

New species and nomenclatural changes for the Costa Rican ant fauna (Hymenoptera: Formicidae)

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Abstract

Additions to the Costa Rican ant fauna are reported. *Camponotus senex* (F. SMITH, 1858) is redefined and *C. senex textor* FOREL, 1899 is raised to species. The natural history of these two species is clarified, with *C. senex* nesting in dead branches and *C. textor* constructing leaf nests sewn together with larval silk. Earlier literature accounts of silk use by *C. senex* are misidentifications of *C. textor*. *Pachycondyla obsoleta* (MENOZZI, 1931) is synonymized under *Cryptopone gilva* (ROGER, 1863). *Nesomyrmex tristani* (EMERY, 1896) is synonymized under *N. asper* (MAYR, 1887) and *N. antoniensis* (FOREL, 1912) is removed from synonymy and raised to species. The following new species are described: *Adelomyrmex brenesi* sp.n., *Lenomyrmex colwelli* sp.n., *Nesomyrmex vargasi* sp.n., *Pyramica augustandrewi* sp.n., *P. cascanteae* sp.n., *P. erikae* sp.n., *P. oconitrilloi* sp.n., *P. paniaguae* sp.n.

Key words: Formicidae, Costa Rica, new species, synonymizations, silk nests.

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Introduction

Costa Rica is an important center of research in tropical biology and has a strong tradition in natural history (GÓMEZ & SAVAGE 1983). Biotic inventory has always been an element of the scientific enterprise in this rich tropical country, and it continues to be fostered by institutions such as the National Museum, The University of Costa Rica, the Organization for Tropical Studies (OTS), and the Instituto Nacional de Biodiversidad (INBio, GÁMEZ 1991). Taxonomy and biotic survey research are essential elements in both the study of biodiversity and its conservation (JANZEN 1993, HAILA & MARGULES 1996, WHEELER & al. 2004) and local inventories of arthropods are particularly important (GODFRAY & al. 1999). Ants are an important part of the Costa Rican biota and have figured prominently in countless ecological and evolutionary studies. Taxonomic knowledge of the Costa Rican ant fauna has grown steadily since the late 1800's, beginning with the extensive collections of Anastasio Alfaro, the first Director of Costa Rica's National Museum. The purpose of this paper is to continue developing Costa Rica's taxonomic infrastructure for ants. I present here a mélange of taxonomic changes, both some nomenclatural "housekeeping" and description of new species.

Methods

Observations were made at 63× magnification with a Leica MZ12.5 dissecting microscope. Measurements were made with a Nikon dual-axis micrometer stage with digital output in increments of 0.0001 mm. However, variation in specimen orientation, alignment of crosshairs with edges of structures, and interpretation of structure boundaries resulted in measurement accuracy to the nearest 0.01 to 0.005 mm, depending on sharpness of the defined boundary. All measurements are presented in millimeters.

The following terminology and abbreviations are used:

HL Head length in full face view; perpendicular distance from line tangent to rearmost point of vertex

margin to line tangent to anteriormost projection of clypeus (either laterally near mandibular insertion or median lobe, depending on which extends further), not including anteromedian denticle if present.

- ML Mandible length; in full face view with closed mandibles, along same axis as HL measurement, distance from anteriormost projection of clypeus to apex of mandibles. Mandible length is only reported for species with elongate mandibles (dacetines and *Lenomyrmex*), for which degree of closure does not affect mandible length.
- HW Head width; in full face view, maximum width of head including eyes if they project beyond border of head capsule.
- HC Head capsule width; in full face view, maximum width of head not including eyes. If eyes do not project beyond border of head capsule HW and HC are the same and only HW is reported.
- HD Head capsule depth; in lateral view, maximum depth of head measured perpendicular to long axis of head.
- EL Eye length; length of maximum diameter of compound eye.
- SL Scape length; maximum chord length of scape shaft from apex to basal flange, not including basal condyle and neck.
- MeL Mesosoma length; in lateral view, distance from anterior declivity of pronotum to posteriormost extent of inferior propodeal lobe.

Collections are referred to by the following acronyms:

- BMNH The Natural History Museum, London, U.K.
 CACS California Academy of Sciences, San Francisco, CA, USA.
 DEIC Deutsches Entomologisches Institut, Müncheberg, Germany.
 INBC Instituto Nacional de Biodiversidad, Costa Rica.

JTLC John T. Longino, personal collection, Olympia, WA, USA.
 LACM Los Angeles County Museum of Natural History, Los Angeles, CA, USA.
 MCZC Museum of Comparative Zoology, Cambridge, MA, USA.
 NMW Naturhistorisches Museum, Vienna, Austria.
 UCDC University of California, Davis, CA, USA.
 USNM National Museum of Natural History, Washington, DC, USA.

Specimens in the Longino collection will eventually be distributed to research collections, most likely INBio and LACM.

All new species names in this work are genitive nouns and thus invariant (ICZN 1999, article 31). All holotypes and paratypes associated with the new species described here have unique specimen-level identifiers affixed to each pin, and these specimen codes are listed in each species description. These are not to be confused with collection codes, which are "lot numbers" associated with particular collection events. When present, collection codes follow the collector. Collector for many specimens is "Project ALAS," a composite of all the on-site staff associated with the project (Danilo Brenes, Flor Cascante, Nelci Oconitrillo, Maylin Paniagua, Ronald Vargas).

Taxonomic synopsis

Adelomyrmex brenesi sp.n.

Camponotus senex (F. SMITH, 1858)

= *Tapinoma tomentosa* NORTON, 1868a

Camponotus textor FOREL, 1899 stat.n.

Cryptopone gilva (ROGER, 1863)

= *Euponera (Trachymesopus) gilva* subsp. *harnedi* M.R. SMITH, 1929

= *Euponera (Trachymesopus) obsoleta* MENOZZI, 1931 syn.n.

Lenomyrmex colwelli sp.n.

Nesomyrmex antoniensis (FOREL, 1912a) stat.n.

Nesomyrmex asper (MAYR, 1887)

= *Leptothorax (Goniothorax) asper* var. *rufa* EMERY, 1896

= *Leptothorax (Goniothorax) tristani* EMERY, 1896 syn.n.

= *Leptothorax asper* var. *sufurea* FOREL, 1912a

Nesomyrmex vargasi sp.n.

Pyramica augustandrewi sp.n.

Pyramica cascanteae sp.n.

Pyramica erikae sp.n.

Pyramica oconitrilloae sp.n.

Pyramica paniaguae sp.n.

***Adelomyrmex brenesi* sp.n.** (Figs. 1 - 3)

Holotype worker: Costa Rica: Heredia Prov., 6 km ENE Vara Blanca (10° 11' N, 84° 07' W), 2000 m elevation, 13.III.2002, leg. Project ALAS, specimen code JTLC00000 3382 (INBC).

Paratypes: 4 workers, same data as holotype, specimen codes INB0003223968 (MCZC), INB0003223966 (LACM), INB0003223953 (UCDC), INB0003223935 (JTLC).

