

(Reprinted from the Proceedings of the Entomological Society of Washington, Vol. 41, No. 5
May, 1939.)

THE NORTH AMERICAN ANTS OF THE GENUS *HARPAGOXENUS* FOREL, WITH THE DESCRIPTION OF A NEW
SPECIES (HYMENOPTERA : FORMICIDAE).

By MARION R. SMITH,

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Harpagoxenus Forel, a genus of degenerate slave-making ants, has been known from only three forms, two of which occur in Europe and one in North America. The European *H. sublaevis* (Nyl.), the genotype, has been recorded from Finland, Denmark, Sweden, Germany, Austria, and Switzerland, and the variety *hirtula* (Nyl.) from Finland. The known hosts of *sublaevis* are three species of *Leptothorax*, namely, *acervorum* (F.), *muscorum* (Nyl.), and *tuborum* (F.).

The single North American species, *Harpagoxenus americanus*, was described by Emery in 1895 from specimens taken by Theodore Pergande in a nest of *Leptothorax curvispinosus* Mayr at Washington, D. C. Although this species was also taken by Wheeler and Schmitt in other localities, until recently almost nothing was known of its biology, especially concerning the ant's method of enslaving its host. In 1927 (see bibliography) both Sturtevant and Creighton published, almost simultaneously, excellent articles furnishing most of the details lacking in our knowledge of the slave-making habits of the species. Their careful observations indicate that the queen of *americanus* enters the nest of the host species, kills or drives away the host ants, and appropriates the brood. Later a mixed colony results. The *americanus* workers of this colony then raid from time to time other nests of the host species in a manner similar to that described for the queen. Although *L. curvispinosus* appears to be the preferred host, *L. longispinosus* Roger is also enslaved. On a few occasions colonies have been found containing *americanus* and both its slave species.

EX LIBRIS
MUSEUM OF NATURAL HISTORY
WASHINGTON, D. C.

Besides the three regular castes (male, queen, and worker) of *americanus*, Sturtevant found ergatoid females similar to the worker in general appearance, but possessing from one to three ocelli, or else ocellus-like protuberances where the ocelli should be. This form, which he did not technically describe or figure, was very rare. It has not been noted in this species by other investigators. Sturtevant's observations led him to believe that such a form can and does function as an egg-laying queen.

The European *sublaevis* has a similar form. For years the early investigators could not find a normal queen of this species and they thus concluded that the ergatoid female alone functioned as a queen. Adlerz not only found males of *sublaevis* mating with these ergatoid females, but upon dissecting the latter he found that they possessed spermathecae and well-developed ovaries. Adlerz's observations seem to leave little doubt that these ergatoid females can and do function as queens. It is now known that normal queens occur in *sublaevis* but are rare as compared with the ergatoid females.

Recently I received from Quebec, Canada, 12 specimens of a new species of *Harpagoxenus* and 24 workers of its host species. Careful study has shown that the new species is represented by 3 queens and 9 specimens that should be considered ergatoid females, although there are some slight morphological differences in the structure of the thorax of the ergatoid forms. This variation of the thorax ranges from a form somewhat worker-like to the more complex queen-like type. The new species, although closely related to *H. sublaevis* morphologically, and also in its host relationship (both have *Leptothorax acervorum* for hosts), is so distinct that it and *sublaevis* can be readily distinguished by a number of striking differences.

***Harpagoxenus americanus* (Emery).**

Tomognathus americanus Emery, Zool. Jahrb. Syst. 8 : 272 (1895), *worker*.

Tomognathus (*Protomognathus*) *americanus* Emery Wheeler, Bull. Amer. Mus. Nat. Hist. 21 : 3 (1905).

Harpagoxenus americanus (Emery) Wheeler, Ants, pp. 494, 495, 567 (1910; Creighton, Psyche 34 : 28 (1927), *male* (fig. 2).

Worker.—Length 2.5–2.75 mm. (fig. 1, C).

