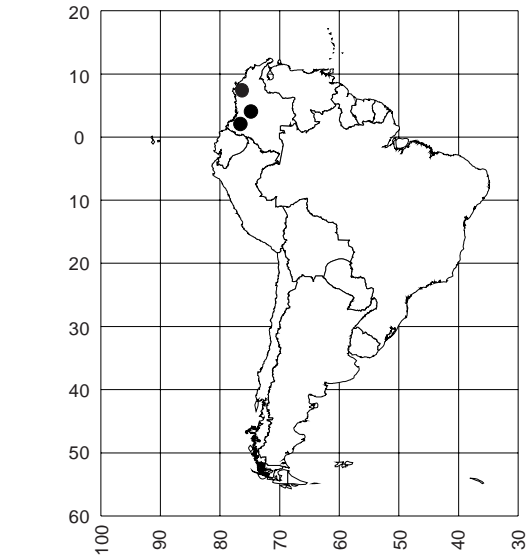
Tropical rain forest, (1430 - 1950 m).

Biology

One specimen was collected by hand, the second (holotype) was extracted from a Winkler sample.

Type series

Holotype worker (IAVH), Colombia Huila PNN Cueva de Los Guácharos Cabaña Cedros 1°37'N



Map 7

Simopelta laevigata

76°6'W, 1950m Winkler 2-5-xii.2002, R. Paramero Leg. M.3375.

Etymology

From Latin, *laevigatus*, meaning smooth, referring to the smooth sculpture of the worker of this species.

Simopelta laticeps Gotwald and Brown

williamsi species complex

Simopelta laticeps Gotwald and Brown, 1966:273-275, Figures 15, 16, worker, [holotype seen] Perú: Lambayeque: 20 mi. E Olmos; *Belonopelta laticeps*: Baroni-Urbani, 1975:299; *Simopelta laticeps*: Bolton, 1995:383

Discussion

The worker is a large (total length about 5.5 mm), reddish-brown to black specimen, with reddish

Figures 23 (head), 38 (mesosoma); Map 8

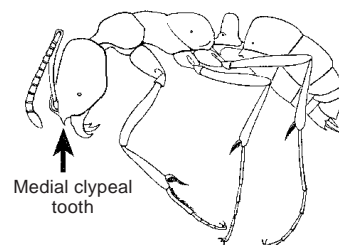


Figure 38

Side view of a worker of *S. laticeps* (from Gotwald and Brown, 1966).

appendages. The mandibles have four well-developed teeth. The anterior medial border of the clypeus has a sharp, short (0.06 mm), spine or tooth. The eye is small (maximum diameter 0.06 mm), and the scape extends about the first funicular segment past the sharply angulate, posterior lateral corner of the head. The posterior margin of the head is strongly concave. The dorsum of the mesosoma is broadly depressed, and reaches its lowest point at the metanotal suture. The petiole is only weakly narrowed as seen in profile; the subpetiolar process forms a single low, flattened lobe, which is angulate posteriorly.

The mandibles are striate, the dorsum of the head is punctate, and finely striolate, with the punctures being smaller than the diameter of the eye. The dorsum of the mesosoma, excluding the propodeum is transversely striolate, the sides are obliquely or nearly horizontally striate. The dorsum of the propodeum of the type series is shining (Gotwald and Brown, 1966), that of specimens from Colombia is transversely striolate. The side and both faces of petiole are horizontally striate, the dorsum is shining (Gotwald and Brown, 1966) or finely striated (specimens from Colombia). The

dorsum of the postpetiole is smooth and glossy, with scattered punctures.

Most surfaces have erect and suberect hairs, including the scapes, dorsal and ventral surfaces the head, dorsum of the mesosoma, petiole, and gaster, suberect to appressed hairs are also present on these surfaces, as well as on the legs, including the tibiae.

The holotype is in the CASC, a paratype is reported to be in the MCZC (not found).

The female and male are unknown.

The worker of this species can be easily separated from most of the others in the genus, by the four mandibular teeth, and the sharp spine on the anterior medial margin of the clypeus. It could be confused with *S. mayri*, which shares these characteristics. It can be separated, as the posterior margin of the head is strongly concave, and the posterior lateral corners are sharply angulate. Additionally, the petiole is thicker (width at level of peduncles, including the poorly developed spiracular horn 0.42 mm, height at same region 0.36 - 0.42 mm).

Distribution

Colombia: Nariño (Municipio Barbacoa Tajadas [1°40'24"N 78°8'6"W] CWEM, IAVH). Perú: Lambayeque.

Habitat

Cloud forest zone on the west slope of a low Andean pass at 2000 m (Gotwald and Brown, 1966).

Biology

Unknown.



Map 8

Simopelta laticeps

Simopelta longinoda new species

Figures 17 (mesosoma), 39 (head); Map 9

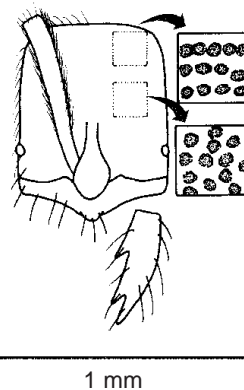
williamsi species complex

Discussion and description

The worker is a small (2.2 - 2.5 mm), black ant with dark brown legs. The head length ranges from 0.70 - 0.71 mm, the head width ranges from 0.51 - 0.53 mm. The mandible has three teeth, the anterior border of the clypeus is convex, and slightly overhangs the clypeal apron. The eye is small (maximum diameter 0.05 mm), located about two diameters from the anterior margin of the head. The scape is short, extending only slightly past the posterior lateral corner of the head. The sides of the head are nearly straight and parallel, the posterior border is weakly convex. The dorsum of the mesosoma is nearly straight, the mesonotum is slightly shorter than the dorsal face of the propodeum. The anterior face of the petiole is concave, the posterior face is straight, the two faces are nearly parallel, and the dorsal face is broadly convex. The spiracular horns are moderately developed, and the subpetiolar process is weakly developed. The petiolar node is long and narrow as seen from above.

Erect hairs (up to 0.1 mm) are present on the clypeus, and a few are present on the dorsum of the mesosoma, and all surfaces of the gaster, the remainder of the hairs are short (0.03 mm), and present on the dorsum and ventral surfaces of the head, the scapes, sides of the head, posterior border, dorsum of the mesosoma, very sparse on the petiole, and gaster, the hairs on the legs are similar, and suberect.

The head is covered by large punctures, with the region between them being smooth and glossy, those on the anterior half of the head are more scattered, those on the posterior half are in rows, giving that region the appearance of having transverse striae, the dorsum of the mesosoma is similar, the punctures on the side of the mesosoma are mixed with striae, the lower third of the pronotum, lower fourth of the mesopleuron, and the gaster are smooth and glossy.

**Figure 39**

Head of the holotype worker of *S. longinodai*, showing samples of the sculpture.

The female and male are unknown.

The short antennal scape would cause confusion with *S. breviscapa*, the other species in which the antennal scape barely exceeds the posterior lateral corner of the head. It can be easily separated by the narrower petiole node (length 0.23, maximum width 0.20 mm, versus length 0.23, width 0.25 mm in *S. breviscapa*) and in that the lower parts of the pronotum and mesopleuron are smooth and glossy (sculpture only moderately shiny in *S. breviscapa*). The predominantly punctured head could result in this species being misidentified as *S. oculata*. It can be easily separated by the much smaller eye, and the shorter antennal scape (extends well past the posterior lateral corner in *S. oculata*).

John Longino refers to this species as JTL-002 on his website.

Distribution

Known only from the type locality in the state of Guanacaste, Costa Rica.

Habitat

Unknown.

Biology

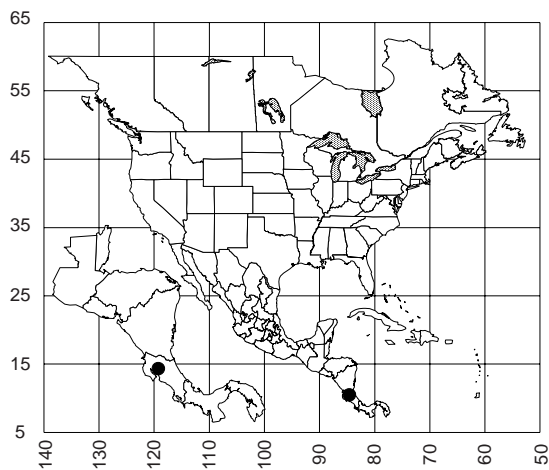
Unknown.

Type series

Holotype worker (INBio), one paratype worker (CWEM), Est. Pitilla, 700m, 9km S Sta. Cecilia, P.N. Guanacaste, Prov. Guanacaste, Costa Rica, C. Moraga, 2-9 mar 1992, L-N 330200,880200.

Etymology

From Latin, *longus*, meaning long and *nodus*, meaning swelling or node, referring to the relatively longer petiolar node as compared to the close relative *S. breviscapa*.



