

NORTH AMERICAN LEPTOTHORAX OF THE NITENS-CARINATUS COMPLEX (HYMENOPTERA: FORMICIDAE)¹

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ABSTRACT

Leptothorax nitens var. *Heathii* Wheeler is found to be indistinguishable from typical *L. nitens* Emery and is synonymized with it, while var. *mariposa* Wheeler is resurrected from synonymy and accorded full specific

status. Other members of the complex are *L. andrei* Emery and *L. carinatus* Cole. Keys are given to the workers of these four species and to the females of three, that of *L. mariposa* being unknown.

Leptothorax nitens was first described by Emery (1895, p. 323) from a single worker collected at American Fork Canyon, near Salt Lake City, Utah. Wheeler (1903, p. 244) redescribed this small and highly distinctive ant and listed Pacific Grove, California, and Canyon City, Colorado, as additional localities. In the same publication (*op. cit.*, p. 245) Wheeler described *Heathii* as a new variety of *nitens*, from which it supposedly differed by a darker body color. The collection on which this brief description was based consisted of approximately an entire colony which had been taken at Pacific Grove, California. Wheeler (1917, p. 507) further described as new the variety *mariposa* from several workers taken from nests beneath stones in dry portions of Tenaya Canyon, Yosemite National Park, California. The variety *mariposa* was said to differ from the typical *nitens* in the opaque and densely and coarsely punctate thorax, petiole, and postpetiole.

Creighton (1950, p. 265) synonymized *mariposa* under *nitens* because he believed the coarse sculpture of the former to be within the normal limits of variation in *nitens*. He also elevated *heathi* to subspecific rank on the basis of a notably shorter antennal scape in comparison with head length, and a darker body color.

From collections made by the writer in various western states during these last 6 years I was able to study intensively long series of *nitens*, as

well as its possible major variants, taken from a total of 79 nest collections made largely in California, Nevada, Arizona, Oregon, and Utah. A random series of 25 workers from each collection was studied carefully, whereas an additional series of 25 workers was examined for pilosity, sculpture, and comparisons of antennal scape and head lengths. Furthermore, numerous males and females were studied, chiefly on a comparative basis, and a description of each of the sexes was formulated.

My studies have shown that the worker of *nitens* is a highly variable species, both intranidally and internidally, in at least four chief respects, namely, body color, scape length compared with head length, surface sculpture, and length of epinotal armature. The species varies in color from a pale, concolorous yellow through various increasing degrees of infuscation to a medium tan. Moreover, there is a considerable degree of variability in scape length with regard to head length, all the way from a condition in which the scape in repose fails by more than its own maximum diameter to reach the occipital border, to a contrasting type in which the scape apex even slightly surpasses the occipital border. The body surface in a great many specimens is virtually free of sculpture and highly shining, a condition which is particularly applicable to the cephalic dorsum. In others the body is largely finely punctate, with the head bearing a median longitudinal band which is shining, puncture-free, and of variable width. In still other workers the entire body is punctate, and varies from slightly shining to subopaque. However, only punctures,

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regardless of their degree of prominence, are present. There are no rugulae. Epinotal armature varies from denticles to definite spines with broad bases and sharp tips. When spines are present, as they are in a great many workers, they appear always to be directed upward and backward.

An invariable feature of the worker of *nitens* is the cuneate petiolar node in profile view. Although the acuteness of the apex undergoes some slight modification, the node is always distinctly cuneate. On the basis of this characteristic, *nitens* can be distinguished from all other known species in the complex with the exception of *mariposa*, which has a similar shape of the petiolar node.

As a result of extended investigations, I was able to reach certain conclusions which, to some degree, are in conflict with those of Creighton (1950). First of all, it has become evident that *nitens* has undergone a great deal of variation in such important characteristics as body color and sculpture, as well as in scape length related to head length. The characters of color and scape length will not serve effectively to separate *heathi* from *nitens*, and inasmuch as I have been unable to find stable separatory characteristics of any nature I propose that *heathi* Wheeler be made a synonym of *nitens* Emery.

It should be noted that the type series of *heathi* was ostensibly collected at Pacific Grove, California, from which locality Wheeler (1903, p. 245) also recorded *nitens*. Creighton (1950) regarded *heathi* as a lowland race of *nitens*. Pacific Grove lies virtually at sea level. It is, therefore, scarcely the sort of habitat where one would expect the genus to be represented. Although we spent a full day intensively collecting in that very dry and sandy area, not a single specimen of *Leptothorax* was found. I suspect, then, that both the types of *heathi* and the series of *nitens* mentioned by Wheeler came from the mountains west of Pacific Grove rather than from the adjacent coastal area.

The synonymy of *nitens* and brief descriptions of the sexual castes follow.

Leptothorax nitens Emery

- L. nitens* Emery, 1895, Zool. Jahrb. Syst. 8: 323, pl. 8, fig. 16, worker; Wheeler, 1903, Proc. Acad. Nat. Sci. Phila. 55: 244, pl. 12, fig. 15, worker.
L. nitens var. *heathi* Wheeler, 1903, Proc. Acad. Nat. Sci. Phila. 55: 245, worker. (NEW SYNONYMY).
L. nitens subsp. *heathi* Wheeler, Creighton, 1950, Bull. Mus. Comp. Zool. 104: 265, worker. (NEW SYNONYMY).
L. nitens subsp. *occidentalis* Wheeler, 1903, Proc. Acad. Nat. Sci. Phila. 55: 245, worker.