Head subrectangular, distinctly longer than broad, with very feebly emarginate or straight posterior border, rounded occipital angles, and moderately convex sides. Mandible rather small, convex, 3- to 4-toothed, apical tooth much larger than others. Anterior border of clypeus with a prominent and broad median emargination, which is distinctly broader than long; each side of emargination with an angular tooth or projection; posterior border of clypeus rounded, extending backward between frontal carinae. Frontal area not clearly defined. Frontal carinae prominent, longer than antennal scapes, and forming

rather deep and distinct scrobes into which the scapes rest when in repose. Antenna 11-segmented; scape stout, curved, strongly depressed; last three segments of funiculus greatly enlarged, ultimate segment slightly exceeding combined length of the two preceding segments, funicular segments 2-6 each clearly broader than long. Thorax, from above, with rounded humeral angles; promesonotal suture present but not always very distinct, mesoepinotal constriction especially pronounced laterally; epinotal spines rather short, acute, directed upward, backward, and outward. Petiole, viewed laterally, scalelike, with abruptly sloping anterior and posterior faces, which meet to form a sharp superior border; viewed posteriorly, sides of petiole converging dorsally toward the superior border, which is narrow laterally, entire or feebly emarginate; ventral surface of peduncle with a prominent tooth anteriorly. Postpetiole, from above, considerably broader than long; viewed laterally, lacking a ventral tooth. Gaster strongly constricted at base, and with feeble basal angles.

Mandibles, clypeus, dorsal surface of head, anterior surface of petiole, and gaster rather smooth and shining; cheeks, and sides of thorax longitudinally rugulose-punctate; antennal scrobes, dorsum of thorax, and dorsal surfaces of petiole and postpetiole finely punctulate, the thorax often with fine rugulae.

Hairs long and erect, moderately abundant, present on all parts of body except appendages; a few hairs sometimes present on coxae, trochanters, and bases of femora. Pubescence sparse, appressed, most easily discernible on appendages but also visible on other parts of body under certain lights.

Color varying from almost uniform deep brown to brownish black, with the mandibles, clypeus, antennae, coxae, trochanters, base of femora, and tarsi lighter; eyes, mandibular teeth, and edges of frontal carinae black.

Queen.—Length 2.7-3.5 mm.

Excluding the usual morphological differences and size, so similar to worker as to be easily associated. Wings whitish, pilose, with ciliated margins; veins pale, indistinct. Anterior wing with a discoidal, a cubital, and an open radial cell, as well as a fairly large but pale stigma.

Male.—Length 2.7 mm.

Posterior border of head and occipital angles strongly rounded. Eye convex, protuberant, occupying approximately one-half length of side of head. Distance between two lateral ocelli greater than that between either of them and median ocellus. Antennal scrobe extending from anterior end of frontal carina to above and somewhat behind eye. Antenna 12-segmented; scape approximately as long as first five funicular segments; first funicular segment pyriform. Clypeus strongly convex, its anterior border with a broad emargination. Mandible with a long, prominent, apical tooth, followed by a broad, blunt edge which is sometimes finely denticulate, sometimes toothless. Thorax with Mayrian furrows and parapsidal furrows; propleuron deeply concave laterally; epinotum without spines but often with a pair of blunt angulations. Wings like those of female. Petiole, viewed laterally, with a blunt superior border; ventrally with a longitudinal carina, which sometimes bears a small tooth anteriorly. Postpetiole distinctly broader than long; ventral surface without a tooth. Base of gaster scarcely wider than posterior border of postpetiole. Genital appendages not remarkably large; a pair of terminal cerci.

Head and thorax subopaque, with reticulate-punctulate shagreening; dorsum of thorax more finely sculptured and shining. Gaster smooth and shining, petiole and postpetiole almost smooth and glabrous.

Body with grayish, moderately long, sparse hairs, those on appendages shorter and suberect.

Color varying from deep brownish black to black; with mandibles, appendages, wings, apex of gaster, and genital appendages pale yellowish white; edges of mandibles brownish to black.

Type locality.—Washington, D. C. (Theodore Pergande).