Map 9

Simopelta longinoda

Simopelta longirostris new species

williamsi species complex

Discussion and description

The worker is a small (total length 3.0 - 3.5 mm), black ant, with brownish legs. The head is relatively elongated, the head length is 0.82 mm, the head width 0.58 mm. The mandibles have three, well-developed, sharp teeth. The clypeus forms an extended, narrow lobe which passes over the apron of the clypeus. The sides of the head are nearly parallel, only slightly narrowed anterior to, and posterior to the eye. The posterior border of the head is broadly convex. The eye is small (maximum diameter 0.06 mm) located more than 2 diameters from the anterior margin of the head. The scape is relatively short (0.74 - 0.78 mm) and extends only slightly past the posterior lateral corner of the head. The mesonotum (length 0.28 mm) is noticeably shorter than the dorsal face of the propodeum (length 0.42 mm), when both are viewed in profile.

Figures 14 (head), 40 (mesosoma); Map 10

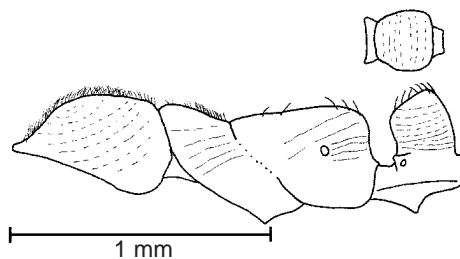


Figure 40

Side view of the mesosoma and petiole of the holotype worker of *S. longirostris*.

The anterior and posterior faces of the petiole are parallel; the dorsal face is well developed and slopes upwards. The spiracular horns and the subpetiolar process are weakly developed.

Short (0.04 mm) erect and suberect hairs are present on most surfaces, including the dorsal and ventral

surfaces of the head, the scapes, dorsum of the mesosoma, legs, dorsum of the petiole, and dorsum of the gaster. Longer hairs (up to 0.1 mm in length) are present on the mandibles, clypeus, and ventral surface of the gaster. A few scattered hairs are nearly appressed.

The mandibles are dull and finely striated, the dorsum of the head is covered with transverse striae, which pass anteriorly on the sides of the head and are mostly transverse on the ventral surface of the head. The striae on the mesosoma are similar, although portions are smooth and glossy, including the lower one third of the pronotum, lower half of the mesopleuron, and most of the legs. The side and dorsum of the petiole and postpetiole (with tiny,

scattered punctures) are finely striated and partially smooth and glossy.

The female and male are unknown.

The worker of this species is easily recognized by the narrow lobe of the clypeus, which overhangs the remainder of the clypeus. The transverse striae on the head, as well as the relatively short antennal scapes and the short mesonotum could cause confusion with *S. breviscapa*, but the latter species has a broadly rounded medial clypeal border or at the most a slightly angulate point. The long, lobed process over the clypeal apron could cause confusion with *S. andersoni*. They can be easily separated as *S. andersoni* has four mandibular teeth, *S. longirostris* has three.

Distribution

Colombia, Nariño (type locality). Ecuador: Cotopaxi (Otonga Reserve [0°25'S 79°0'W] QCAZ).

Habitat

High elevation tropical cloud forest (1840m).

Biology

Both type specimens were collected from a Winkler extraction. The series from Ecuador formed a column on the forest floor.

Type series

Holotype worker (# 50123 IAVH), one paratype worker (# 50122 CWEM), COLOMBIA Nariño R.N. La Planada Vía Hondón, 1°15'N 78°15'W 1930m, Winkler 16-20.xii.2000, G. Olivia Leg. M.1446.

Etymology

From Latin *longis* meaning long, and *rostrum*, meaning beak, referring to the long clypeal process which overhangs the apron of the clypeus.



Map 10

Simopelta longirostris

Simopelta manni Wheeler

Figures 7 (mesosoma), 41 (head), 42 (top of petiole); Map 11

williamsi species complex

Simopelta manni Wheeler, 1935:17 - 18, Figure 4, worker, Ecuador: Mera [cotype seen, MCZC]; *Belonopelta manni*: Baroni-Urbani, 1975:299; *Simopelta manni*: Gotwald and Brown, 1966:273; Bolton, 1995:383.

Discussion

The worker is a relatively small (total length 3.5 mm), dark reddish black ant, with brown appendages. The eye is small (maximum diameter 0.06 mm), located nearly two diameters from the anterior margin of the head. The dorsum of the mesosoma is nearly straight, with the anterior margin of the mesonotum nearly as high as the posterior margin of the pronotum, and the metanotal suture is only slightly depressed. The anterior and posterior faces of the petiole are nearly parallel, and the apex is broadly rounded, nearly forming a distinct face.

The head is densely and coarsely punctate, with the regions between the punctures being moderately smooth and glossy, the side of the mesosoma is very finely sculptured, and glossy, the dorsum of the pronotum has punctures similar to those of the head, but glossy between the punctures, the dorsum of the mesonotum and propodeum are mostly smooth and glossy. The side of the petiole is very finely sculptured, and glossy, as is the dorsal surface, the postpetiole and remainder of the gaster are finely sculptured, and smooth and glossy.

The female and male are unknown.

It would not be likely to confuse this species with most of the other members of *Simopelta*, due to the smooth sculpture of most surfaces. It could be confused with *S. laevigata*, but differs as the head and the pronotum are without sculpture in *S. laevigata*.

Distribution

Ecuador: Pichincha (Mera, 3 k east of Tandapi).

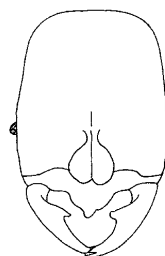


Figure 41

Head of a worker of *S. manni* (from Wheeler, 1935).

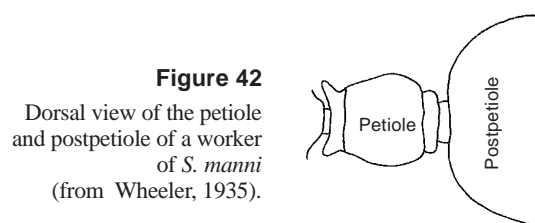
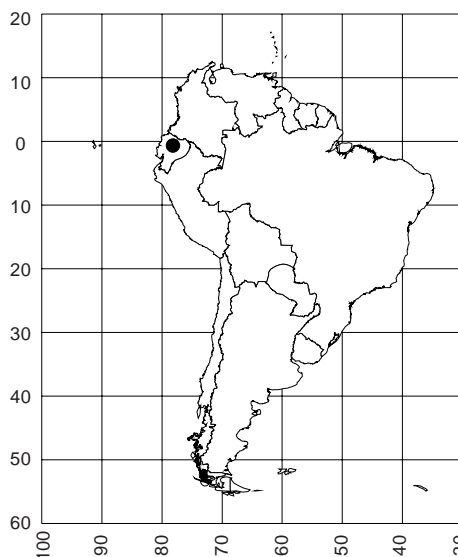


Figure 42

Dorsal view of the petiole and postpetiole of a worker of *S. manni* (from Wheeler, 1935).



Map 11

Simopelta manni

Habitat

Wet ravine at 1300 m.

Biology

Workers have been collected in leaf litter.

Simopelta mayri new species

Figures 43 (mesosoma), 44 (head); Map 12

curvata species complex

Discussion and description

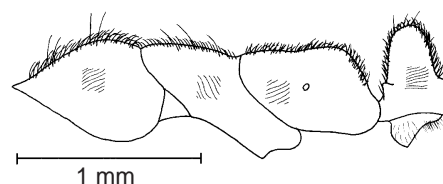
The worker is a moderate sized (total length 4.5 mm), reddish brown specimen. The mandible has four well-developed teeth, the anterior medial border of the clypeus has a single, short (0.05 mm) sharp tooth, with the area adjacent to the tooth being distinctly concave. The head length is 1.11 mm (excluding the clypeal tooth), the head width is 1.03 mm. The eye is small (maximum diameter 0.04 mm, and the scape (1.04 mm) extends past the posterior lateral corner of the head. The mesosoma is depressed at the metanotal suture, the petiole is relatively narrow when viewed in profile, with the anterior and posterior faces being nearly parallel, and forming a broadly rounded apex. The subpetiolar process is a single, narrow flange, which is slightly angulate posteriorly.

The mandibles are coarsely striated, the head is mostly punctate, but fine, transverse striae may be present, especially posteriorly. Transverse striae are present on all surfaces (top and side) of the mesosoma, including the propodeum. The petiole has poorly defined, horizontal striae on all surfaces. The dorsum of the postpetiolar is smooth and glossy, with only fine sculpture.

Erect and suberect hairs are present on all surfaces, including the dorsal and ventral surfaces of the head, the scapes, the mesosoma, the legs, the petiole, and the gaster. Hairs tend to be of two distinct lengths, the longest are about 0.3 mm in length, and are sparse, the other hairs are much more abundant, and about 0.04 mm in length.

