

capture. And yet they still remain among the fish commanding the highest market prices and are savory to hundreds of thousands of palates including that of the author. Let the oysters join the fish and exclude all remembrance of the copepods.

ENTOMOLOGY.—*A key to the genera of chiggers (mite larvae of the subfamily Trombiculinae) with descriptions of new genera and species.*¹ H. E. EWING, Bureau of Entomology and Plant Quarantine.

When the present writer began the study of chiggers some years ago only a few species were sufficiently well known to have received names. In the United States only a single species had been named. Today there are known from the New World no less than sixty-five named species and almost as many from the Old World. Because so many species are in this economic group, and particularly because one of them is known to be a transmitter of Kedani fever, a serious disease of man, their study is assuming much importance.

HOST RELATIONSHIPS

The only genera that are here included in the subfamily Trombiculinae are those whose species are believed to have vertebrates as their natural hosts. Although several species have been reported as having both invertebrate and vertebrate hosts, such reports probably are in error. This certainly must be true of a few species with which the writer is familiar. For example, *Trombidium striaticeps* Oudemans which has been reported from both vertebrate and invertebrate hosts, occurs commonly about Washington, D. C., as a parasite of various insects, such as *Musca domestica* and *Stomoxys calcitrans*; yet from the many hundreds of vertebrate hosts from this vicinity examined for chiggers by the writer no specimens of *T. striaticeps* have been taken. In fact, among the many thousands of larvae of Trombiculinae from both North and South America examined by the writer, those of no species have been found to parasitize both invertebrates and vertebrates.

Records of chiggers of a single species from both vertebrate and invertebrate hosts have resulted in most cases, it is believed, either from misidentifications or from finding unattached chiggers wandering over a presumed host, just as they would wander over any other object in their environment. Further observations will eventually enable us to decide whether such species have either vertebrates or

¹ Received March 2, 1938.

invertebrates as hosts, and thus allocate them to their proper subfamily.

POSSIBLE VARIATIONS IN THE NUMBER OF PRONGS
ON THE PALPAL CLAW

Several workers have remarked, in describing larvae of a chigger species, that the number of prongs on the palpal claw varies. It is