Hosts.—*Leptothorax curvispinosus* Mayr, *longispinosus* Roger.

Distribution.—Pennsylvania: Beatty (Schmitt), Haverford (L. G. Wesson), near Philadelphia (F. L. Brown); New York: Bronxville (W. M. Wheeler), near Tuxedo (W. S. Creighton); Massachusetts: Naushon Island (Woods Hole) (A. H. Sturtevant); New Jersey: Near New Vernon, near Morris Plains, Belle Mead (A. H. Sturtevant); Virginia: Arlington County (J. C. Bridwell); Ohio: Jackson (L. G. Wesson).

The description of the worker is based on four cotypes, and numerous specimens from Arlington County, Va., and Jackson, Ohio. The male and queen are described from a number of specimens collected in Jackson, Ohio. The queen has not been previously described.

The characters which distinguish the worker of *Harpagoxenus americanus* from the ergatoid female of *H. canadensis* are given under the remarks dealing with the latter species.

Although *Leptothorax curvispinosus*, the preferred host of this species, has a very wide distribution (occurring over approximately the eastern half of the United States), *americanus* has a more limited and sporadic distribution. That intensive collecting will reveal the presence of this slave-making species in localized spots in other areas is hardly to be questioned. There is also the possibility that *americanus* may be found to enslave other forms of *Leptothorax* than the two mentioned above.

As Creighton has pointed out, it is inconceivable that this species could have arisen from an ancestor anything like that of either of its two hosts.

***Harpagoxenus canadensis*, new species.**

Simple ergatoid female.—Length 4–4.25 mm. (fig. 1, *A, B*; fig. 2, *A*).

Head subrectangular, distinctly longer than broad, with very feebly emarginate posterior border, rounded occipital angles, and moderately convex sides. Eye convex, separated from base of mandible by a distance greater than eye's widest diameter. Mandible rather small, less convex than that of *americanus*, masticatory border obliquely, concavely curved, toothless or very finely denticulate. Anterior border of clypeus with a rather deep median emargination, which is narrow (much narrower than that of *americanus*); posterior border of clypeus

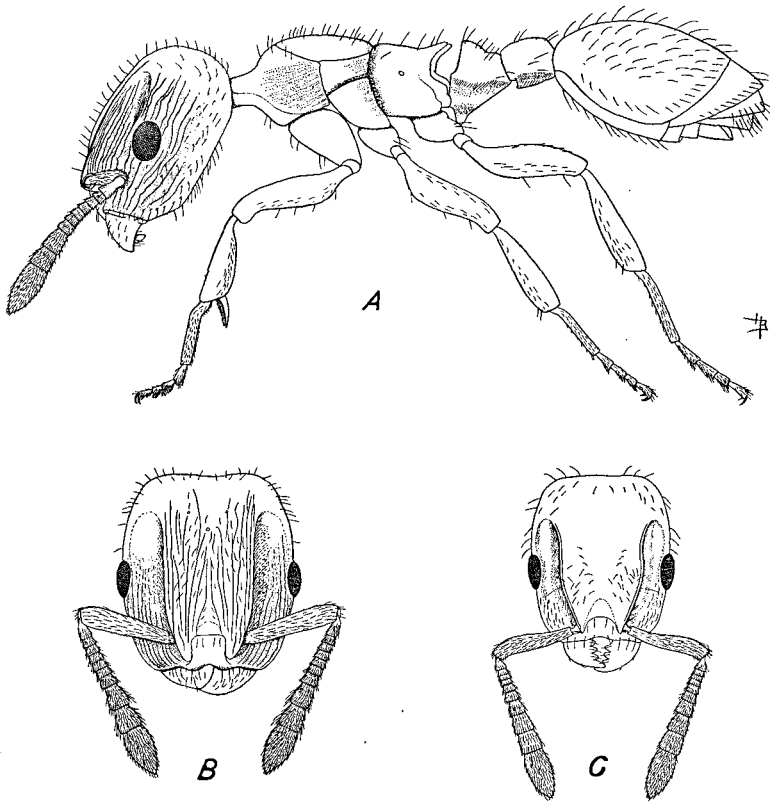


Fig. 1.—A, Simple ergatoid female of *Harpagoxenus canadensis* Smith; B, head of same; C, head of worker of *H. americanus* (Emery). Drawn by H. B. Bradford. No attempt has been made to show the finer details of sculpture.