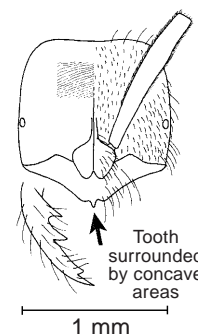
The female and male are unknown.

The four mandibular teeth, and the spine on the medial anterior clypeal border, would separate this species from most of the others in the genus. It could be confused with *S. laticeps*, from which it

**Figure 43**

Mesosoma and petiole of the holotype worker of *S. mayri*, as seen from the side.

Only portions of the sculpture are shown.

**Figure 44**

Head and mandible of the holotype worker of *S. mayri*.

Only a small portion of the sculpture is shown.

↑ Tooth surrounded by concave areas

differs in having the posterior edge of the head nearly straight, where it is strongly concave, and forms sharp, posterior lateral lobes in *S. laticeps*. Additionally, the petiole is relatively narrow (width at the base of the peduncles, including the poorly developed spiracular horn 0.30 mm, height at the same level 0.32 mm).

This species differs from *S. curvata*, in having moderately well-developed, transverse striae on the posterior half of the head, which bends anteriorly towards the eyes on the sides of the head. Additionally, the region on both sides of the tooth of the clypeus is noticeably concave (Figure 44).

Distribution

Known only from the type locality in the state of Nariño, in southern Colombia.

Habitat

Tropical rain forest, 1430 m.

Biology

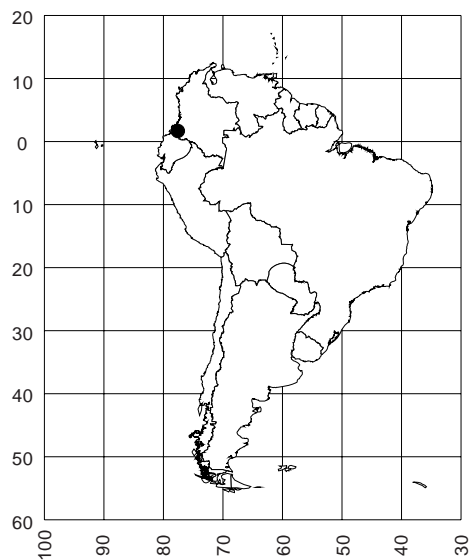
Unknown, the worker from Colombia was collected by hand.

Type series

Holotype worker (50084, IAVH), COLOMBIA: Nariño, Mun. Orito, Territorio Kofán Bosque, 0°30'7"N 77°13'43"W, 1430m, Cap. Manual, 1-4 25.ix.1998 E. González, Leg.

Etymology

Named in honor of Ernst Mayr, one of the most prominent biologists of our time, who recently died at 100 years of age. Dr. Mayr generously supported our research at the Museum of Comparative Zoology.



Map 12
Simopelta mayri

Simopelta minima (Brandão)

Figures 45 (mesosoma), 46 (head); Map 13

curvata species complex

Belonopelta minima Brandão, 1989:136 - 138, Figures 1-4, worker, BRASIL: Bahia, km. 22, Ilhéus-Itabuna road (BR 415) [paratype seen, MCZC]; *Simopelta minima*: Bolton, 1995:383.

Discussion

Based on Brandão, 1989: the worker is a small (total length less than 2.5 mm) bright ferrugineous red ant with yellow antennae and legs. The mandible has three well-developed, sharp teeth, and the anterior medial margin of the clypeus has a well-defined, sharp spine, followed posteriorly by a well-developed carina. The eyes are tiny, and the scape

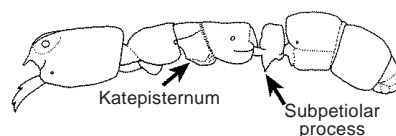


Figure 45

Side view of a worker of *S. minima* (holotype, modified from Brandão, 1989, used with permission).

fails to reach the posterior lateral corner of the head by almost twice its apical width. The sides of the head are nearly parallel, and meet the nearly straight posterior border through broadly rounded occipital corners. The dorsum of the mesosoma is nearly straight, and only slightly depressed at the promesonotal and metanotal sutures. The petiole is moderately narrowed (profile), and a subpetiolar process is large, and angulate anteriorly.

Long, erect hairs are present on the central portion of the clypeus, mandibles, ventral surface of gaster, and near the tarsal claws. The entire ant, including the appendages, is covered by a fine, dense, and short subdecumbent pubescence (suberect on the propodeum and dorsum of the petiole), which is sparse only on the mandibles, clypeus, posterior face of the propodeum, sides of the mesosoma, and sloping faces of the petiole.

The dorsal surfaces of the mandibles are smooth and shiny, the head is densely and finely punctulate, the punctures are nearly contiguous, subopaque. The dorsum of the mesosoma is also finely punctulated, although the sculpture is shallower, leaving smooth areas near the promesonotal suture. The katepisternum (lower half of the mesopleuron, Figure 45) and sides of the propodeum are covered with fine, almost parallel, longitudinally oriented striations over an even finer punctulated surface. The same sculpture is plainly visible on the posterior face of the propodeum and posterior face of the petiole.

The female and male are unknown.

The workers of this species should be easily recognized by their small size, much smaller than any of the other known species. It can be separated from similar species, such as *S. pergandei*, by the shiny surfaces of the mandible. It can be distinguished from the similar *S. bicolor* by the presence of three mandibular teeth, *S. bicolor* has at least six teeth.

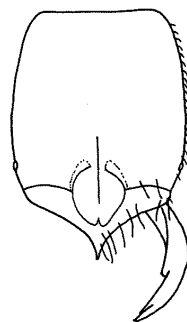
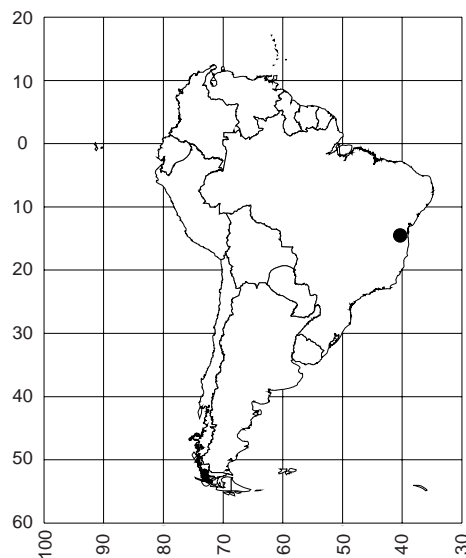


Figure 46

Head of a worker of *S. minima* (holotype, modified from Brandão, 1989, used with permission).



Map 13

Simopelta minima

Distribution

Known only from the type locality in the state of Bahia, Brasil.

Habitat

Old shaded cocoa plantation (Brandão, 1989).

Biology

The workers were collected from Berlese extractions of 0-15 centimeter deep soil samples near trees.

Simopelta oculata Gotwald and Brown

Figures 1 (antenna worker), 9 (head worker), 47 (side view worker), 48 (side view female), 49 (top view female), 50 (head female); Map 14

williamsi species complex

Simopelta oculata Gotwald and Brown, 1966:267-273, Figures 1-14, worker, female, Costa Rica: Limón: Río Toro Amarillo near Guapiles; *Belonopelta oculata*: Baroni-Urbani, 1975:300; *Simopelta occulta*: Bolton, 1995: 383.

Discussion

The worker is a small (total length 3.5 mm), black ant, with dark brown appendages. The mandible has 3 teeth, and the anterior margin of the clypeus is broadly rounded or only slightly angulate. The relatively large eye (maximum diameter ~ 0.1 mm), which is located less than two eye diameters from the anterior margin of the head, characterizes this species. The dorsum of the mesosoma is broadly concave. The petiole is thick when viewed in profile, with well-developed spiracular horns and a poorly developed subpetiolar process.

The head is covered with punctures, as is the dorsum of the pronotum. The lower half of the side of the pronotum is smooth and shining, the mesonotum and propodeum have transverse, poorly defined striolate, most of the side of the mesopleuron is smooth and shiny, and the sides of the propodeum have longitudinal, poorly defined striae. Most of the side of the petiole is moderately smooth and glossy, the dorsum has transverse, poorly defined striolae, the dorsum of the first tergum is mostly smooth and shiny.

The female is wingless and has a large, protruding scutum and scutellum, as well as a large propodeum, and a wide petiole (when viewed from above).

The large eyes would separate this species from most other species. *Simopelta andersoni* also has relatively large eyes, but can be separated by the four-toothed mandibles (*S. oculata* has a three-toothed mandible). Occasionally, the eyes of *S. paeminosa* are moderately large, and in these cases the partially smooth and shiny mesopleuron would separate the two species (mostly coarsely sculptured in *S. paeminosa*). It would not be

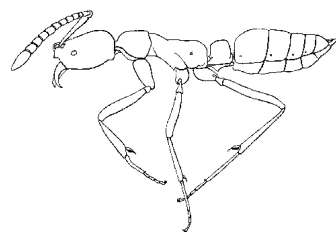


Figure 47

Side view of a worker of *S. oculata* (from Gotwald and Brown, 1966).