Diagnosis of worker: Mandible shining, coarsely striate, with five teeth on masticatory margin, masticatory margin meeting basal margin at obtuse angle, basal margin



Figs. 1 - 3: *Adelomyrmex brenesi* sp.n., holotype worker. (1) Face view; (2) lateral view; (3) dorsal view.

with stout triangular tooth at base near mandibular insertion; median lobe of clypeal plate a single blunt projection or slightly emarginate medially; lateral teeth of clypeal plate pronounced, triangular, interlocking with basal mandibular tooth when mandibles closed; anterior and medial face with striae mixed with large, widely-spaced foveae, grading posteriorly to area of large foveae separated by smooth, shiny interspaces, with foveae becoming sparser and smaller toward vertex margin; eye composed of 5 - 12 ommatidia, variably fused; hypostomal margin with small tooth; promesonotum smooth and shiny with sparse, shallow, piligerous foveae; mesopleuron and propodeum with large rugae, rugae widely spaced with smooth and shiny in-

terspaces, rugae on dorsal face and upper half of posterior face of propodeum transverse, lower half of posterior face smooth and shining; promesonotum forming single convexity, dropping step-like to flat dorsal face of propodeum; propodeal spines triangular, acute, about as long as wide; petiolar and postpetiolar dorsa smooth except for piligerous puncta, shining; anteroventral margin of petiole lacking tooth, with at most a narrow longitudinal lamella; anteroventral margin of postpetiole with a strongly projecting transverse flange that appears as an acute tooth in side view; gaster smooth except for piligerous puncta, shining; mandibles, scapes, face, sides of head, femora, tibiae, petiolar and postpetiolar nodes, and gaster covered with abundant, long, subdecumbent pilosity; promesonotum covered with similar but somewhat more erect pilosity; dorsal face of propodeum with two long setae inclined forward, otherwise pilosity sparse; color dark red brown.

Measurements (holotype): HL 0.814, HW 0.698, SL 0.519, MeL 0.822.

Comments: In FERNÁNDEZ (2003) this species keys to *A. foveolatus* FERNÁNDEZ (in FERNÁNDEZ & MACKAY 2003). It is a large montane version of *A. foveolatus*, differing in the much larger size and the step-like juncture of promesonotum and propodeum. In *A. foveolatus* the mesosoma forms a single arched convexity.

Etymology: Named for Danilo Brenes M., Project ALAS Parataxonomist from 1992 to 2006.

Range: Costa Rica.

Biology: This species is a montane endemic, known only from uppermost limits of ant distribution on the Barva Transect in Braulio Carrillo National Park. It is known only from the type specimens, which occurred in four mini-Winkler samples (leaf litter sifted from a 1 m² forest floor patch) from one of the Project ALAS Winkler transects (<http://purl.oclc.org/ alas>). It appears to be patchy in its local distribution: it occurred in only one of five Winkler transects at the site. Each transect was 250 m long, and the four occurrences of *A. brenei* were widely separated along the transect in which it occurred.

Camponotus senex (F. SMITH, 1858) (Figs. 4, 5)

Formica senex F. SMITH, 1858: 47: syntype worker, queen: Brazil, RJ, Constancia (Rev. H. Clark) [BMNH] (image examined); MAYR (1862: 676): combination in *Camponotus*; MAYR (1878: 868): description of male; FOREL (1912b: 91): combination in *C. (Myrmobrachys)*.

Tapinoma tomentosa NORTON, 1868a: 60, pl. 2, fig. 2: syntype worker: Mexico; NORTON (1868b: 3): combination in *Camponotus*; EMERY (1892: 167): junior synonym of *C. senex*.

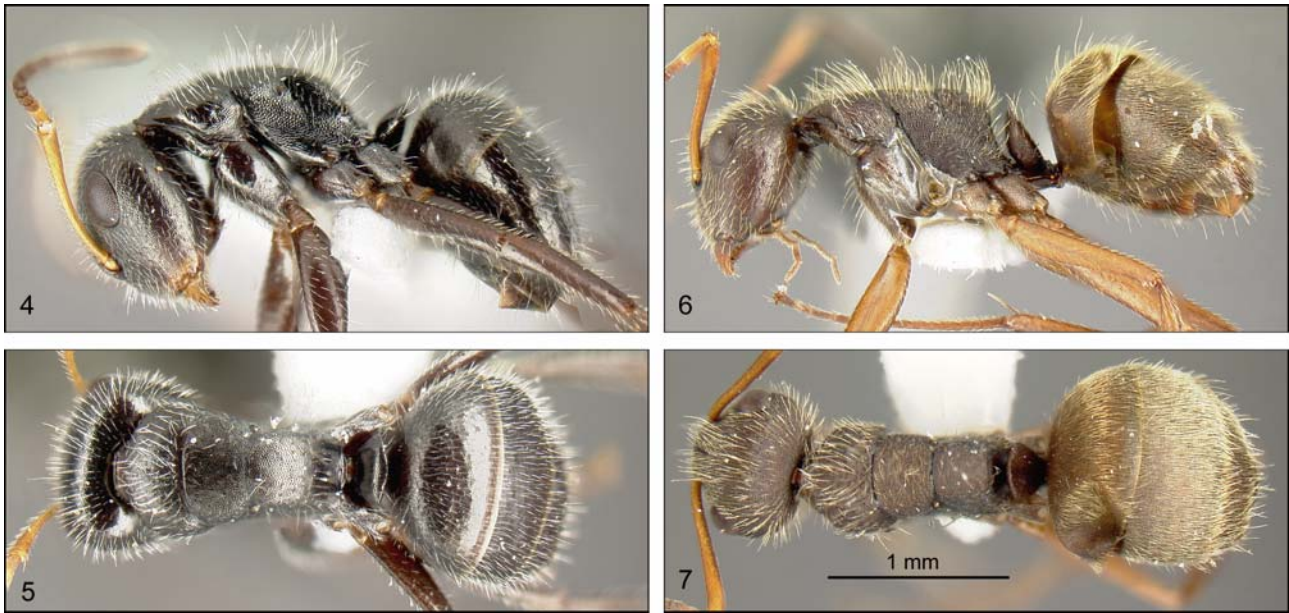
The subgenus *Myrmobrachys* of *Camponotus* is characterized by workers with a somewhat box-like propodeum that has a broad, subrectangular dorsal face. Within this group there is a confusing set of morphologically similar species that vary in details of shape, surface sculpture, and pilosity. In Costa Rica extensive faunal inventory work has resulted in an improved understanding of species boundaries. The species I identify as *C. senex* is all black, the side of the mesosoma is densely punctate, there are abundant short erect setae projecting from the sides of the head in full face view, the mesosomal dorsum is abundantly setose, the gastral dorsum is abundantly setose with an underlying pubescence that is sparse. Some species, such as

the common *C. planatus* and the silk-making *C. textor* to be discussed below, have dense appressed pubescence on the gaster that nearly obscures the underlying cuticle and gives the gaster a yellow to white color. In contrast, the black cuticle of *C. senex* is easily seen beneath the dilute pubescence and the gaster appears black. There is strong worker polymorphism: the major worker is relatively large compared to minor workers. This contrasts with *C. textor*, which has major workers that are little larger than minor workers.