broadly rounded, extending backward between frontal carinae. Frontal area not clearly defined. Frontal carinae subparallel, not strongly elevated, extending beyond apices of antennal scapes but not forming such deep and distinct scrobes as in *americanus*. Antenna 11-segmented; scape stout, curved, and strongly depressed; last three segments of funiculus greatly enlarged, ultimate segment exceeding the combined length of the two preceding segments, funicular segments 2-6 each clearly broader than long. Vertex with a distinct median and two extremely small, indistinct lateral ocelli. Thorax, from above, with distinct promesonotal, and mesoepinotal sutures, the mesoepinotal region strongly constricted; epinotum with a pair of moderately long, coarse spines which are directed upward, backward, and outward. Petiole, viewed laterally, with convex posterior surface, which meets the anterior surface in such a manner as to

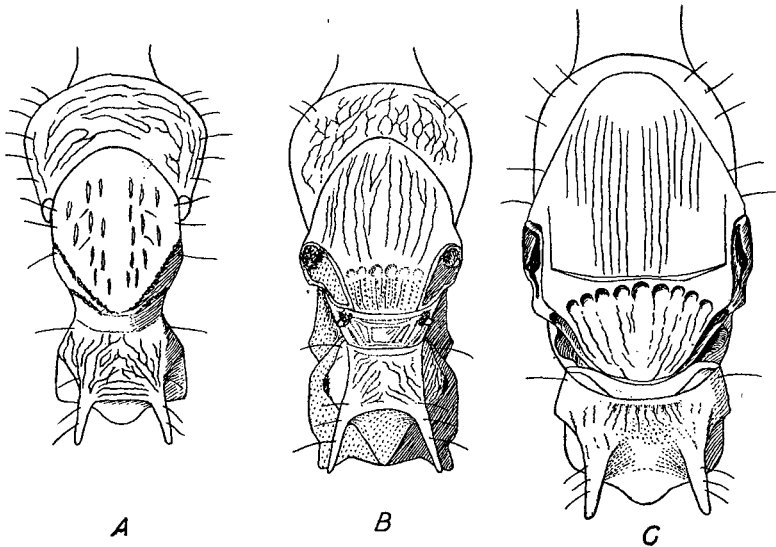


Fig. 2.—*Harpagoxenus canadensis* Smith.—A, Dorsum of thorax of the simple ergatoid female; B, dorsum of the thorax of intermediate ergatoid female; C, dorsum of thorax of queen. Drawn by H. B. Bradford. No attempt has been made to show the finer details of sculpture.

form a bluntly angular node; ventral surface of peduncle with a short, blunt, anterior tooth, but no prominent midventral plate as in *sublaevis*; viewed posteriorly, sides of petiole converging toward superior border, which is narrow laterally and faintly emarginate. Postpetiole distinctly broader than long, broader anteriorly than posteriorly, and with pronounced angular humeri; lacking ventrally the prominent tooth or spine of *sublaevis*, but with a very weak anterior tubercle. Base of gaster much constricted, very little broader than the postpetiole, and with slightly angular humeri.

Mandibles, anterior surface of petiole, and gaster mostly smooth and shining, remainder of body subopaque; front of head with longitudinal striae, remainder of head, excepting clypeus, posterior border of head, and occipital angles, reticulate punctate, the cheeks, however, with longitudinal rugulae in addition; thorax, petiole, and postpetiole varying from reticulate punctate to rugulose reticulate.

Hairs moderately long, suberect to erect, sparsely distributed over body and on coxae, trochanters, and femora, especially the ventral surfaces of the two latter. Pubescence rather long and coarse but sparse, closely appressed on the body, suberect on the appendages.