Male.—Head densely punctate and subopaque except for a narrow longitudinal strip, between the median ocellus and the clypeus, which is finely and faintly punctate and rather shining; hairs sparse, slender, pointed, erect and suberect, yellow, of variable length, mostly limited to

ocellar area, mandibles, and clypeus. Thorax, except scutum, strongly shining, very faintly punctulate and longitudinally striate; scutum distinctly striato-punctulate and shining to subopaque; epinotal declivity finely and faintly punctate. Mayrian furrows moderately developed. Thoracic dorsum with sparse, slender, pointed, mostly suberect and subappressed, moderately long hairs which are longest on scutellum. Petiolar and postpetiolar nodes with very sparse, suberect hairs. Gaster with sparse, scattered, moderately long, slender, pointed, appressed, subappressed, and suberect hairs. Pubescence absent from entire body.

Female (alate).—Epinotal spines prominent, rather long, very broad at base, pointed apically, directed posteriorly. Petiole and postpetiole as in worker. Cephalic dorsum with very sparse, rather long, blunt, slender, erect, yellow hairs. Gular area with abundant, short, slender, pointed, suberect hairs. Thoracic dorsum with numerous erect, mostly short (but variable in length), slender, blunt, yellow hairs. Hairs on petiolar and postpetiolar nodes long, slender, pointed, rather numerous. Lateral surfaces of epinotum densely punctate; infraspinal facet transversely striato-punctate. Head and thorax rather uniformly and longitudinally rugulose, faintly and finely punctulate, and shining. Gastric hairs moderately abundant, slender, scattered, of unequal length, erect and suberect dorsally, suberect laterally. Pubescence everywhere very dilute. Body color a rather deep tan, gaster strongly infuscated.

Leptothorax mariposa Wheeler, new status

- L. nitens* var. *mariposa* Wheeler, 1917, Proc. Amer. Acad. Arts and Sci. 52: 507, worker.

The status of *mariposa* Wheeler is quite another matter than that of *heathi*. At Tenaya Canyon, Yosemite National Park, as well as at Glacier Point in the same general area, I found several colonies which answer to a broad general description of *nitens* but which, during a critical examination, proved to be quite different. The colonies were under stones on dry coniferous slopes at elevations above 7,000 feet. From them I was able to collect only workers which are significantly larger in stature than those of *nitens* and which possess heads which are far more quadrate.² Moreover, the epinotal spines average notably longer than those of *nitens*, and the thorax as well as the petiolar and postpetiolar nodes are not only very coarsely punctate but are also prominently longitudinally rugulose. At the same situation were nests of *nitens*. There was not the slightest indication of an intergradation of these separatory characteristics. This popula-

²The average cephalic index of *mariposa* is 96; that of *nitens* is 79. The average total thoracic length of *mariposa* is 0.95 mm.; that of *nitens* is 0.71 mm.

tion which differs from that of *nitens* is, in my opinion, representative of Wheeler's *mariposa*. It does not fall within even the very broad variational limits of *nitens*.

I propose, therefore, that the name *mariposa* Wheeler be resurrected and that the population concerned be elevated to full specific status. A brief description of the worker follows.

Worker.—Head only slightly longer than broad, with an average cephalic index³ of 96; densely punctate and subopaque; scape length variable. Thorax and petiolar and postpetiolar nodes longitudinally rugulose, the rugae not obscured by the dense, coarse punctures. Average total thoracic length³ 0.95 mm. Epinotal spines rather long, equalling about one-half the distance between their bases. Body color a medium to dark reddish brown, gaster darker.

Leptothorax andrei Emery

L. andrei Emery, 1895, Zool. Jahrb. Syst. 8: 322, pl. 8, fig. 15, worker; Wheeler, 1903, Proc. Acad. Nat. Sci. Phila. 55: 256, pl. 12, fig. 22, worker.

Another species in the complex is *andrei* Emery, which has California as its type locality. It is indeed unfortunate that there are no types in this country, but it is my belief that the population can be clearly recognized on the basis of the descriptions by Emery and by Wheeler.

My collections of *andrei* come from Yosemite National Park (4,000 feet), California; Lee Canyon (7,200 feet), Charleston Mountains, Nevada; Kaibab Forest (7,000 feet), Arizona; and Sandia Mountains, Bernalillo County, New Mexico. The species appears, therefore, to have a rather wide range in the western states. All nests were either beneath stones or between relatively loose layers of large stones in comparatively dry coniferous forests.

The worker of *andrei* is, I believe, a very distinctive ant, and one should have no difficulty in distinguishing it from other members of the complex. Descriptions of the sexual castes follow.