In Costa Rica, *C. senex* is very common in lowland wet forest habitats. It can occur in both mature forest and highly disturbed areas. For example, workers are very common in canopy fogging samples from mature forest at La Selva Biological Station, yet I have also found them on the landscaping around the Juan Santa Maria airport near San Jose. Foragers are diurnal. Nests occur in highly insolated areas such as upper forest canopy, open scrubby or second growth vegetation, roadsides, and agricultural land. The species is an opportunistic cavity nester. Nests are in dead branches, ranging from narrow vine stems to relatively large branches. In surveys of *Cecropia* trees, I often find nests in internodes of saplings, or in mature trees abandoned by *Azteca*, or in peripheral portions of trees that have a dominant *Azteca* colony elsewhere in the crown. Importantly, they never make silk nests among leaves.

Camponotus senex was described in 1858 from material collected in Brazil. I have not made extensive examinations of *C. senex* from museum collections, but in my own collecting experience I have identified as *C. senex* material from Costa Rica, Panama, Venezuela, and Guyana. The range of the species based on published identifications is Mexico to Brazil. Alex Wild examined a syntype of *C. senex* and provided a high-resolution image. It differs from the Costa Rican material in having red instead of black legs, but this is a character that appears intraspecifically variable in many species of *Camponotus*. The syntype is also similar to a montane form of *C. textor* found in Costa Rica, and I cannot easily distinguish the two. However, the montane form of *C. textor* is more likely to be a local endemic species or geographic variant of *C. textor*. Type specimens from Brazil are more likely to be conspecific with the widespread generalized cavity nester that I recognize in Central America and northern South America.

Through an early misidentification by Forel, it has been thought that *C. senex* builds silk nests. There is no mention of the nest of *C. senex* in Smith's original description nor in MAYR's (1878) redescription. FOREL (1879) reviewed the *Camponotus* species related to *C. senex* and identified a collection from Cordoba, Mexico, as *C. senex*. The Mexican collection was from a "paper nest among branches," and Forel noted the similarity to the silk nests of *C. chartifex* and *C. nitidior* (subgenus *Dendromyrmex*). FOREL (1899) described the subspecies *C. senex textor*, based on material that Tonduz collected in Costa Rica, from a carton nest on leaves. FOREL later (1905) identified Brazilian material as *C. senex* and reported Göldi's observations that the larvae are used to spin silk for the nest. WHEELER (1915) reviewed use of larval silk for nest construction by ants, perpetuating the association of *C. senex* with carton nests. This was followed by WHEELER & WHEELER (1953), SCHREMMER (1979), and HÖLLDOBLER & WILSON (1983). The name



Figs. 4 - 7: *Camponotus senex* and *C. textor*, minor workers. *Camponotus senex*: (4) lateral view; (5) dorsal view. Specimen data: Costa Rica: Cartago Prov., 5 km E Turrialba (9° 54' N, 83° 38' W), 945 m elevation, 20.III.1987, leg. J. Longino#1535, specimen code INBIOCRI002280890 (JTLC). *Camponotus textor*: (6) lateral view; (7) dorsal view. Specimen data: Costa Rica: Heredia Prov., La Selva Biological Station (10° 26' N, 84° 01' W), 50 m elevation, 9.I.1993, leg. J. Longino#3336, specimen code INBIOCRI001218776 (JTLC). Scale is same for Figs. 4 - 7.

C. senex should be disassociated from the silk-spinning *Camponotus* and *C. textor* applied instead.

Given the lack of dense gastral pubescence on *C. senex*, it is unlikely that Norton's *C. tomentosa* is actually a synonym of *C. senex*. However, given the unavailability of types for the old Norton names, it can rest in oblivion under *C. senex*.

***Camponotus textor* FOREL, 1899 stat.n.** (Figs. 6, 7)

Camponotus senex textor FOREL, 1899: 138: syntype worker, queen: Costa Rica (Tonduz); EMERY (1925: 164): combination in *C. (Myrmobrachys)*.

Camponotus senex (misidentifications): FOREL (1879: 96): description of major worker; FOREL (1905); WHEELER (1915); WHEELER, G.C. & WHEELER, J. (1953:194): description of larva; SCHREMMER (1979); HÖLDOBLER & WILSON (1983).

Camponotus textor is a typical *Myrmobrachys* in the form of the propodeum and general habitus. Like *C. senex* it is very setose, with abundant erect setae projecting from the sides of the head in face view and from the mesosomal and gastral dorsa in side view. Unlike in *C. senex* the gaster is covered with a dense yellow appressed pubescence that obscures the underlying cuticle and gives the ant a golden sheen. Forel described *C. textor* based on a Costa Rican collection by Tonduz. It was collected in a silk nest attached to leaves, and the entire nest, with queen, was sent to Forel. The description includes the dense yellow pubescence and abundant long erect pilosity, and I am confident of this determination. The presence of dense gastral pubescence is relatively common in *Myrmobrachys*. Similarly pubescent species in Costa Rica include *C. planatus* and *C. brettesi*. The former is bicolored, with red head and mesosoma and darker gaster. Minor workers of *C. brettesi* tend to have relatively shorter and whiter pubescence, lack-

ing the golden sheen of *C. textor*. *Camponotus textor* is weakly polymorphic, whereas *C. planatus* and *C. brettesi* have more distinct major workers that are much larger than minor workers.

Camponotus textor inhabits mature rainforest canopy, where it builds nests by sewing leaves together with larval silk (FOREL 1899, 1905, WHEELER 1915, SCHREMMER 1979, HÖLDOBLER & WILSON 1983). In Costa Rica it is relatively uncommon. At La Selva Biological Station, in the Atlantic lowlands, there is a large foot bridge that crosses the Rio Puerto Viejo. On each side of the river the bridge goes through the crowns of canopy trees growing on the banks of the river. One of these is an *Inga*, and for a while it contained nests of *C. textor*. From the side of the bridge I could see two or three of the nests, each a cluster of leaves and silk about the size of a baseball. Workers and a dealate queen were obtained in a Project ALAS canopy fogging sample from *Virola koschnyi* (Myristicaceae). This was the only occurrence among 52 ALAS fogging samples. In addition, workers were obtained in a single ALAS Malaise trap, one of 16 traps run for a year of sampling.

There is a montane form of *C. textor* which differs from the lowland form. The gaster has dilute pubescence, like *C. senex*. It occurs at 500 m elevation on the Barva Transect, a continuously forested slope above La Selva Biological Station. I found a colony when I cut and lowered a large live branch from the crown of a *Vochysia ferruginea* tree. The branch contained two nests of silked-together leaves. The nests were relatively small, comprised of only two or three *Vochysia* leaves held together with silk sheets. The two forms of *C. textor* seem to be sharply parapatric. During Project ALAS sampling of the Barva transect, workers of typical *C. textor* were collected in a Malaise trap at a 300 m site but not at any of the higher sites. The montane form was collected only from the 500 m site. It is

unknown whether this is intraspecific clinal variation or evidence of two species with a parapatric distribution.

WHEELER (1915) discussed the *Camponotus* species that build exposed nests of leaves sewn together with silk and use their larvae as a source of silk. He observed that these species tend to have very weak polymorphism. I also have noted the surprising lack of major workers in *C. textor* and the montane form. There is some variation in worker size, but no large major workers. Members of the subgenus *Dendromyrmex* exhibit no size variation at all. The workers of subgenus *Dendromyrmex* do not seem at all closely related to *C. textor*, suggesting that the construction of silk nests and the weak to absent polymorphism have evolved independently in two different lineages.