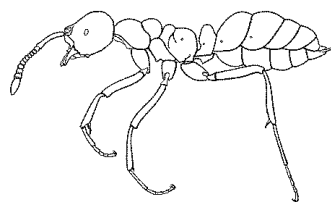


Figure 48

Side view of a female of *S. oculata* (from Gotwald and Brown, 1966).

Figure 49
Dorsal view of a female of *S. oculata* (from Gotwald and Brown, 1966).

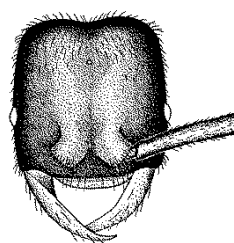
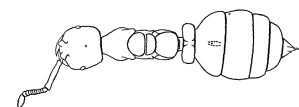


Figure 50

Head of a female of *S. oculata* (from Gotwald and Brown, 1966).

confused with *S. pergandei* due to its larger size and wider petiole as seen from the side. The large eyes would also separate this species from those that occur in South America, such as *S. fernandesi*, in which the dorsum of the head has transverse striae.

Distribution

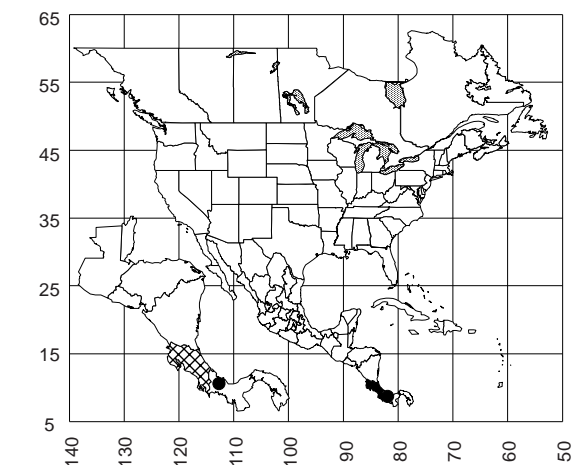
Costa Rica: Limón (about 1/2 km NW of bridge over Río Toro Amarillo, near Guapiles); Guanacaste (Maritza Field Station CWEM).

Habitat

Dense second growth rain forest.

Biology

The type series formed a column about 30-150 cm above the ground in vegetation in deep shade (Gotwald and Brown, 1966). The nest was in a hollow, dead twig 1.5 cm in diameter and 33 cm long, suspended vertically by a dead vine about 1.5 m above the soil surface. The column was carrying larvae, pupae and workers of a medium-size species of *Pheidole*, which was the dominant



Map 14

Simopelta oculata

ant genus in the area. Partly eaten pieces of prey were found in the twig. The nest contained at least several hundred workers, plus a female and brood. The workers ran rapidly, holding their antennae in a similar fashion to the workers of Ecitoninae. Workers are able to sting, which feels something like a mosquito bite (Gotwald and Brown, 1966).

Simopelta paeminosa Snelling

williamsi species complex

Simopelta paeminosa Snelling, 1971:17, Figure 1, worker, Costa Rica: Puntarenas, 4 mi S San Vito de Java [paratype seen, MCZC]; *Belonopelta paeminosa*: Baroni-Urbani, 1975:300; *Simopelta paeminosa*: Bolton, 1995:383.

Discussion

These are moderate sized (total length slightly over 4 mm), dark reddish black ants, with appendages being somewhat paler. The mandible has three teeth, the basalmost tooth usually being poorly developed. The anterior border of the clypeus is broadly convex, without a spine. The eye is relatively small (0.08 mm, maximum diameter about 1/2 distance between

Figures 21 (mesosoma), 51 (head); Map 15

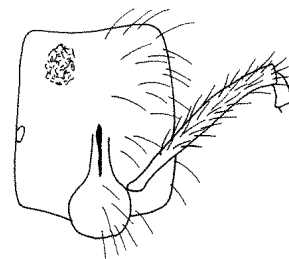


Figure 51

Head of a paratype worker of *S. paeminosa*. Only a small portion of the sculpturing is shown.

anterior edge of eye and anterior edge of head). The anterior face of the petiole is broadly rounded, meeting the posterior, vertical face at a right angle.

Erect and suberect hairs are present on most surfaces, including the dorsal and ventral surfaces of the head, scape, mesosoma, petiole, gaster, the hairs on the legs are finer and suberect.

The entire head, mesosoma, and petiole are granulate and dull, or with poorly defined rugae, the dorsum of the propodeum and petiole have poorly defined, transverse rugae, the dorsum of the postpetiole is covered with scattered, punctures, with the region between the punctures being smooth and glossy.

The relatively small eye would separate this species from *S. oculata* and *S. andersoni*. The granulated sculpturing of the head distinguishes it from several species, which have transverse striae or rugae (i.e. *S. transversa*). The three-toothed mandible separates it from the Brazilian *S. curvata*. The dark color distinguishes it from the Brazilian *S. minima* and the Central and South American *S. pergandei*. The punctures on the dorsum of the postpetiole would distinguish it from all the other species. Five specimens (5 k SW of the Estación Biológica Las Cruces) differ in having finer and sparser punctures (about 6 per 0.1 mm² versus about 10 per 0.1 mm²), as well as in having small punctures on the second gastral tergum, which are lacking in the typical *S. paeminosa*, and could be a new species.

The female and male are unknown.

The holotype is deposited in the LACM, paratypes are in the LACM, AMNH and MCZC.

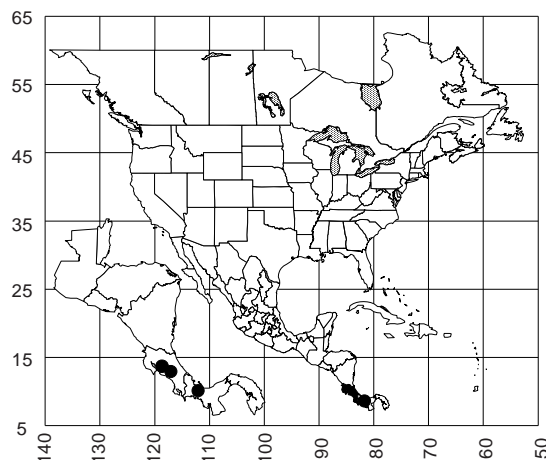
Simopelta pentadentata new species

Figures 5 (head and mandible), 52 (mesosoma); Map 16

williamsi species complex

Discussion and description

The worker is a moderate sized (total length 4 mm), black ant, with brown legs. The mandible has five teeth, with the apical and subapical being larger. The head length ranges from 0.86 - 0.99 mm (excluding the clypeal lobe), the head width ranges from 0.66 -



Map 15

Simopelta paeminosa

Distribution

COSTA RICA: Puntarenas (4 mi S San Vito de Java, Las Cruces Biological Station [CWEM], 5 k SW of Research Station, Monte Verde [CWEM]); Puntarenas (16 k SSE La Virgen, INBio). PANAMA: Chiriquí (Fortuna Area, Finca La Suisse, CWEM).

Habitat

Wet montane tropical and cloud forest, 1050 - 1150m.

Biology

Workers have been extracted from leaf litter.

0.68 mm. The anterior border of the clypeus is broadly rounded, forming a short, blunt lobe. The eye is moderate in size (maximum diameter 0.1 mm) located about 1½ times the maximum diameter from the anterior margin of the head. The scape is

relatively long (0.90 - 0.94 mm) and extends well past the posterior lateral border of the head. The mesonotum is elongated (0.43 mm), approximately as long as the dorsal face of the propodeum (0.45 mm). The anterior face of the petiole is concave, the posterior face is nearly straight, the two faces are approximately parallel, and the dorsal face is well defined. The spiracular horn is moderately well developed; the subpetiolar process is small and rectangular-shaped.

Short (0.03 mm), erect and suberect hairs are present on the dorsum of the head, on the scape, on the mesosoma, legs, petiole, and dorsum of the gaster, longer, mostly erect hairs (up to 0.18 mm) are present on the mandibles, clypeus, and ventral surface of the gaster.

The mandibles are striate and dull; the dorsum of the head is covered with coarse, transverse striae, which pass to the ventral surface of the head on the posterior half of the head. The dorsum of the mesosoma is covered with coarse, transverse striae, the striae on the remainder of the side of the mesosoma are mostly horizontal, or obliquely elevated posteriorly on the mesopleuron and the side of the propodeum. The side, and anterior and posterior faces of the petiole have horizontal striae, the dorsum has transverse striae, and the postpetiole is smooth and glossy.

The female and male are unknown.