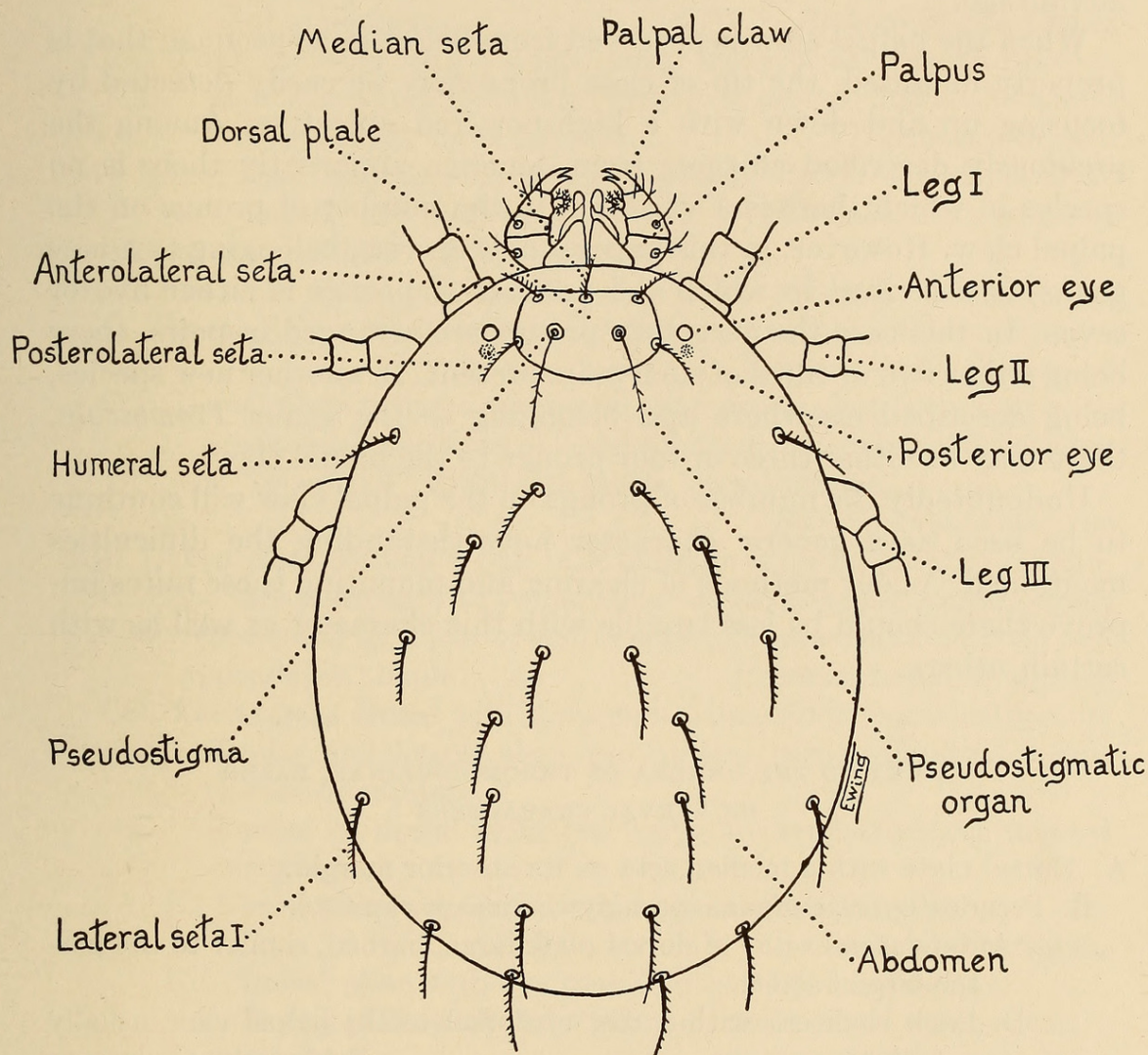


Fig. 1.—Dorsal view of the common North American chigger, *Eutrombicula alfreddugèsi* (Oudemans), with parts labeled. Greatly enlarged.

probable that most of this supposed variation is due to the fact that one prong is so small or so closely appressed to the claw proper that it has been overlooked.

The success one has in counting these prongs depends largely on two factors—the proper clearing of the specimen, and the viewing

of the palpal claw from below. In poorly cleared specimens, particularly those mounted in balsam, the prongs of many species can not properly be seen. Specimens that have been partly crushed by having an insufficiency of mounting medium on the microscope slide—and there are very many such specimens in most collections—will have the palpi spread out laterally so that they occupy an unnatural, horizontal position. In such a position the palpal claw can not be seen to advantage.

When the palpal claw is observed from below in a specimen that is properly mounted, the tip of each prong may be easily detected by focusing up and down with a high-powered objective. Among the previously described chiggers from America apparently there is no species in which there is a variation in the number of prongs on the palpal claw. However, in this paper a new species, belonging to a new genus, is described in which the number of prongs is either five or seven. In this case the accessory prongs are arranged in pairs, there being either two or three of such pairs present. In another new species, being described elsewhere and belonging to the genus *Trombicula*, there may be either three or four prongs to the palpal claw.

Undoubtedly the number of prongs on the palpal claw will continue to be used as a generic character notwithstanding the difficulties mentioned. As our methods of clearing and mounting these mites improve there should be less trouble with this character as well as with certain others.

A KEY TO THE GENERA OF THROMBICULINAE, BASED
ON LARVAL CHARACTERS

- A. Dorsal plate with a median seta on its anterior margin.
- B. Pseudostigmatic organs strongly clavate or capitate.
- C. Anterolateral setae of dorsal plate large, barbed, similar to the posterolateral setae.
- D. Each chelicera with a row of dorsal teeth; palpal claw usually with two prongs.....*Schöngastia* Oudemans
- DD. Each chelicera with not more than one dorsal tooth.
- E. Palpal claw with two or three prongs.....*Neoschöngastia* Ewing
- EE. Palpal claw with five or seven prongs, the accessory prongs being in two or three pairs; dorsal tooth of chelicera vestigial or absent.....*Euschöngastia*, new genus
- CC. Anterolateral setae of dorsal plate minute, simple. Parasitic on bats.....*Dolosisia* Oudemans