Cryptopone gilva (ROGER, 1863)

Ponera gilva ROGER, 1863: 170: syntype worker: U.S.A.

Pachycondyla (Pseudoponera) gilva: EMERY (1901: 46).

Euponera (Trachymesopus) gilva: EMERY (1911: 86); CREIGHTON & TULLOCH (1930: 74): description of worker, queen; WHEELER, G.C. & WHEELER, J. (1952: 625): description of larva.

Trachymesopus gilva: KEMPF (1960: 424).

Cryptopone gilva: BROWN (1963: 3).

Euponera (Trachymesopus) gilva ssp. *harnedi* M.R. SMITH, 1929: 543: syntype worker: U.S.A., Mississippi, Columbus; synonymy by CREIGHTON & TULLOCH (1930: 74).

Euponera (Trachymesopus) obsoleta MENOZZI, 1931: 196, fig. 5: syntype worker: Costa Rica, Vara Blanca (Schmidt) [DEIC] (examined). **syn.n.**

Trachymesopus obsoleta: KEMPF (1960: 424).

Pachycondyla obsoleta: BROWN, in BOLTON (1995: 308).

BROWN (1963) redefined the genus *Cryptopone*, including within it mainly Old World species. He considered *Cryptopone* to have made a small incursion into the New World, mainly represented by *C. gilva*, a species endemic to the southern U.S.A. He also discussed *Ponera ochracea* r. *guatemalensis* FOREL, 1899 as a probable *Cryptopone* from Guatemala (known only from the type, and presumably Brown was not able to examine the type for the diagnostic mandibular pit). KEMPF (1972) listed *Cryptopone guatemalensis*, and included Nicaragua in its distribution.

I have found *Cryptopone* to be relatively common in Costa Rican cloud forest habitats. For example, it is common in the ridge crest cloud forest in the Monteverde area (1400 - 1600 m), rare around "El Aleman" at the head of the Penas Blancas Valley (900 m), and absent at Casa Eladio further down the valley (800 m). On the Barva Transect in Braulio Carrillo National Park, it occurs in a narrow elevational band from 1000 - 1500 m. It is common under loose bark of dead wood and under epiphyte mats in the low arboreal zone: ground level to a few meters high. I often encounter lone founding queens. I find colonies in logs at a certain stage of decay, when the bark comes off in intact sheets, and there is a thin layer of decayed humus between the bark and the still hard wood. Workers are found thinly scattered in anastomosing tunnels in the humus layer. As a bark sheet is peeled away one to five workers may be revealed, which quickly disappear into holes in the wood and under adjacent bark. I have never been able to collect more than a few dozen workers from a colony, and I have never found an obvious colony center or distinct galleries with aggregations of workers and brood. Occasional larvae



Fig. 8: *Lenomyrmex colwelli* sp.n., holotype worker. Face view.

and pupae occur in the tunnels. The nesting behavior is very similar to that of *Typhlomyrmex rogenhoferi*, a species more common at lower elevations. Specimens are occasionally taken in samples of sifted leaf litter (Winkler samples).

I cannot distinguish Costa Rican *Cryptopone* from U.S.A. material of *C. gilva*. Thus I consider *C. gilva* to occur from the southeastern U.S.A. south to the highlands of Costa Rica. The type of *C. guatemalensis* remains to be examined but it is likely to be a synonym of *C. gilva*. I examined the types of *Pachycondyla obsoleta* at the DEIC in Eberswalde, Germany, in 1990. They are the typical *Cryptopone* of Costa Rican cloud forests.

Lenomyrmex colwelli sp.n. (Figs. 8 - 10)

Holotype worker: Costa Rica: Heredia Prov., 16 km SSE La Virgen (10° 16' N, 84° 05' W), 1100 m elevation, 19.III.2001, leg. Project ALAS, specimen code INB0003211842 (INBC).

Paratypes: 2 workers, same data as holotype, except 9.IV.2001, INB0003214454 (MCZC); and 20.II.2001, INB0003213510 (LACM).

Diagnosis of worker: Mandible smooth and shining; eye with about 9 ommatidia across greatest diameter; face with dense foveate sculpture grading to reticulate rugose sculpture toward vertex; mesosoma covered with coarse, widely-separated rugae, shiny interspaces, rugae transverse on promesonotal dorsum and dorsal face of propodeum, curving to longitudinal on side of pronotum, mesopleuron, and side of propodeum, posterior face of propodeum with fine transverse rugulae; propodeal spines long, stout; inferior propodeal lobes broadly triangular; petiole gradually sloping to rounded posterior node, without differentiated peduncle; petiole with large, sharp anteroventral tooth; petiolar dorsum with faint longitudinal rugulae anteriorly, grading to smooth and shining posteriorly; dorsum of postpetiole and entire gaster smooth and shining, highly polished; scape with about 10 fine erect setae that are about half maximum width of scape; face, promesonotal dorsum, posterior petiolar dorsum, postpetiolar dorsum, and gastral dorsum with similar sparse, short, erect setae; scapes, face, and side of head with sparse, long, ap-

pressed pubescence; tibia with very sparse short appressed pubescence, a few erect setae at apex near basitarsus; surface of gaster with no pubescence; mandible and tip of funiculus yellow brown, scapes and legs including coxae light red brown, rest of body dark red brown.

Measurements of holotype: ML 0.272, HL 0.740, HW 0.679, HC 0.601, SL 0.529, EL 0.199, MeL 1.050.

Comments: This is the first report of this recently described genus in Costa Rica (FERNÁNDEZ & PALACIO 1999, FERNÁNDEZ 2001). It is most similar to *L. wardi* FERNÁNDEZ & PALACIO 1999, a species known from Ecuador. It differs in the much larger propodeal spines, the lack of a differentiated petiolar peduncle, and the smooth and polished postpetiolar dorsum.

Etymology: Named for Robert K. Colwell, eminent tropical biologist, fellow Director of the ALAS Project, and long-term colleague and friend.

Range: Costa Rica.

Biology: This species is a montane endemic, known from one cloud forest site on the Barva Transect in Braulio Carrillo National Park. It is known only from the type specimens, which occurred in two miniWinkler samples (leaf litter sifted from a 1 m² forest floor patch) from two of the Project ALAS Winkler transects and one Berlese sample of rotten wood (<http://purl.oclc.org/ alas>).

***Nesomyrmex antoniensis* (FOREL, 1912) stat.n.**

Ponera gilva ROGER, 1863: 170: syntype worker: U.S.A.

Leptothorax asper var. *antoniensis* FOREL, 1912a: 18: syntype workers: Colombia, San Antonio, Sierra Nevada de Santa Marta (Forel). Name is available according to ICZN, Art. 45.6.4 because FOREL (1912a) did not explicitly state its use is infrasubspecific.

Leptothorax (Nesomyrmex) tristani EMERY, 1896: KEMPF (1959: 414): incorrect synonymy.

***Nesomyrmex asper* (MAYR, 1887)**

Leptothorax asper MAYR, 1887: 618: syntype worker, queen, male: Brazil, Santa Catarina.

Leptothorax (Goniothorax) asper: EMERY (1896: 59).

Leptothorax (Goniothorax) asper var. *rufa* EMERY, 1896: 61: syntype worker, queen: Brazil, Pará (Schulz); synonymy by KEMPF (1959: 414).