This species could be easily confused with the widespread *S. williamsi*, but can be immediately recognized by the five teeth on the mandible. Additionally, the petiolar node is elongated when viewed from above, not essentially square-shaped as it is in *S. williamsi*. It could also be confused with the southern Colombian *S. fernandezi*, which has similar sculpture patterns, and an elongated petiolar node. It can be easily separated, as the mesonotum is elongated, and the mandible has more teeth than are present in *S. fernandezi* (3 teeth).

John Longino refers to this species as JTL 001 and JTL-CR01.

Distribution

Known only from Costa Rica: Guanacaste (type locality), Heredia (16 k SSE La Virgen [10°16'N

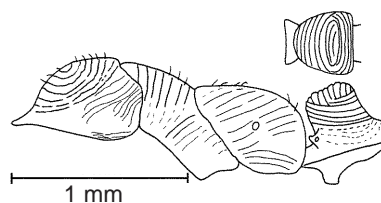
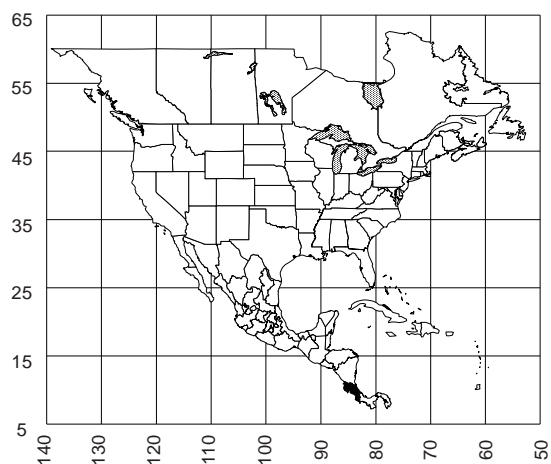


Figure 52

Side view of the mesosoma and petiole of the holotype worker of *S. pentadentata*. The inset shows the petiole as seen from above.



Map 16

Simopelta pentadentata

84°5'W, INBio], Parque Nacional Braulio Carrillo, INBio), Alajuela (Reserva Forestal Arenal [CASC]).

Habitat

Elevations from 700 - 1150 m.

Biology

Unknown.

Type series

Holotype worker (# 748544, INBio), four paratype workers (INBio, CWEM, MCZC), Est. Pitilla, 700m, 9km S Sta. Cecilia, Prov. Guan., COSTA RICA, I Curso Microhym., Ene 1991, L-N-330200, 380200.

Etymology

From Greek, *pente*, meaning five and from Latin, *dentatus* meaning toothed, referring to the five teeth of the mandible.

Simopelta pergandei (Forel)

Figures 2 (mesosoma and petiole female), 3 (head female), 19 (eye worker), 20 (mesosoma worker), 22 (head worker), 53 (top of petiole worker), 54 (mesosoma worker worker); Map 17

curvata species complex

Belonopelta pergandei Forel, 1909:242-244, worker, Guatemala (without locality); Borgmeier, 1950:372-377, female, Figs 1-12; *Belonopelta* (*Simopelta*) *pergandei*: Mann, 1922:10; *Simopelta pergandei*: Wheeler, 1935:11-13, Figure 1; Gotwald and Brown, 1966:265; *Belonopelta pergandei*: Baroni-Urbani, 1975:300; *Simopelta pergandei*: Bolton, 1995:383.

Discussion

The worker of this species is a small (total length about 3 mm), yellowish red ant, with the gaster and appendages slightly lighter in color. The mandible has three sharp teeth, which are approximately equal in size. The anterior medial border of the clypeus generally has a long (0.08 mm), slender spine, which is often somewhat widened apically, although the process may be reduced to a small (0.03 mm) angle. A short, clypeal carina is present. The eye is very small (maximum diameter 0.02 - 0.03 mm), located about four diameters from the anterior margin of the head, but noticeably larger than the punctures on the head. The head is nearly as wide (0.6 mm) as it is long (0.7 mm, excluding the spine). The posterior border of the head is nearly straight, the sides of the head nearly parallel, although they are slightly convex. The mesosoma is unusual for the genus, in that the dorsum is nearly straight, with only slight indentations at the promesonotal and metanotal sutures. The petiole is slender in profile, with a slightly concave anterior face, the two faces are nearly parallel, usually narrowest about 1/2 of the distance to the apex. The subpetiolar process is large and triangular or rectangular shaped, with a concave posterior face, which is angulate posteriorly.

Erect hairs are sparse, with a few on the mandibles, clypeus, few or none on the scapes, they are present on the posterior border of head, ventral surface of

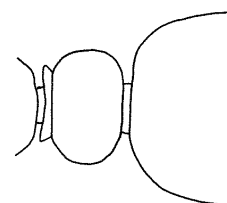


Figure 53

Petiole and postpetiole of a worker of *S. pergandei* as seen from above (from Wheeler, 1935).

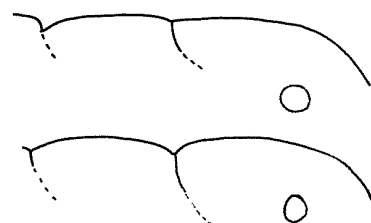


Figure 54

Mesosoma of two workers of *S. pergandei*, showing the variation in the depressed metanotal suture (top image from Magdalena, Colombia, bottom "normal" mesosoma).

the head, dorsum of the mesosoma, dorsum of the petiole, and all surfaces of the gaster, appressed hairs are present on the scapes, head, mesosoma, gaster, the hairs on the tibiae are nearly appressed.

The mandibles are finely striolate, the head is densely and evenly punctate, as is the dorsum of the mesosoma, the sides of the mesosoma are granulate, with poorly defined striolae, and petiole is finely punctate, the dorsum of the gaster is mostly shining, with a few scattered punctures. The dorsum of the postpetiole is smooth and glossy.

The female is a small, yellowish ant, with a large, swollen scutum, the scutellum is poorly developed,

or possibly fused with the scutum. The mandibles are without teeth, and two frontal lobes are more widely separated, and larger than in the worker. The petiole is large when viewed from the front and flattened and slender when viewed from the side.

The male is unknown.

This species would be unlikely to be confused with any other species, based on the lighter color, and the smaller size. Additionally, the eyes are smaller, which would separate it from *S. oculata*. The finely punctate head would separate it from *S. paeminosa*, which has granulate sculpture on the head. It could be separated from *S. minima* on the basis of distribution (*S. minima* occurs in Brasil). This species would not be confused with *S. curvata* and *S. mayri*, which have four well-developed mandibular teeth.

The specimens from the state of Magdalena, Colombia differ by the nearly flat dorsal surface of the mesosoma, and the lack of a depression at the metanotal suture (Figure 54).

Distribution

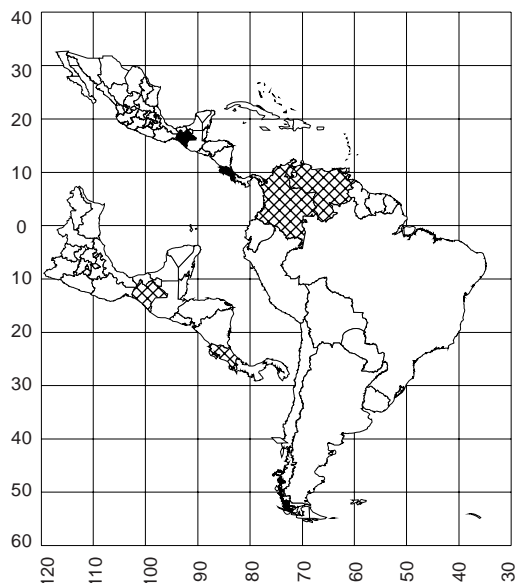
Guatemala (without locality). Costa Rica: San José (16 k W La Caja, San José, La Caja, 8 km from San Jose [Borgmeier, 1950]). Colombia: Magdalena (Parque Nacional Sierra de Santa Marta [Marta El Ramo, 10°48'N 73°39'W]), Valle (4 k W Queremal). Venezuela: Falcón (between Trapichito and Curimaqua); Aragua, (Parque Nacional Henri Pittier); Sucre (road from Las

Simopelta quadridentata new species

williamsi species complex

Discussion and description

The mandibles have four teeth, which are approximately equal in length. The head length ranges from 0.98 - 1.00 mm, the head width from 0.73 - 0.78 mm. The clypeal apron is concave, the anterior margin of the clypeus is convex and



Map 17

Simopelta pergandei

Melonas - Santa Isabel); Tachira (Road from Santa Ana - Río Frio, Curimaqua Valley, Parque La Petrolea near Rubio, San Cristóbal).

Habitat

High elevation tropical forest, between 920 - 2500 m.

Biology

The four workers from Colombia were collected in a malaise trap.