- BB. Pseudostigmatic organs setiform or flagelliform, frequently with barbs.
- C. Each chelicera with a row of dorsal teeth; ventral tooth sometimes absent.
- D. More than three subequal dorsal teeth on each chelicera; dorsal plate well developed; median seta pectinate. *Odontacarus* Ewing
- DD. Three unequal dorsal teeth on each chelicera; dorsal plate vestigial; median seta simple. Living under surface of skin of amphibians. *Endotrombicula* Ewing
- CC. Each chelicera with a single dorsal tooth; ventral tooth present.
- D. Palpal claw typically divided into three prongs; dorsal abdominal setae usually more than 30. *Trombicula* Berlese
- DD. Palpal claw divided into two prongs; dorsal abdominal setae usually less than 30. *Eutrombicula*, new genus
- AA. Dorsal plate without median seta.
- B. Dorsal plate with a pair of submedian setae on anterior margin.
- C. Dorsal plate with an anterior median process but without crista. *Leeuwenhoekia* Oudemans
- CC. Dorsal plate without anterior median process but frequently with crista; each chelicera obliquely flattened at distal end, forming a "spearhead" with teeth on its lateral margin. *Hannemania* Oudemans
- BB. Dorsal plate without a pair of submedian setae on anterior margin.
- C. Each tarsus armed with two unequal claws; pseudostigmatic organs represented by a pair of simple setae; all setae, both on body and appendages, simple. *Hemitrombicula*, new genus
- CC. Each tarsus armed with three claws, the middle one usually more slender and longer than the others; pseudostigmatic organs clavate or capitate.
- D. All setae on dorsal plate (exclusive of pseudostigmatic organs) marginal.
- E. Dorsal plate with four or more pairs of lateral setae. *Gahrlepieia* Oudemans
- EE. Dorsal plate with less than four pairs of lateral setae.
- F. Dorsal plate with three pairs of lateral setae; eyes present. *Schöngastiella* Hirst
- FF. Dorsal plate with two pairs of lateral setae; eyes absent. *Walchia* Ewing
- DD. Some of setae on dorsal plate not marginal; eyes usually present. *Gateria*, new genus

GENERIC HOMONYM AND SYNONYMS

The name *Typhlothrombium* Oudemans (1910, Nov. 1), proposed for *T. nanus* Oudemans, was found to be preoccupied by *Typhlo-*

thrombium Berlese established earlier in the same year. In its place Oudemans proposed in 1912 the name *Gahrliopia*.

The generic name *Otonissus* Kolenati (1856)² comes into consideration in the subfamily Trombiculinae. Oudemans³ has pointed out that one of the species originally included in *Otonissus*, *O. aurantiacus* Kolenati, is a larval form of Trombidiidae that would be included in Berlese's *Trombicula* as defined by Berlese. The eminent Dutch authority even lists *Trombicula* as a synonym of *Otonissus*, which he spells *Otonyssus*, following a later emendation by Kolenati. In view of the fact that *Trombicula* has become greatly restricted in recent years there can be no justification for this suggested synonymy.

The name *Leptotrombidium* Nagayo, Miyagawa, Mitamura and Imamura, proposed in 1917⁴ for the Kedani mite, has been considered by subsequent workers as a synonym of *Trombicula*. Objections might well be raised against such a practice as an investigation of the use of the name *Trombicula* shows.

The generic name *Trombicula* Berlese appears to have been first applied to a larval form of the subfamily Trombiculinae in 1918 by Kitashima and Miyajima.⁵ In this paper they claimed that the adult of the Kedani mite, then known as *Leptus akamushi* (Brumpt), was the same as *Trombicula coarctata* Berlese. Although subsequent investigation has shown that the Kedani mite is different from *T. coarctata* Berlese, it also has shown that this Japanese mite does belong to the genus *Trombicula*, as defined in a broad sense by Berlese.

It is very unfortunate, however, that the type species of *Trombicula*, *T. minor* Berlese, has every appearance of being established on a nymphal form. Until the larva or adult of this type species has been obtained by breeding, the status not only of the genus *Trombicula* but of all the genera of Trombiculinae will be somewhat in doubt.

Neotrombicula Hirst (1925)⁶ was established as a subgenus for *Leptus autumnalis* Shaw, the common chigger of Europe. It should be regarded as a synonym of *Leptotrombidium*, since the palpal claw of the larva of the type species is trifurcate, and the other larval characters are those of the *akamushi* group of chiggers (*Trombicula*, *sensu stricto*).

² KOLENATI, F. A. *Die Parasiten der Chiroptern*, p. 17. Brünn, Rudolf Rohrer's Erben.

³ OUDEMANS, A. C. *Kritisch Historisch Overzicht der Acarologie*, Part III, Vol. D, p. 1362. 1937.

⁴ NAGAYO, M., MIYAGAWA, Y., MITAMURA, T., and IMAMURA, A. *Jour. Exp. Med.* 25: 255.