Leptothorax (Goniothorax) tristani EMERY, 1896: 61: syntype worker, queen: Costa Rica, Jimenez (Alfaro). **syn.n.**

Leptothorax asper var. *sulfurea*: FOREL (1912a: 18): syntype worker: Brazil; emendation of spelling to *sulfurea* by EMERY (1924: 250): synonymy by KEMPF (1959: 414).

Leptothorax (Nesomyrmex) asper: KEMPF (1959: 414).

Nesomyrmex asper: BOLTON (2003: 272).

KEMPF (1959) expressed doubt about the distinctness of the two species *N. asper* and *N. tristani*, but he saw evidence of two sympatric species in the vicinity of Caracas, Venezuela. One of the species matched his concept of *N. asper*. The other one differed from *N. asper* as follows: "1) Longitudinal rugae on cephalic dorsum regular, more widely spaced, often fading out to a variable degree on front, vertex and occiput. 2) Rugae of thoracic dorsum usually less strikingly vermiculate, obsolescent on basal face of epinotum. 3) Epinotal spines shorter, more elevated and more diverging toward apex. 4) Petiolar node, as seen from the side, more depressed; broader, with sides diverging caud-



Figs. 9 - 10: *Nesomyrmex colwelli* sp.n., holotype worker. (9) lateral view; (10) dorsal view.

ad, when seen from above. Each side postero-laterally with at least two prominent teeth. 5) Postpetiole laterally with two prominent teeth. 6) First gastric tergite generally distinctly transverse, broader than long." This second form also matched Forel's *N. asper antoniensis*, from the Santa Marta region of Colombia, and additional material from Trinidad and Colombia. Kempf misidentified this second form as *N. tristani*, and illustrated *N. tristani* (figs. 11 and 15) with a worker from Trinidad.

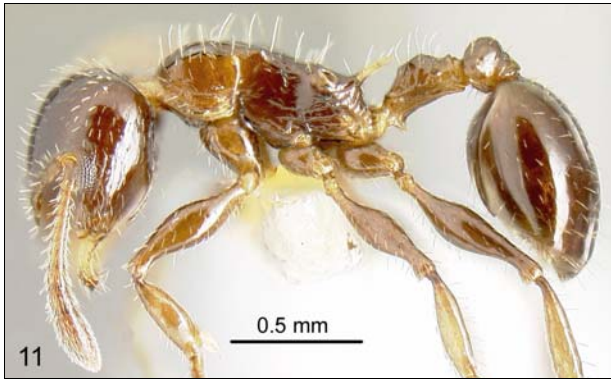
The type locality of *N. tristani* is Costa Rica. I have examined abundant material from Costa Rica, and it all closely matches Kempf's description and illustration of *N. asper*. In Emery's description of the *N. tristani* worker, he states that the side of the postpetiole has two obtuse tubercles that are more or less distinct, which matches all the Costa Rican material I have seen. In contrast, workers from Colombia and Venezuela that I have examined have distinct acuminate teeth on the postpetiole, matching Kempf's description of what he thought was *N. tristani*. I conclude that *N. tristani* is a junior synonym of *N. asper*, and that what Kempf thought was *N. tristani* is a distinct species. Forel's *N. antoniensis* is the valid name for the form.

Costa Rican *N. asper* differs from South American *N. asper* in having a more elongate petiole. If further research reveals discontinuous variation, *N. tristani* might emerge as a distinct Central American species. But Kempf noted that *N. asper* itself is highly variable, with two infraspecific synonyms. If *N. tristani* is distinct, then *N. asper* will probably resolve into multiple differentiated forms.

***Nesomyrmex vargasi* sp.n.** (Figs. 11 - 12)

Holotype worker: Costa Rica: Heredia Prov., 15 km SSE La Virgen (10° 17' N, 84° 05' W), 1000 m elevation, 12.VII.1986, leg. J. Longino#1365, specimen code INBIOCRI0 02281227 (INBC).

Paratypes: 1 worker and 1 dealate queen on same pin, same data as holotype, specimen (pin) code INBIOCRI002 281228 (JTLC); 5 workers, same data as holotype but 9. VII.



Figs. 11 - 12: *Nesomyrmex vargasi* sp.n., holotype worker. (11) Lateral view; (12) dorsal view.

1986, leg. J. Longino#1380-s, JTLC000008515 (LACM), JTLC00000 8516 (MCZC), JTLC000008517 (UCDC), JTLC000008518 (CASC), JTLC000008519 (NMW); 1 worker, Costa Rica: Heredia Prov., 16 km SSE La Virgen (10°16' N 84°05' W), 1100 m elevation, leg. R. Vargas C. 11/RG/RVC/009, INB0003225385 (INBC); 1 worker, same data but 15 - 17.XI.2000, leg. J. Longino#4365-s, INBIOCR I0022 82019 (USNM); 1 worker same data but 11.II.2001, leg. J. Longino#4385-s, LACM ENT 144699 (BMNH).

Diagnosis of worker: Antenna 11-segmented; eye with about 11 ommatidia across greatest diameter; mandible smooth and shiny to weakly striate; all surfaces of body shiny; generally smooth and polished except for about 5 longitudinal rugae between eye and antennal insertion, about 6 longitudinal rugae on promesonotum, a few longitudinal rugulae on dorsal face of propodeum, about 3 longitudinal rugae on ventral half of side of pronotum, irregular rugulae on katepisternum and side of propodeum, about 4 longitudinal rugae on side and dorsum of petiole; side and dorsum of pronotum flat, meeting at carinate right angle; propodeal spiracles large, horizontal, opening dorsally; inferior propodeal lobes large, produced as an acute but rounded angle; anteroventral margin of petiole with acute, ventrally-directed tooth; scapes with abundant erect setae, these shorter than maximum width of scape, and with abundant underlying suberect pubescence; face with abundant short erect setae, these about as long as setae on scapes; in full face view abundant short suberect setae projecting from sides of head and margin of vertex; mesosomal and petiolar dorsa with abundant flexuous setae, these longer than those on face, longest about as long as propodeal spines; postpetiole, gastral dorsum, femora, and tibiae with abundant erect setae, these about as long as those on scapes and face; color red brown.

Measurements of holotype: HL 0.764, HW 0.722, SL 0.603, MeL 0.938.

Comments: This species keys to *N. pleuriticus* in KEMPF (1959). The two species have a parapatric distribution on

the Barva Transect in Braulio Carrillo National Park, *N. pleuriticus* occurring at La Selva Biological Station and the 500 m site, *N. vargasi* occurring around the 1100 m site. *Nesomyrmex vargasi* differs from *N. pleuriticus* in the much smoother and shinier surface sculpture.

Etymology: Named for Ronald Vargas C., ALAS Parataxonomist from 1992 to 2005.

Range: Costa Rica.

Biology: This species occurs in mid-elevation wet forest habitats. So far it is known only from the Volcan Barva transect in Braulio Carrillo National Park, from 1000 - 1100 m elevation. I collected a nest in a treefall gap, in the 1.25 cm diameter live stem of a melastome vine. It contained 32 workers, 1 dealate queen, and abundant brood of various sizes. One specimen was collected in a Project ALAS sweep sample. Workers have been collected as foragers on low vegetation.