Figures 26 (head), 55 (mesosoma); Map 18

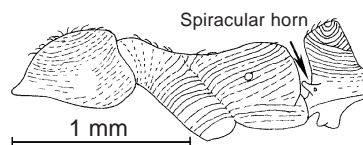


Figure 55

Side view of the mesosoma and petiole of the holotype worker of *S. quadridentata*.

angulate, but does not form a spine, the eye is relatively small (maximum diameter 0.07 - 0.09 mm) as compared with *S. andersoni*, located about two diameters from the anterior margin of the head. The scape is relatively long (0.96 - 1.00 mm) and extends about the first 2 funicular segments past the posterior lateral margin of the head. The anterior margin of the mesonotum (Weber's length 1.57 - 1.58 mm) is at a noticeably lower level than the posterior border of the pronotum, the dorsum of the mesosoma is broadly concave. The anterior and posterior faces of the petiole are approximately parallel, and form a distinct, horizontal, dorsal face. The spiracular horns are well developed, and the subpetiolar process is large and basically triangular shaped, without a concave posterior face.

Erect hairs are sparse on most surfaces, except for the clypeus, the ventral surface of the head, and the ventral surface of the gaster. Most other hairs on the head, mesosoma, petiole, and gaster are decumbent to appressed, including the hairs on the tibiae.

The head is covered with transverse rugae or striae, which pass anteriorly on the sides and ventral surface of the head. The rugae or striae on the dorsum of the mesosoma are finer than those on

the head, and less well defined, especially on the dorsum of pronotum. The sculpture forms concave, curved, concentric rugae on the side of the pronotum, the striae on the mesopleuron and propodeum are obliquely vertical. The petiole is encircled with striae, the apex of the node has transverse rugae. The gaster is smooth and glossy. The ant is dark reddish-brown to black.

The female and male are unknown.

This species could be confused with *S. transversa*, as well as other similar species. It can be easily separated by the four mandibular teeth (mandibles have three teeth in *S. transversa*, and the other, related species). Among the species with four mandibular teeth, it can be separated from *S. laticeps*, *S. mayri* and *S. curvata*, by the lack of the median tooth on the anterior border of the clypeus. Separation from *S. andersoni* is difficult, but it differs in having a smaller eye (the maximum diameter of the eye of *andersoni* is > 0.1 mm), and the hairs on the scape are appressed against the surface (slightly elevated in *S. andersoni*). See the discussion of *S. andersoni* for more characteristics that can be used to separate these two species.

Distribution

Costa Rica: Puntarenas (4 km SSE of San Vito); Guanacaste (Cacao Field Station, 1158m, 15-ii-1996, R. Anderson # 17670, CWEM).

Habitat

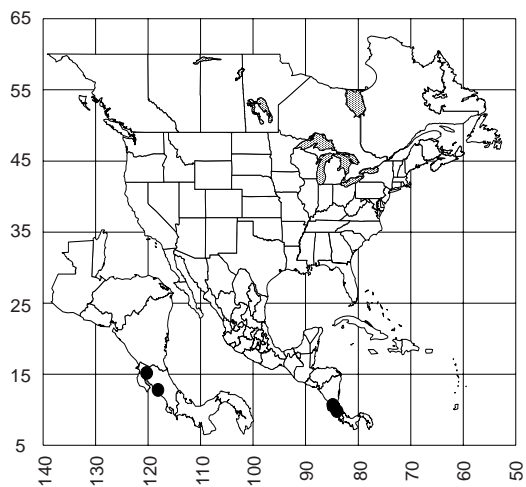
Rain forest.

Biology

The workers were foraging on the ground.

Type series

Holotype worker (MCZC), 1 paratype worker (CWEM), CR Puntarenas: 4 km SSE San Vito, 8°47'N 82°58'W [?], 1200m, 27-iii-1990, P. S. Ward # 10662-1.



Map 18

Simopelta quadridentata

Etymology

From Latin, *quattuor* for four and *dentatus* meaning toothed, referring to the four teeth of the mandible.

***Simopelta transversa* new species**

Figures 11 (tibia worker), 13 (top of petiole worker), 56 (head worker), 57 (mesosoma worker), 58 (head of female), 59 (side of female); Map 19

williamsi species complex**Discussion and description**

The workers are moderately large specimens (total length 4.5 mm), dark reddish-brown, with lighter brown appendages and gaster. Head length ranges from 0.97 - 1.02 mm, head width from 0.77 - 0.83 mm. The mandibles have 3 teeth, which are approximately equal in size. The anterior border of the clypeus is broadly rounded, and the eyes are small (maximum diameter 0.05 - 0.07 mm), located more than two diameters from the anterior margin of the head. The scape (0.88 - 0.94 mm) extends approximately the first three funicular segments past the posterior lateral corner. The mesosoma (Weber's length 1.48 - 1.60 mm) is deeply impressed at the metanotal suture. The anterior and posterior faces of the petiole are nearly parallel, and the dorsal face is moderately defined, and horizontal. The spiracular horns are moderately well-developed, and the subpetiolar process is triangular, with a concave posterior face.

The dorsum of the head is covered with coarse, transverse rugae or striae, which pass anteriorly on the sides of the head, as well as the ventral surface of the head. The dorsum of the pronotum, mesonotum, and propodeum have transverse rugulae (especially on the pronotum) or poorly defined striae (especially on the propodeum). The rugulae on the side of pronotum form concentric curves, those on the mesopleuron and propodeum are obliquely vertical, or completely vertical. The dorsum of the gaster is mostly smooth and glossy.

Erect hairs are present on the mandibles, clypeus, the dorsal and ventral surfaces of the head, the scape, the dorsum of the mesosoma, the petiole, and the gaster, the hairs on the legs are long and erect to suberect.

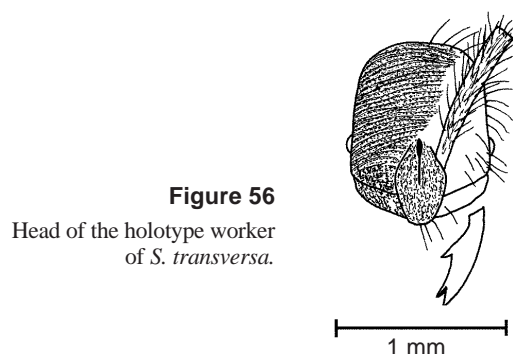


Figure 56
Head of the holotype worker
of *S. transversa*.

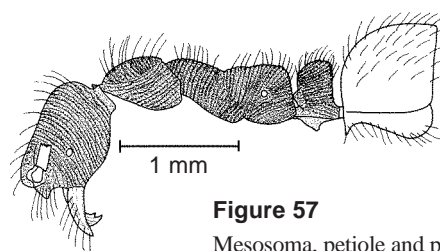


Figure 57
Mesosoma, petiole and part of the
postpetiole (first gastral tergum) of
a paratype worker of *S. transversa*.

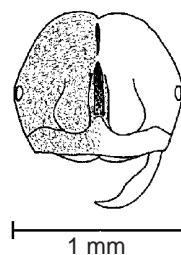


Figure 58
Head of the paratype female
of *S. transversa*.

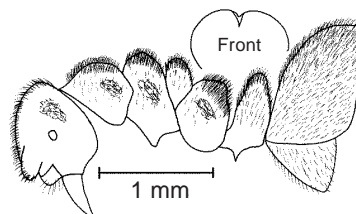


Figure 59
Side view of the paratype female of *S. transversa*.
The inset shows the petiole as seen from the front.

The female is small (total length 6 mm, Weber's length 1.44 mm), with an enlarged gaster. The mandibles of the female are sickle-shaped, without teeth. The clypeal apron and the anterior margin of clypeus are concave medially. The head is nearly round (head length 0.88 mm, head width 1.00 mm), and the eye is small (0.08 mm maximum diameter), located about three diameters from the anterior border of the head, and apparently contains about ten poorly defined ommatidia. The scapes are missing in the specimen (Brown, in an unpublished manuscript lists the length for this specimen as 0.65 mm). The dorsum of the pronotum is rounded, the scutum is rounded and convex, bulging, the scutellum is narrow and projecting strongly upwards, the propodeum is angulate posteriorly, the petiole is narrow when viewed in profile, composed of two distinct lobes when seen from the front. The subpetiolar process is strongly angulate, and directed ventrally.

The dorsum of the head of the female is covered with coarse punctures, and lacks the transverse rugae of the worker, the mesosoma is similar, and also lacks rugae. The dorsum of the gaster is moderately smooth and shining, but with roughened, granulate sculpture.

The dorsum of the head has several erect to decumbent hairs, as does the mesosoma, the hairs on the petiole are mostly erect, as are the hairs on the gaster, the hairs on the legs are mostly suberect.

The male is unknown.

Several species with transverse striae on the dorsum of the head could be confused with the workers of this species. It can be easily separated from all of them by the long, suberect hairs on the outer surface of the posterior tibia. Additionally, the node of the petiole (seen from above) is much broader than long, which is rare in the genus.

Distribution

Known only from the type locality, Pance, from municipality of Cali, Valle del Cauca, Colombia.

Habitat

Wet mountain rain forest.