Head, gaster, and masticatory border of mandibles deep brownish black; thorax, petiole, postpetiole, and appendages lighter brown.

Intermediate ergatoid female.—Length 4.10 mm. (fig. 2, B).

Thorax, viewed from above, differing from that of the queen as follows:

Paraptera of mesothorax fused with scutum; anterior wings represented by black, sclerotized stubs; scutellum not clearly separated from preceding part of mesonotum, trapezoidal, wider anteriorly than posteriorly; paraptera of metathorax fused with metanotum, forming a trapezoidal area similar to scutellum but smaller; posterior pair of wings represented on each side by a small rough area, out of which projects a whitish appendage; epinotum like that of queen; petiole, viewed laterally, with posterior surface less convex than in the simple ergatoid female, and therefore more acutely angular. Sculpturing very similar to that of the simple ergatoid female but with a rather distinct row of transverse foveolate punctures anterior to the scutellum. This form represents an intermediate stage between the simple ergatoid female (which is decidedly more workerlike) and the more structurally complex queen. The drawings representing a dorsal view of the thorax of each of the three forms (fig. 2, *A*, *B*, *C*) show the differences between them.

Queen.—Length 4.5–5 mm. (fig. 2, *C*).

Larger than the ergatoid female. Also differing in the structure of the thorax. Similar in other ways except for the following differences: Anterior angles of head more protuberant. Posterior border of head more deeply emarginate. Ocelli larger and more conspicuous. Posterior surface of petiole less convex, thus causing the dorsum of the node to appear more acutely angular, when the petiole is viewed in lateral profile. Ventral surface of peduncle with a slight median plate, which ends in a blunt tooth anteriorly. Thorax, from above, with subangular humeri. Scutum of mesothorax bluntly angular anteriorly, forming an angle of considerably less than 90 degrees; parapsidal furrows present. Sculpturing similar to that of the ergatoid female but posterior surface of head more shining. Scutum and scutellum with a few weak but distinct longitudinal rugulae.

Type locality.—Quebec, Province of Quebec, Canada (Jos. I. Beaulne).

Host.—*Leptothorax acervorum* subsp. *canadensis* Prov., var.

Cotypes.—No. 53248, U. S. National Museum.

Described from nine ergatoid females and three queens which were collected from a fungus, *Polyporus* sp., on birch. Eight ergatoid females and two queens have been deposited in the U. S. National Museum, two ergatoid females and one queen in the Canadian National Collections, Ottawa, Canada, and one ergatoid female each in the American Museum of Natural History and the Museum of Comparative Zoology (Harvard University).

The ergatoid female of *Harpagoxenus canadensis* can be distinguished from the worker of *H. americanus* by the narrower and deeper median emargination of the anterior border of the clypeus, the shallower antennal scrobes, the toothless or finely denticulate mandibles, and the blunter, superior border of the petiole. It differs from the ergatoid female of *H. sublaevis* (Nyl.) in the following characters: Posterior border of head not so strongly emarginate; clypeus with a narrow median emargina-

tion on its anterior border; no erect hairs on the antennal scapes; antennal scrobes much shallower; petiole lacking the sharp lateral carinae; and postpetiole without the long, distinct, ventral tooth.

BIBLIOGRAPHY.

CREIGHTON, W. S.

1927. The Slave Raids of *Harpagoxenus americanus*. Psyche 34 : 11-29.

STURTEVANT, A. H.

1925. Notes on the Ant Fauna of Oak Galls in the Woods. Psyche 32 : 313-314.

1927. The Social Parasitism of the Ant *Harpagoxenus americanus*. Psyche 34 : 1-9.

WHEELER, W. M.

1907. The Origin of Slavery Among Ants. Pop. Sci. Mo. 71 : 550-559.

1910. Ants, Their Structure, Development and Behavior. xxv + 663 pp. New York.

1919. The Parasitic Aculeata, a Study in Evolution. Proc. Amer. Phil. Soc. 58 : 1-40.