Pyramica paniaguae sp.n. (Figs. 13, 14, 15, 19)

Holotype worker: Costa Rica: Heredia Prov., 16 km SSE La Virgen (10° 16' N, 84° 05' W), 1100 m elevation, 11. II.2001, leg. J. Longino#4375, specimen code JTLC000 008506 (INBC).

Paratypes: 11 workers, same data as holotype, specimen code JTLC000008505 (MCZC), JTLC000008507 (LACM), JTLC000008508 (UCDC), JTLC000008509 (CASC), JTLC000008510 (USNM), JTLC000008511, LACM ENT 144683 (BMNH), JTLC000008512 (NMW), JTLC000008513, JTLC000008514, LACM ENT 144684 (JTLC); 1 worker, same data as holotype but 14.II.2001, leg. Project ALAS 11/B/BE/029, INB0003212274 (JTLC); 2 workers, Costa Rica: Heredia Prov., 11 km SE La Virgen (10° 20' N, 84° 04' W), 500 m elevation, 17.II.2003, leg. Project ALAS 05/B/BV/017, INB0003604821, INB0 003604822 (INBC); 1 worker, Costa Rica: Heredia Prov., 10 km NE Vara Blanca (10° 14' N, 84° 05' W), 1500 m elevation, 14.III.2005, leg. Project ALAS 15/B/BE/052, INB0003662486 (INBC); 1 worker, same data but 20.III. 2005, leg. Project ALAS 15/B/BE/068, INB0003662711 (INBC); 1 worker, same data but 8.II.2005, leg. Project ALAS 15/B/BV/001, INB0003662491 (INBC); 1 worker, same data but 14.II.2005, leg. Project ALAS 15/B/BV/ 014, INB0003662502 (INBC).

Diagnosis of worker: With the characters of the *P. gundlachi* group, sensu BOLTON (2000); inner margin of mandible evenly convex for nearly entire length; preapical mandibular dentition consisting of two well-defined small teeth proximal to apicodorsal tooth, second (basalmost) tooth larger than first, second tooth sometimes followed by minute denticle; eye with about 15 ommatidia; basalmost projecting seta on leading edge of scape curved away from base, remaining setae broadly fan-shaped and projecting forward; ground pilosity of clypeus, face, and promesonotum abundant, remiform, subdecumbent; dorsal face of propodeum and gastral dorsum lacking ground pilosity; most of mesosoma, petiole, and postpetiole feebly punctate, mesopleuron and part of side of propodeum smooth and shiny; metanotal groove broadly and shallowly impressed, such that promesonotum and dorsal face of propodeum form two separate convexities; gastral dorsum smooth and shiny with short, sparse basal costulae; pairs of stout clavate setae on sides of head at upper scrobe margin, upper face near vertex margin, pronotal humeri, meso-



Figs. 13 - 18: *Pyramica paniaguae* sp.n., *P. cascanteae* sp.n., *P. oconitrilloae* sp.n., holotype workers. *Pyramica paniaguae*: (13) face view; (14) lateral view; (15) scape. *Pyramica cascanteae*: (16) lateral view. *Pyramica oconitrilloae*: (17) lateral view; (18). scape. Figures 15 and 18 are not to scale.

notum, and petiolar node; postpetiole and gaster with abundant stout clavate setae; color orange.

Measurements of holotype: ML 0.418, HL 0.733, HW 0.612, SL 0.332, MeL 0.710.

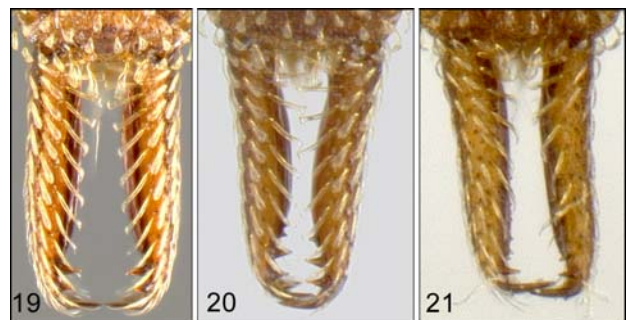
Etymology: Named for Maylin Paniagua G., Project ALAS Parataxonomist from 1994 to 2005.

Range: Costa Rica.

Biology: This species occurs in a restricted elevational band, from 500 m to 1500 m on the Barva transect in Braulio Carrillo National Park. It is arboreal, nesting under epiphytes. A colony was discovered during a 2001 Project ALAS expedition to the 1100 m site, an area of continuous cloud forest. A populous nest was under an epiphyte mat in a recent treefall. I found workers and brood, but no sexuals. Subsequently workers were obtained in Project ALAS Berlese samples of epiphytic material from the same and two other sites on the Barva Transect.

***Pyramica cascanteae* sp.n.** (Figs. 16, 20)

Holotype worker: Costa Rica: Heredia Prov., 11 km ESE La Virgen (10° 21' N, 84° 03' W), 300 m elevation, 9.III.



Figs. 19 - 21: Mandibles of holotype workers of *Pyramica paniaguae* sp.n. (19), *P. cascanteae* (20), and *P. oconitrilloae* (21). Figures are not to same scale.

2004, leg. Project ALAS 03/B/BE/037, INB0003623928 (INBC).

Paratypes: 1 worker, same data as holotype but 10.II.2004, 03/B/BE/004, INB0003623947 (MCZC); 1 worker, 13.II.2004, 03/TN/17/010, INB0003619741 (LACM); 1 worker, Costa Rica: Alajuela Prov., Par. Nac. Arenal, Sen-

dero Pilón (10° 27' N, 84° 43' W), 600 m elevation, 26. II.2003, leg. J.S. Noyes, JTLC000004301 (JTLC).

Diagnosis of worker: Differing from *P. paniaguae* as follows: (1) preapical mandibular dentition consisting of three distinct teeth or two apical teeth followed by a pair of denticles, two apical teeth nearly equal in size or second (more basad) tooth larger; (2) side of mesosoma mostly punctate, only katapisternum smooth and shining; (3) size smaller (see measurements).

Measurements of holotype: ML 0.348, HL 0.634, HW 0.530, SL 0.265, MeL 0.616.

Etymology: Named for Flor Cascante, Project ALAS Parataxonomist from 2001 to 2005.

Range: Costa Rica.

Biology: This species is known from the 300 m site on the Barva transect in Braulio Carrillo National Park and from Arenal National Park. Workers have been collected in Berlese samples of epiphytic material, in a flight intercept trap, and in a sweep sample.

Pyramica oconitrilloae sp.n. (Figs. 17, 18, 21)

Holotype worker: Costa Rica: Heredia Prov., La Selva Biological Station (10° 26' N, 84° 01' W), 50 m elevation, 28.X.1991, leg. J. Longino#3152, specimen code JTLC000007866 (INBC).

Paratypes: 5 workers, same data as holotype, JTLC000007867 (MCZC), INBIOCRI001224829 (LACM), JTLC000007869 (UCDC), INBIOCRI001224828 (BMNH), JTL C000007868 (USNM); dealate queen, same locality as holotype, 11.V.2000, leg. Project ALAS FOT/49/1-40, INBIO CRI002281849 (JTLC); 1 worker, Costa Rica: Heredia Prov., 11 km ESE La Virgen (10° 21' N, 84° 03' W), 300 m elevation, 16.II.2004, leg. Project ALAS 03/B/BV/019, INB0003624227 (JTLC); 1 worker, same data but 15.III.2004, 03/B/BV/049, INB0003624223 (NMW); 1 worker, same data but 10.IV.2004, 03/WF/02/06, INB0003621500 (CASC); 1 worker, same data but 13.II.2004, 03/TN/03/003, INB0003619372 (INBC).