Biology

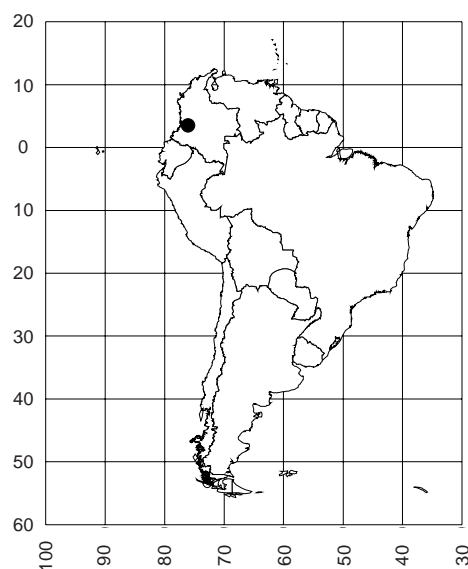
From an unpublished manuscript by Brown: the type colony was collected on a steep slope in the forest along a large stream. The ants were running rapidly downhill among moderately abundant leaf litter, all moving in the same direction. Almost all of them were carrying white pupae, and perhaps a few larvae, the brood of a medium-size *Pheidole* species. The column formed a bivouac consisting of a mass of workers, brood, and prey in a shallow basin of a leaf beneath another leaf. The colony size was estimated at 1000 or more adult workers.

Type series

Holotype worker (MCZC), 44 paratype workers (CASC, CWEM, IAVH, MIZA, MCZC, LACM, NHMB, USNM), 1 paratype female (MCZC), Pance, 1700m, Mun. of Cali, 16-vi, mt. rain forest; COLOMBIA: Valle, 1971. WL Brown S. Chaplin.

Etymology

From Latin, *transversus* meaning crosswise, referring to the rugae on the dorsum of the head. William Brown suggested the name.



Map 19

Simopelta transversa

Simopelta vieirai new species

Figures 13 (top of petiole), 60 (mesosoma), 61 (head), 62 (tibia); Map 20

williamsi species complex

Discussion and description

The worker is a moderately sized (total length 4.5 mm), dark reddish-brown ant with brown legs. The mandibles have three equal sized teeth, in which the second and third teeth are usually truncated. Head length ranges from 1.04 - 1.06 mm, head width 0.79 - 0.83 mm. The anterior border of the clypeus is broadly convex and somewhat angulate, and slightly overhangs the apron of the clypeus. The eye is moderate in size (maximum diameter 0.07 mm), located about two diameters from the anterior edge of the head. The scape (1.06 - 1.11 mm) extends between three or four funicular segments past the posterior lateral corner. The sides of the head become wider anteriorly, and the posterior border is nearly straight. The mesosoma is strongly concave at the metanotal suture, and the metanotum is approximately as long as the dorsal face of the propodeum. The anterior and posterior faces of the petiole are nearly straight, and the dorsal face is broadly convex. The spiracular horns are moderately developed, but the subpetiolar process is poorly developed.

Long (up to 0.2 mm), erect hairs are present on the clypeus, ventral surface of the head, scattered on the mesosoma, and on the ventral surface of the gaster, much shorter (0.02 mm) suberect to decumbent hairs are present on the dorsum of the head, dorsum of the mesosoma, dorsum of the petiole, and dorsum of the gaster, the hairs on the legs are similar, but slightly longer (up to 0.06 mm).

The head has well defined, transverse striae, which pass ventrally and anteriorly to the underside of the head and are nearly vertical between frontal lobes and the eyes. The dorsum of the mesosoma has transverse striae, the side has oblique striae. The side of the petiole is very finely striated, the dorsum of the petiole is nearly without sculpture. The gaster is nearly smooth and glossy, with faint, coriaceous sculpture.

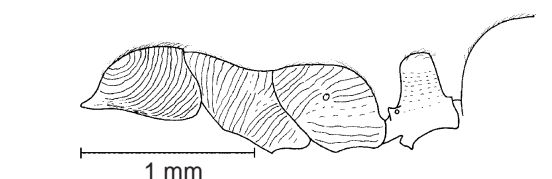


Figure 60

Mesosoma, petiole, and part of the first gastral tergum of the holotype worker of *S. vieirai*.

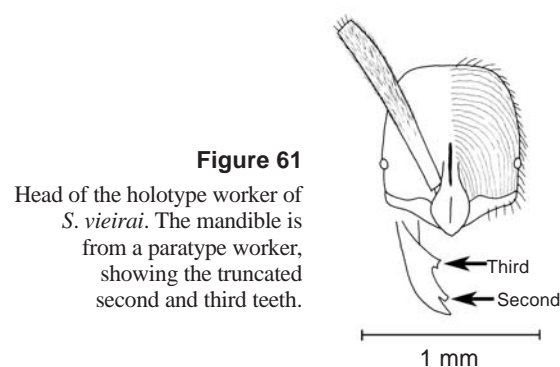


Figure 61

Head of the holotype worker of *S. vieirai*. The mandible is from a paratype worker, showing the truncated second and third teeth.

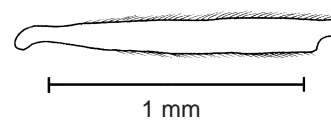


Figure 62

Posterior left tibia of the holotype worker of *S. vieirai* as seen from the front.

The female and male are unknown.

The worker of this species is nearly identical to that of *S. williamsi*. It differs in having the sides and top of the petiole nearly without sculpture, glossy and shining. The sides of the petiole of *S. williamsi* are horizontally striated, and the dorsum is granulated, usually with a longitudinal depression in the middle, the latter longitudinal depression is lacking in workers

of *S. vieirai*. The petiolar node is nearly circular (seen from above) in *S. vieirai*, not angulate posteriorly as in *S. williamsi*. Actually, the shape of the petiolar node, as well as the smooth sculpture on the node, would separate this species from all of the others that have transverse striae on their heads.

Distribution

Colombia: Quindío (Municipio Córdoba [Fca. San Diego Guandal 4°24'12"N 75°41'24"W], IAVH); Nariño (Reserva Natural La Planada Ricaurte [1°9'N 77°58'W], IAVH). ECUADOR: Cotopaxi (type series); Pichincha (Reserva Biológica Maquifucuna [CASC]).

Habitat

High elevation montane cloud forest at 1350 - 2000 m.

Biology

The foragers of the type series formed a column on the forest floor. One worker was extracted from ridge top leaf litter.

Type series

Holotype worker (QCAZ), 11 paralectotype workers (CASC, CWEM, QCAZ, IAVH, MCZC, MZSP, USNM).



Map 20

Simopelta vieirai

Etymology

Named in honor of our friend Juan Vieira, of Quito, Ecuador, who collected the type series.

Simopelta williamsi Wheeler

Figures 10 (head), 13 (top of petiole), 63 (mesosoma), 64 (top of petiole); Map 21

williamsi species complex

Simopelta williamsi Wheeler, 1935:14-16, Figure 3, worker, Ecuador: Naranjapata [cotype seen, MCZC]; *Belonopelta williamsi*: Baroni-Urbani, 1975:300; *Simopelta williamsi*: Bolton, 1995:383.

Discussion

The worker is a moderate sized (total length slightly more than 4 mm), dark reddish brown ant, with slightly lighter colored legs. The mandible has three

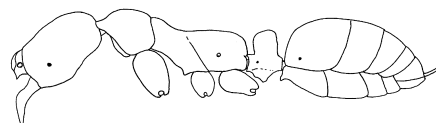
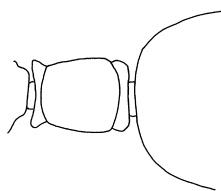


Figure 63

Side view of a worker of *S. williamsi* (from Wheeler, 1935).

**Figure 64**

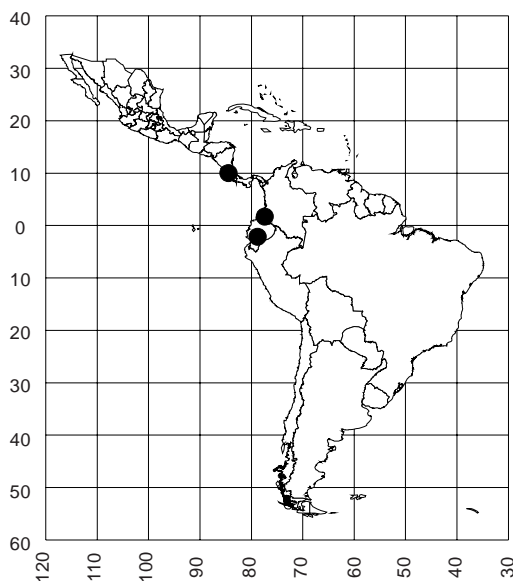
Dorsal view of a petiole of a worker of *S. williamsi* (from Wheeler, 1935).

well-developed teeth, the basalmost tooth (third) is nearly always obliquely truncated, the middle (second) tooth is sharp. The anterior border of clypeus is broadly rounded. The eye is small (maximum diameter 0.05 mm). The scape extends well past the posterior lateral border of the head. The length of the mesonotum is approximately equal to the length of the dorsal face of the propodeum (both seen in profile). Anterior and posterior faces of the petiole are approximately parallel, and a well-developed dorsal face is present. The node of the petiole, as seen from above, is in the shape of a square, with relatively square corners posteriorly, and rounded anteriorly. The spiracular horns of the petiole are well-developed, as is the subpetiolar process, which is angulate posteriorly.