⁵ KITASHIMA, T., and MIYAJIMA, M. *Kitasato Arch. Exp. Med.* 2: Nos. 2-3. 1918.

⁶ HIRST, S. *Nature* 116: 609. 1925.

DESCRIPTION OF NEW GENERA AND SPECIES

Four new genera and two new species, both type species, are described in the following pages. Types are deposited in the United States National Museum.

Euschöngastia, new genus

Chelicerae each with a vestigial dorsal tooth or none. Palpal claw with five or seven prongs. Eyes present. Dorsal plate with posterolateral corners, without anterior median process, without crista. Median seta of dorsal plate present, barbed; anterolateral setae barbed; submedian setae absent; total number of setae on dorsal plate (exclusive of pseudostigmatic organs) five. Pseudostigmatic organs clavate or capitate. Dorsal abdominal setae numerous, barbed, arranged in very irregular, transverse rows. Legs and tarsal claws typical of the subfamily Trombiculinae.

Type species.—*Euschöngastia americana*, n. sp.

Only the type species is included in *Euschöngastia*. The genus is near *Neoschöngastia* Ewing, from which it differs in having the palpal claw either five-, or seven-pronged instead of two-, or three-pronged.

Euschöngastia americana, n. sp.

Palpus short, broad near base and rapidly narrowing to apex; segment II angulate laterally; first palpal seta semiplumose; second well supplied with rather slender barbs; third barbed. A single eye present on each side of cephalothorax near lateral margin. Dorsal plate over twice as broad as long; anterior margin slightly incurved; posterior margin very broadly rounded. A crescent-shaped ridge present in front of each pseudostigma. Pseudostigmatic organs strongly clavate, barbed, extending backward beyond posterior margin of dorsal plate. Dorsal abdominal setae about 40; humerals not situated in first row, which includes 12 setae; second row irregular, containing 8 setae. Other dorsal setae not arranged in rows. Legs moderate in length; tarsus I with short dorsal spine situated about twice its length from base of segment and tactile seta situated on a broad tubercle.

Length of engorged specimen, 0.58 mm; width, 0.37 mm.

Type host.—Chipmunk, *Eutamias* sp.

Type locality.—Boise, Idaho.

Type slide.—U.S.N.M. No. 1277.

Remarks.—Described from eight engorged specimens taken from type host at type locality, September 20, 1930, by S. B. Locke, and three partly engorged specimens taken from a "mouse" at San Simeon, Calif., June 7, 1931, by R. L. Boke.

Eutrombicula, new genus

Chelicerae each with a single dorsal tooth. Palpal claw bifurcate. Eyes present. Dorsal plate with posterolateral corners, without anterior median process, without crista. Median seta of dorsal plate present, barbed; anterolateral setae with barbs; submedian setae absent; total number of setae on dorsal plate (exclusive of pseudostigmatic organs) five, all marginal. Pseudostigmatic organs setiform or flagelliform, with or without barbs. Dorsal abdominal setae usually less than thirty, barbed, arranged in more or less

irregular transverse rows. Legs and tarsal claws typical for the subfamily Trombiculinae.

Type species.—*Microthrombidium alfreddugèsi* Oudemans.

This new genus includes the species of the *alfreddugèsi* group of the genus *Trombicula*. The following North American species are transferred to it: *Microthrombidium alfreddugèsi* Oudemans, *Trombicula hominis* Ewing, *Trombicula flui* van Theil, *Trombicula butantanensis* Fl. da Fonseca, *Trombicula tropica* Ewing, *Trombicula insularis* Ewing, *Trombicula brasiliensis* Ewing, *Microthrombidium bruyanti* Oudemans, *Trombicula harperi* Ewing, *Trombicula ophidica* Fl. da Fonseca, *Microthrombidium göldii* Oudemans, *Microthrombidium helleri* Oudemans, *Microthrombidium tinami* Oudemans, *Trombicula dunni* Ewing, *Trombicula yorkei* Sambon, *Trombicula myotis* Ewing, *Trombicula panamensis* Ewing, *Trombicula gurneyi* Ewing, and *Trombicula cavicola* Ewing.

Doubtfully included in this genus are the South American species *Trombicula ewingi* Fl. da Fonseca and *Trombicula travassosi* Fl. da Fonseca. In both of these species the anterolateral setae of the dorsal plate are short, very stout, and peglike. The present writer has not yet seen a specimen of either species, but it appears to him that they should be put into a new genus, or at least into a new subgenus.