Diagnosis of worker: With the characters of the *P. gundlachi* group, sensu BOLTON (2000); inner margin of mandible evenly convex for nearly entire length; preapical mandibular dentition consisting of one small sharp tooth immediately proximal to apicodorsal tooth, followed by up to five minute denticles; eye with about 15 ommatidia; setae on leading edge of scape thicker apically but not broadly fan-shaped, first two setae (starting at base) strongly curving toward scape apex, next two strongly curving toward scape base, fifth curving toward scape apex; ground pilosity of clypeus, face, and promesonotum abundant, remiform, subdecumbent; dorsal face of propodeum and gastral dorsum lacking ground pilosity; katapisternum smooth and shiny, rest of mesosoma, head, petiole, and postpetiole punctate; metanotal groove not impressed, such that promesonotum and dorsal face of propodeum form single flat surface; gastral dorsum smooth and shiny with short, sparse basal costulae, plus variable extent of fine longitudinal striolation on basal fourth or less; pairs of stout clavate setae on sides of head at upper scrobe margin, upper face near vertex margin, pronotal humeri, mesonotum, and petiolar node; postpetiole and gaster with abundant stout clavate setae; color orange.

Measurements of holotype: ML 0.261, HL 0.506, HW 0.415, SL 0.237, MeL 0.512.

Diagnosis of queen: Similar to worker in mandibular structure, surface sculpture, pilosity, and color; katapisternum smooth and shiny as in worker, rest of side of mesosoma punctate; gastral dorsum longitudinally striolate in basal fourth.

Measurements of queen: ML 0.273, HL 0.522, HW 0.436, SL 0.253, MeL 0.603.

Etymology: Named for Nelci Oconitrillo, Project ALAS Parataxonomist from 1994 to 2001.

Range: Costa Rica.

Biology: At La Selva Biological Station, while night collecting in the arboretum, I found a nest under a bark flap at the base of a large *Pithecellobium* tree. I saw a worker carrying a collembolan prey item at the time of collection. Workers have been taken in Winkler and Berlese samples and a flight intercept trap at La Selva and at the 300 m site on the Barva transect in Braulio Carrillo National Park. A dealate queen was collected in a canopy fogging sample at La Selva.

Comments: Intensive collecting at La Selva Biological Station and the Barva Transect has revealed a complex of five closely similar but consistently separable species related to *P. subdentata* (MAYR, 1887). *Pyramica subdentata* occurs throughout the Neotropics, usually in lowland wet to somewhat seasonal sites, in both mature and second growth forests. It is often collected in samples of litter and rotten wood from the forest floor. *Pyramica trieces* (BROWN, 1960) occurs on the Atlantic slope of Central America from Nicaragua to Panama, from sea level to 1100 m elevation. It occurs most abundantly in mature wet forest where, like *P. subdentata*, it inhabits leaf litter and rotten wood on the forest floor. The three new species described here – *P. oconitrilloae*, *P. cascanteae*, and *P. paniaguae* – occur as a graded series of elevational specialists, with *P. oconitrilloae* occurring at La Selva and the 300 m site on the Barva Transect, *P. cascanteae* occurring at the 300 m site and at a 600 m site in the nearby Arenal National Park, and *P. paniaguae* occurring at the 500 m, 1100 m, and 1500 m sites on the Barva Transect. These three all show a tendency to be arboreal, nesting under bark flaps or epiphytes and rarely occurring in samples of litter and rotten wood from the forest floor. A sixth species in this complex, *P. connectens* (KEMPF, 1958), occurs in Colombia and Ecuador.

All these species lead to couplet 29 in BOLTON'S (2000: 141) key to Neotropical *Pyramica*. I provide a revised key below to replace Bolton's couplets 29 and 30.

- 1 Ground pilosity of head nearly or quite obsolete; color usually dark brown; mandible with exactly 3 small preapical teeth; erect setae on gastral dorsum filiform. *P. trieces*
- Ground pilosity abundant and conspicuous on head; color usually light brown to orange; mandible dentition various; erect setae on gastral dorsum remiform, swollen at the tip. 2
- 2 Mandible with only tiny preapical denticles or one relatively larger preapical tooth followed by tiny denticles (Fig. 21); metanotal groove not impressed (Fig. 17); size relatively small, HL less than 0.6 mm. 3
- Mandible with two or more relatively large preapical teeth (Figs. 19, 20); metanotal groove

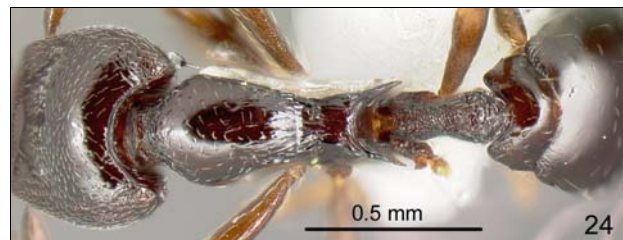
- impressed or not; size relatively large, HL 0.6 mm or greater. 4
- 3 Promesonotum with a single pair of standing setae (in addition to those at humeri), on mesonotum; setae projecting from leading border of scape relatively thin and strongly curved (Fig. 18); first gastral tergite relatively less sculptured, with variable extent of longitudinal striation on basal fourth or less; first gastral sternite largely smooth and shining; katapisternum smooth and shining. *P. oconitrilloae*
- Promesonotum with 4 - 6 pairs of stout remiform standing setae (in addition to those at humeri); setae projecting from leading border of scape broadly fan-shaped, less strongly curved (Fig. 15); first gastral tergite relatively more sculptured, basal fourth or more striatopunctate; first gastral sternite finely reticulate to reticulate-punctate at least basally; katapisternum punctate. *P. subdentata*
- 4 Katapisternum punctate; metanotal groove not impressed (Colombia). *P. connectens*
- Katapisternum smooth and shining; metanotal groove broadly and shallowly impressed, such that promesonotum and dorsal face of propodeum form two separate convexities (Figs. 14, 16). 5
- 5 Mandible with exactly 2 small preapical teeth and no denticles (Fig. 19); katapisternum and part of side of propodeum smooth and shining; MeL about 0.7 mm. *P. paniaguae*
- Mandible with 3 or more preapical teeth (Fig. 20); only a portion of katapisternum smooth and shining, side of propodeum punctate; MeL about 0.6 mm. *P. cascanteae*

***Pyramica augustandrewi* sp.n.** (Figs. 22 - 24)

Holotype worker: Costa Rica: Heredia Prov., 16 km SSE La Virgen (10° 16' N, 84° 05' W), 1100 m elevation, 20. II.2001, leg. Project ALAS 11/WF/01/13, specimen code INB0003213484 (INBC).

Paratypes: 2 workers, same data as holotype but 11/WF/01/23, INB0003213214 (MCZC), 11/WF/01/40, INB0003213234 (JTLG); 1 worker, Costa Rica: Heredia Prov., 10 km NE Vara Blanca (10° 14' N, 84° 05' W), 1500 m elevation, 9.III.2005, leg. Project ALAS 15/WF/02/03, INB0003666649 (LACM).