The dorsum of the head is covered with transverse, curved striae, similar striae are present on the dorsum of the pronotum, where many of them form concentric circles, the striae on the mesonotum and dorsum of the propodeum are mostly transverse, and partially absent on the dorsum of the propodeum. The striae on the side of the petiole are very poorly formed, leaving the surface slightly smooth and glossy. The dorsum of the petiole has a few, fine, transverse striolae, with part of the surface smooth and glossy. The dorsum of the postpetiole is finely coriaceous, but mostly smooth and glossy.

The female and male are unknown.

This species could be confused with *S. breviscapa*. It differs in having much longer scapes, which extend well past the posterior lateral corner of the head (the scapes extend only slightly past the corner of the head in *S. breviscapa*). This species is similar to *S. fernandesi*, but can be separated by the truncated basal mandibular 1tooth, which is sharp in *S. fernandesi*. Additionally, the mesonotum is about the same length

**Map 21**

Simopelta williamsi.

as the dorsal face of the propodeum, when they are viewed in profile. It can be separated from *S. vieirai* as the petiole has sculpture on all surfaces, and is not nearly smooth and glossy as in *S. vieirai*.

A few specimens have a relatively long mesonotum, as well as an elongated petiolar node (Colombia: Magdalena, Valle del Cauca, Caquetá, IAVH). The specimens will be considered to be “near williamsi” until more specimens become available.

Distribution

Costa Rica: Puntarenas (11 k SW Las Cruces, CWEM). Colombia: Nariño (Río Ñambí [1°18'N 78°5'W], IAVH), Reserva Natural La Planada Ricaurte [1°9'N 77°58'W], IAVH). Ecuador: Guayas (Naranjapata, QCAZ).

Habitat

Wet cloud forest at 570 (Wheeler, 1935) - 1450 meters elevation.

Biology

Unknown. Many specimens have been extracted from leaf litter.

Table 2
Checklist of the species of *Simopelta*

Species	collected	complex	worker (x = described)	female	male	USA	Mexico/C America	Caribbean	Colombia/ Venezuela	Ecuador/Perú	Brasil /Guianas/Urug.	Bolivia	Paraguay	Argentina	Chile
<i>andersoni</i>		wi	x				x								
<i>bicolor</i>		cu	x								x				
<i>breviscapa</i>		wi	x				x								
<i>curvata</i>		cu	x								x				
<i>fernandezi</i>		wi	x						x						
<i>jeckylli</i>		wi	x							x	x				
<i>laevigata</i>		wi	x						x						
<i>laticeps</i>		wi	x						x	x					
<i>longinoda</i>		wi	x				x								
<i>longirostris</i>		wi	x						x	x					
<i>manni</i>		wi	x							x					
<i>mayri</i>		cu	x						x						
<i>minima</i>		cu	x								x				
<i>oculata</i>		wi	x	x			x								
<i>paeminosa</i>		wi	x				x								
<i>pentadentata</i>		wi	x				x								
<i>pergandei</i>		cu	x	x			x	x							
<i>quadridentata</i>		wi	x				x								
<i>transversa</i>		wi	x	x				x							
<i>vieirai</i>		wi	x					x	x						
<i>williamsi</i>		wi	x				x	x	x						

Acknowledgements

We would like to thank Tania Arias, Fernando Fernández, Manuel Solís, Stefan Cover, Juan Manuel Vieira, John Lattke, Ted Schultz, Daniel Burckhardt, Stefan Schödl, Herbert Zettel, and Bernard Merz for the loan of material, without which this revision would not have been possible.

Tania Arias, Fernando Fernández, Stefan Cover and Gary Alpert provided valuable advice and lodging.

Numerous visits to the Museum of Comparative Zoology were generously supported by the Ernst Mayr Fund of the Museum. Collection of some of the Costa Rican and Panamanian material was supported by the National Geographic Society, Robert Anderson, principal investigator, and some of the Colombian material was supported by the National Science Foundation of the United States, Michael Sharkey, principal investigator.

Literature cited

- Baroni Urbani, C. 1975. Contributo alla conoscenza dei generi *Belonopelta* Mayr e *Leiopelta* gen. n. (Hymenoptera: Formicidae). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* 48:295-310.
- Bolton, B. 1995. *A New General Catalog of the Ants of the World*. Harvard University Press, 504 pp.
- Borgmeier, T. 1950. A fêmea dichthadiiforme e os estádios evolutivos de *Simopelta pergandei* (Forel), e a descrição de *S. bicolor*, n. sp. *Revista de Entomologia* 21:369-380.
- Brady, S. G. 2003. Evolution of the army ant syndrome: the origin and long-term evolutionary stasis of a complex of behavioral and reproductive adaptations. *Proceedings of the National Academy of Sciences* 100:6575-6579.
- Brandão, R. 1989. *Belonopelta minima* new species (Hymenoptera, Formicidae, Ponerinae) from eastern Brazil. *Revista brasileira de Entomologia* 33:135-138.
- Djiéto-Lordon, C., J. Orivel and A. Dejean. 2001. Consuming large prey on the spot: the case of the arboreal foraging ponerine ant *Platythyrea modesta* (Hymenoptera, Formicidae). *Insectes Sociaux* 48:324-326.
- Forel, A. 1909. Ameisen aus Guatemala usw., Paraguay und Argentinien. (Hym.). *Deutsch Entomologische Zeitschrift* 1909:239-269.
- Gotwald, W., and W. Brown. 1966. The ant genus *Simopelta* (Hymenoptera: Formicidae). *Psyche* 73:261-277.
- Hermann, H. R. 1968. The hymenopterous poison apparatus VII. *Simopelta oculata* (Hymenoptera: Formicidae: Ponerinae). *Journal of the Georgia Entomological Society* 3:163-166.
- Hölldobler, B. and E. Wilson. 1990. *The Ants*. Harvard University Press, 732 pp.
- Longino, John. www.evergreen.edu/ants/genera/Pachycondyla/SPECIES
- Mann, W. 1916. The ants of Brasil. *Bulletin of the Museum of Comparative Zoology, Harvard* 60:399-490.
- Mann, W. 1922. The ants from Honduras and Guatemala. *Proceedings of the United States National Museum* 61:1-54.
- Mayr, G. 1887. Südamerikanische Formiciden. *Verhandlungen der k. k. Zoologisch-Botanischen Gesellschaft in Wien* 37:511-632.

- Miyata, H., H. Shimamura, H. Hirose and S. Higashi. 2003. Morphology and phenology of the primitive ponerine army ant *Onychomyrmex hedleyi* (Hymenoptera: Formicidae: Ponerinae) in a highland rain forest of Australia. *Journal of Natural History* 37:115-125.
- Peeters, C. P. 1991. Ergatoid queens and intercastes in ants: two distinct adult forms which more look morphologically intermediate between workers and winged queens. *Insectes Sociaux* 38:1-15.
- Ravary, F. and P. Jaisson. 2002. The reproductive cycle of thelytokous colonies of *Cerapachys biroi* Forel (Formicidae, Cerapachyinae) *Insectes Sociaux* 49:114-119.
- Snelling, R. 1971. A new species of *Simopelta* from Costa Rica. *Bulletin of the Southern California Academy of Sciences* 70:16-17.
- Villet, M. 1989. A syndrome leading to ergatoid queens in ponerine ants (Hymenoptera: Formicidae). *Journal of Natural History* 23:825-832.
- Wheeler, G. C. and J. Wheeler. 1957. The larva of *Simopelta* (Hymenoptera: Formicidae). *Proceedings of the Entomological Society of Washington* 59: 191-194.
- Wheeler, G. C. and J. Wheeler. 1964. The ant larvae of the subfamily Ponerinae: Supplement. *Annals of the Entomological Society of America* 57:443-462.
- Wheeler, G. C. and J. Wheeler. 1986. Supplementary studies of ant larvae: Ponerinae. *Transactions of the American Entomological Society* 112:85-94.
- Wheeler, G. C. and J. Wheeler. 1989. Notes on ant larvae: Ponerinae. *Journal of the New York Entomological Society* 97:50-55.
- Wheeler, W. 1935. Ants of the genera *Belonopelta* Mayr and *Simopelta* Mann. *Revista de Entomologia*. 5:8-19.
- Wilson, E. O. 1958. The beginnings of nomadic and group-predatory behavior in the ponerine ants. *Evolution* 12:24-31.