Some Old World species should go into *Eutrombicula*, but mounted specimens of such species are not available for study.

Hemitrombicula, new genus

Chelicerae each with a single dorsal tooth. Palpal claw bifurcate. Eyes present. Dorsal plate without posterior corners, anterior median process, or crista. Median seta of dorsal plate absent; anterolateral setae simple, similar to other setae on dorsal plate; submedian setae absent; total number of setae on dorsal plate (exclusive of pseudostigmatic organs) six, all of which are marginal. Pseudostigmatic organs simple, similar to other setae borne by dorsal plate. Dorsal abdominal setae simple, not numerous, arranged in transverse rows. Tarsi each with two unequal slender claws.

Type species.—*Hemitrombicula simplex*, new species.

Only the type species is included. This genus differs from all others of its subfamily in having only two claws to each tarsus instead of three, and in having the pseudostigmatic organs represented by a pair of simple setae.

Hemitrombicula simplex, n. sp.

Palpus slender, extending slightly beyond tips of chelicerae; second segment broadly rounded laterally; third segment long, about one and one-half times as long as second; thumb short, cone-shaped. All palpal setae simple, slightly curved. Anterior eye much larger than posterior and situated almost its diameter from latter; both eyes on sclerotized plate. Dorsal plate about as broad as long; anterior margin almost straight; posterior margin broadly rounded. Pseudostigmata absent. Pseudostigmatic organs represented by a pair of simple setae situated at about middle of dorsal plate. Dorsal abdominal setae simple, curved, each situated on a minute chitinous (? sclero-

tized) disc; total number about 20; humerals absent. Legs of moderate length; tarsus I without dorsal spine or specialized tactile seta.

Length of engorged specimen, 0.69 mm; width, 0.45 mm.

Type host.—Pilot black snake, *Elaphe obsoleta obsoleta* (Say).

Type locality.—Camp Bryan, Cass County, Mich.

Type slide.—U.S.N.M. No. 1278.

Remarks.—Described from two engorged specimens taken from type host at type locality during July, 1931, by P. C. Trexler. Professor Trexler wrote as follows in regard to these chiggers: "The red acarina were taken from the mouth of the snake, where they were attached so firmly that they were difficult to remove without crushing. There were ten specimens attached between the rows of teeth on the upper jaw only."

The snake from which these chiggers were taken was six feet long, and was infested also with our common chigger, *Eutrombicula alfreddugèsi* (Oudemans). The larvae of *E. alfreddugèsi* were found exclusively between the scales on the neck of the host. Of the ten specimens of *H. simplex* observed by the collector only two were seen by the present writer.

Gateria, new genus

Chelicerae each with a single dorsal tooth. Palpal claw trifurcate. Eyes reduced, vestigial or absent. Dorsal plate very large, without posterolateral corners, without anterior median process, without crista. Median seta of dorsal plate absent, anterolateral setae with barbs, similar to other setae on dorsal plate; submedian setae absent; total number of setae on dorsal plate (exclusive of pseudostigmatic organs) twelve or more, some of which are not marginal. Pseudostigmatic organs clavate. Dorsal abdominal setae with barbs and arranged in somewhat irregular transverse rows. Middle and hind legs with only six segments each. Tarsi each with three claws as in related genera.

Type species.—*Gahrliopia fletcheri* Gater.

Other species included are *Gahrliopia ciliata* Gater and *G. rutila* Gater. When Gater (1932)⁷ described the type species of this genus he not only placed it in the genus *Gahrliopia*, a genus based on a species with only eight setae on the dorsal plate, but at the same time placed Hirst's genus *Schöngastiella* in the synonymy of *Gahrliopia*. His reasons for so doing he states in part as follows, "the fact that the number of scutal setae, posterior to the first two pairs, varies in different specimens of *G. fletcheri* from the same cluster, leads me to believe that the number of scutal setae is not a sound criterion for the separation of genera in this group." The present writer agrees with Gater in part only. It should be noted that individual variation in the number of setae has never been found in any species in which the total number of such setae is less than ten. In the new genus here proposed the important point about the setae on the dorsal plate is not their number, but the fact that some of them are not marginal.

⁷ GATER, B. A. R. *Parasitology* 24: 161.



Ewing, H. E. 1938. "A key to the genera of chiggers (mite larvae of the subfamily Trombiculinae) with descriptions of new genera and species." *Journal of the Washington Academy of Sciences* 28, 288–295.

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