Male.—Head finely and sparsely punctate, shining; vertex with a few widely-spaced, fine, blunt, erect, golden hairs. Thorax faintly shagreened, strongly shining; dorsum (except epinotum) and petiolar and postpetiolar nodes with very sparse, moderately long, slender, blunt, suberect hairs. Petiolar and postpetiolar nodes smooth, strongly shining. Gaster with sparse, slender, pointed, erect and suberect hairs.

Female (alate).—Head moderately shining, longitudinally punctato-rugulose; dorsum with rather coarse and numerous, scattered, widely-spaced, short, blunt, yellow, fully erect hairs which are subequal in length; gular region with several slender, moderately long, pointed hairs.

Thorax with dorsum very smooth, nearly free of any sculpture, highly shining; lateral surfaces shining, very faintly longitudinally striolate except for those of epinotum which are rather strongly longitudinally punctato-rugulose and dull; epinotal spines prominent, rather long, very broad at base, dully pointed at apex, directed posteriorly; infraspinal facet shining, faintly punctate; hairs virtually limited to dorsum and similar to those of cephalic dorsum but more sparse. Petiolar and postpetiolar nodes like those of worker; hairs limited to nodes, somewhat longer than those on head and thorax.

Leptothorax carinatus Cole

L. carinatus Cole, 1957, Jour. Tenn. Acad. Sci. 32: 213.

This is the most recently described member of the complex. Its type locality is Limpia Canyon (5,400 feet), Davis Mountains, Texas. During the summer of 1957 the writer found three additional nests at the type locality. Although a queen was taken from one of these nests, no winged castes were found. The male apparently is unknown.

That the range of *carinatus* is not limited to the immediate region of its type locality has been proved by a collection of workers which I made from a nest beneath a stone on a dry, forested slope at an elevation of 5,400 feet in the Chiricahua Mountains, Arizona. The specimens compare very favorably with the types.

Although *carinatus* certainly appears to be a very distinctive species, I am now inclined to minimize the significance of the pronotal carina as a usable separatory character. Studies of the entire complex have revealed that this feature can show a considerable amount of variation. Undoubtedly the most definitive characteristic of the worker of *carinatus* is the very broad postpetiolar node, which contrasts sharply with the postpetiolar nodal breadth in all other species in the complex. Also important as a separatory characteristic is the shape, in profile, of the petiolar node of *carinatus*. This does not attain the apical breadth and shape of that of *andrei*, but it is not cuneate like that of both *nitens* and *mariposa*. There are relatively minor pilosity differences also.

All members of the complex may at times use nesting sites other than those beneath or between stones, but it is worth noting that I have never found nests under bark of trees or logs, within decaying wood, or in the open soil. Colony strength appears to vary considerably, and the number of workers which I have aspirated from nests shows the following range for each of the species concerned: *nitens*, 69 to 276; *mariposa*, 58 to 97; *andrei*, 32 to 109; and *carinatus*, 29 to 182.

Males and females were found in the nests of *nitens* on June 22 (southern Arizona), July 19

³Based on a total of 100 workers from four collections.

to 23 (southern Nevada), July 22 to 29 (northern California), and August 7 to 12 (southern Oregon); those of *andrei* on July 18 (northern Arizona).

The following keys to workers and females should aid in distinguishing the species from one another.

A KEY TO THE WORKERS

1. Petiolar node, when viewed in profile, strongly cuneate, the apex rather sharp; gular region with numerous, short, scattered, uneven, erect and suberect hairs. 2
 Petiolar node, when viewed in profile, not strongly cuneate, the apex very blunt; gular region with a few (one to three) long, erect hairs. 3
2. Thorax, petiole, and postpetiole with coarse punctures and pronounced longitudinal rugulae; average cephalic index 96; average total thoracic length 0.95 mm. *mariposa* Wheeler
 Thorax, petiole, and postpetiole without pronounced longitudinal rugulae, the surface punctate only; average cephalic index 79; average total thoracic length 0.71 mm. *nitens* Emery
3. Node of petiole, when viewed in profile, nearly as broad apically as basally, the apical border strongly and evenly rounded; width of postpetiolar node, when viewed from above, distinctly less than twice that of petiolar node. *andrei* Emery
 Node of petiole, when viewed in profile, considerably less broad apically than basally, the apical border rather blunt; width of postpetiolar node, when viewed from above, at least twice that of the petiolar node. *carinatus* Cole

A KEY TO THE FEMALES⁴

1. Gular region with short, suberect or subappressed hairs; thoracic dorsum with moderately abundant to abundant short hairs; infraspinal facet of epinotum transversely and finely to coarsely punctato-striolate, the surface subopaque to opaque. 2
 Gular region with a few long, erect hairs; thoracic dorsum with sparse, moderately long hairs; infraspinal facet of epinotum faintly punctulate, the surface shining. *andrei* Emery
2. Pilosity fine; hairs on thoracic dorsum pointed, uneven in length; epinotum finely punctato-striolate, the surface subopaque. *nitens* Emery
 Pilosity coarse; hairs on thoracic dorsum blunt, rather even in length; infraspinal facet of epinotum coarsely punctato-striolate, the surface opaque. *carinatus* Cole

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⁴The female of *mariposa* apparently is unknown.