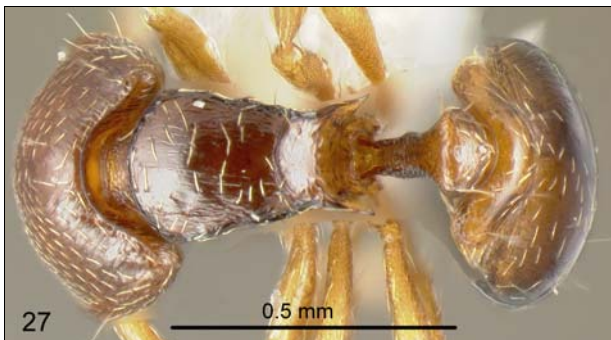
Diagnosis of worker: Mandible short and curving downward in profile; lateral head capsule with the antennal scrobe mostly or entirely smooth and shining; propodeal spines present (former *Glomyrmex*); leading edge of scape lacking erect setae; disc of postpetiole in dorsal view very broadly U-shaped, with an extremely deeply concave anterior face; spongiform tissue absent from ventral surface of petiole, postpetiole and first gastral sternite; face lacking erect setae; head in side view convex above and below, not flattened; pronotum in dorsal view elongate, anterior margin strongly convex, rounding into lateral margins; pronotal humeral hair absent; dorsum of petiolar node strongly reticulate rugose; gaster in lateral view relatively elliptical, not strongly concave near postpetiolar insertion.



Figs. 22 - 24: *Pyramica augustandrewi* sp.n., holotype worker. (22) Face view; (23) lateral view; (24) dorsal view.

Measurements of holotype: ML 0.134, HL 0.746, HW 0.600, HD 0.372, MeL 0.763.

Comments: This species is similar to *P. longinoi*. In BOLTON'S (2000: 147) key to Neotropical *Pyramica*, it fails at couplet 70, which differentiates *P. prex* and *P. longinoi*. Like *P. prex*, *P. augustandrewi* has the head less dorsoventrally flattened (maximum depth of head = 0.62 × HW) and with the mandibles fully closed the cuticular margins of the mandibles from which the teeth arise diverge anteriorly (they are parallel in *P. longinoi*). Like *P. longinoi*, the dorsum of the petiolar node is longer than wide, and it is a large species, similar in size to *P. longinoi* (*P. prex* is minute). The propodeal spines of *P. longinoi* are relatively short with well-developed infradental lamellae; in contrast, the spines of *P. augustandrewi* are longer, more spiniform, and without strongly developed infradental lamellae. The first gastral sternite of *P. longinoi* is strongly concave anteriorly, so that the gaster is teardrop-shaped in side view.



Figs. 25 - 27: *Pyramica erikae* sp.n., holotype worker. (25) Face view; (26) lateral view; (27) dorsal view.

The first gastral sternite of *P. augustandrewi* is less concave and the gaster is more elliptical in side view.

Etymology: Named for my son August Andrew Longino.

Range: Costa Rica.

Biology: This species occurs in mature cloud forest. It is known from four workers from four different Winkler samples of sifted litter from the forest floor.

***Pyramica erikae* sp.n.** (Figs. 25 - 27)

Holotype worker: Costa Rica: Heredia Prov., 16 km SSE La Virgen (10° 16' N, 84° 05' W), 1100 m elevation, 14. III.2001, leg. Project ALAS 11/WF/02/01, specimen code INB0003214077 (INBC).

Paratype: 1 worker, same data as holotype but 20.II.2001, leg. Project ALAS 11/WF/01/15, INB0003213718 (MCZC).

Diagnosis of worker: Mandible short and curving downward in profile; lateral head capsule with antennal scrobe mostly or entirely smooth and shining; propodeal spines present (former *Glamyromyrmex*); leading edge of scape lacking erect setae; disc of postpetiole in dorsal view very broadly U-shaped, with an extremely deeply concave anterior face; spongiform tissue absent from ventral surface of petiole, postpetiole and first gastral sternite; lateral margins of head and posterior face near vertex margin, promesonotum, petiolar node, postpetiole, and gastral dorsum with sparse erect setae; head in side view convex above and below, not flattened; mesosoma strongly ankylosed, dorsal face of propodeum absent, posterior face forming long flat shiny surface that meets promesonotal dorsum at a sharp transverse carina.

Measurements of holotype: ML 0.124, HL 0.561, HW 0.532, HD 0.296, MeL 0.484.

Comments: In BOLTON's (2000: 148) key to Neotropical *Pyramica*, this species keys to *P. rogata*, but the strongly ankylosed mesosoma is unique and immediately distinguishes this species from any other of the *Glamyromyrmex*-like *Pyramica*.

Etymology: Named for my daughter Erika Jane Longino.

Range: Costa Rica.

Biology: This species occurs in mature cloud forest. It is known from two workers from two different Winkler samples of sifted litter from the forest floor.

Acknowledgements

This paper is dedicated first and foremost to the ALAS staff: Danilo Brenes, Flor Cascante, Nelci Oconitrillo, Maylin Paniagua, and Ronald Vargas. They committed large parts of their lives to the ALAS Project and have made a lasting contribution to our knowledge of tropical arthropod biodiversity. Rob Colwell and Henry Hespenehde have been valued colleagues and friends for the life of the project, and I also thank the dozens of taxonomic collaborators who made ALAS possible. Multiple Costa Rican institutions have been supportive: The Servicio de Parques Nacionales, Instituto Nacional de Biodiversidad (INBio), Organizacion de Estudio Tropicales (OTS), the Monteverde Conservation League, and Monteverde Cloud Forest Reserve. James Trager provided advice on Latin names. Stefan Schödl, to whom this special issue is dedicated, was an inspiration as an ant taxonomist of the highest caliber. This work was supported by National Science Foundation grant DEB-0072702 and National Geographic Society grant 7751-04.

Zusammenfassung

Es wird Neues über die Ameisenfauna Costa Ricas berichtet. *Camponotus senex* (F. SMITH, 1858) wird neu definiert und *C. senex textor* FOREL, 1899 wird in den Artstatus gehoben. Die Biologie dieser beiden Arten wird erklärt: *C. senex* legt Nester in toten Zweigen an, *C. textor*

baut Nester aus mit Seide der Larven verwobenen Blättern. Frühere Berichte in der Literatur über den Einsatz von Seide durch *C. senex* gehen auf Fehlbestimmungen von *C. textor* zurück. *Pachycondyla obsoleta* (MENOZZI, 1931) wird mit *Cryptopone gilva* (ROGER, 1863) synonymisiert. *Nesomyrmex tristani* (EMERY, 1896) wird mit *N. asper* (MAYR, 1887) synonymisiert und *N. antoniensis* (FOREL, 1912) wird aus der Synonymie und in den Artstatus gehoben. Die folgenden Arten werden neu beschrieben: *Adelomyrmex brenesi* sp.n., *Lenomyrmex colwelli* sp.n., *Nesomyrmex vargasi* sp.n., *Pyramica augustandrewi* sp.n., *P. cascanteae* sp.n., *P. erikae* sp.n., *P. oconitilloi* sp.n., *P. paniaguae* sp.n.

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