

No. 8.— *The Genera Lithobius, Neolithobius, Gonibius, and Zinapolys in America North of Mexico.*

BY RALPH V. CHAMBERLIN.

THE genera revised in this paper include all the species of larger size in the Lithobiidae in the restricted sense occurring in America north of Mexico. In the West and the Southwest these forms seem nearly wholly to be replaced by the similarly large species of the Ethopolidae and Gosibiidae.

The paper was in manuscript in its present form eleven years ago, and is published unchanged excepting for the addition of the description of *Neolithobius helius* Chamberlin, the omission of diagnoses preceding the descriptions, and minor additions to locality records, and bibliography.

Key to Genera.

- a. Coxae of last two pairs of legs ventrally armed; (posterior angles of none of the dorsal plates produced); claw of female gonopods entire and the basal spines numerous (*e.g.*, 6+6); articles of antennae 20.....*Zinapolys* Chamberlin.
- aa. None of the coxae ventrally armed; posterior angles of three or more of the dorsal plates produced; claw of female gonopods partite, the basal spines 2 + 2 or 3 + 3.
 - b. Articles of antennae 20.....*Gonibius*, gen. nov.
 - bb. Articles of antennae more than 20, mostly 25–45.
 - c. Posterior angles of only the ninth, eleventh, and thirteenth dorsal plates produced; anal legs of male not conspicuously modified.....*Lithobius* Leach (emend.).
 - cc. Posterior angles of seventh, ninth, eleventh and thirteenth dorsal plates produced; fourth article of anal legs of male specially thickened and with its dorsal surface or else the entire article bowed ventrad.
Neolithobius Stuxberg (emend.).

ZINAPOLYS Chamberlin.

Can. ent., 1912, 44, p. 14.

Antennae short; articles twenty.

Eyes composed of seriate ocelli. Organ of Tömösvary large in outline.

Prosternal teeth 5 + 5 to 7 + 7, without diastema on each side.

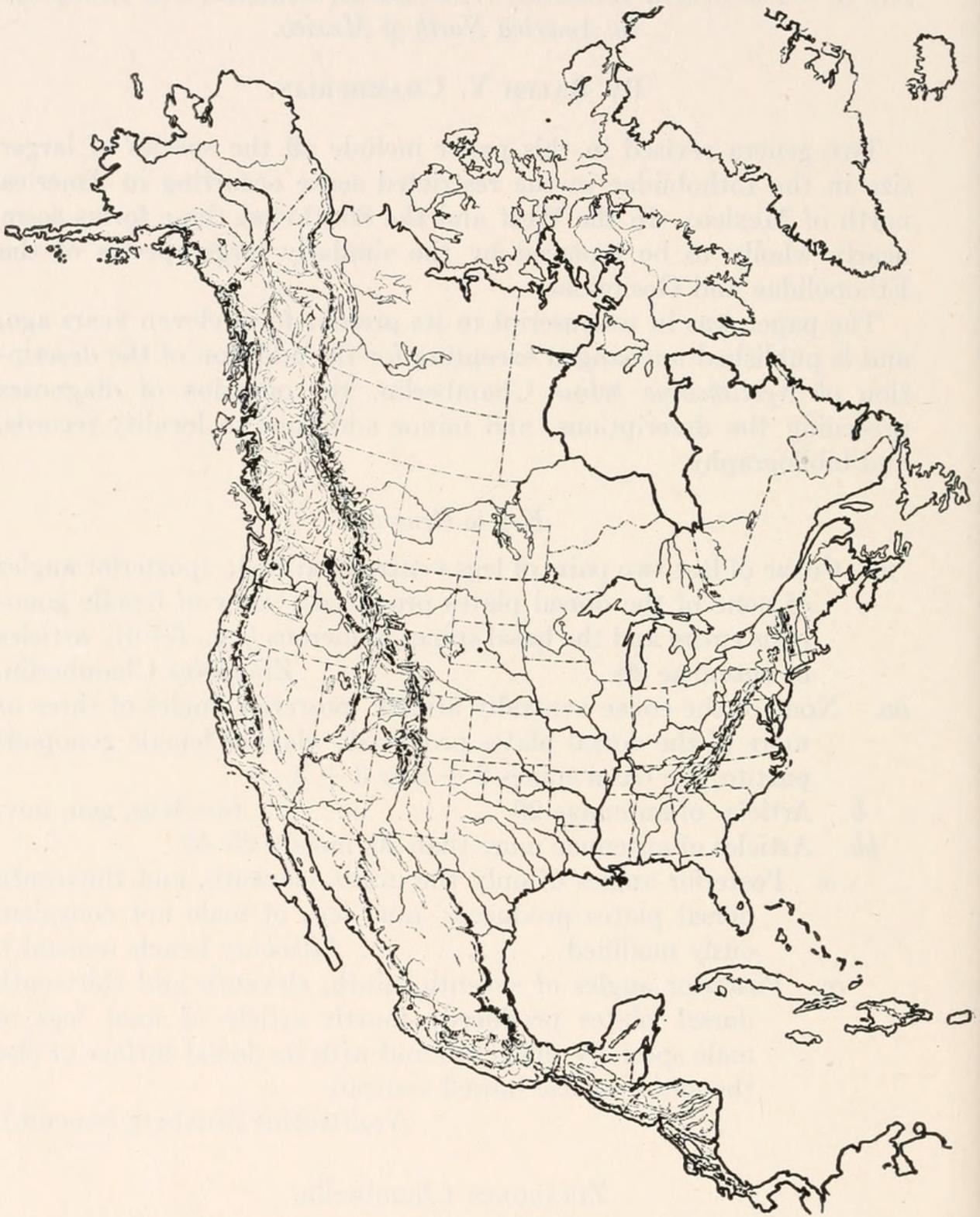


FIG. 1.— Distribution of *Zinapolys Chamberlin*.

Spine slender, situated caudad of ectal tooth on each side.
Posterior angles of none of the dorsal plates produced.
Coxal pores uniseriate; present on last four pairs of coxae.

Claw of female gonopods strictly entire, deeply excavated on mesal side. Basal spines in type 6 + 6(5).

Gonopods of male large; biarticulate.

Tarsi of all legs bearing three claws.

Coxae of last two pairs of legs armed ventrally and laterally as well as dorsally. Third joint of all legs armed with three dorsal spines. Fifth joint of first thirteen pairs of legs with two dorsal spines. Dorsal spines of anal legs 1, 0, 3, 1, 0; ventral 1, 1, 3, 3, 1(2). Dorsal spines of penult legs 1, 0, 3, 1, 1; ventral 1, 1, 3, 3, 2. Dorsal spines of twelfth and thirteenth legs 1, 0, 3, 2, 2; ventral 0, 1, 3, 3, 2.

Length of type species 17–20 mm.

TYPE.—*Z. zipius* Chamberlin.

Outside of the Ethopolidae this is the only known American member of the Lithobiomorpha having any of the coxae ventrally armed. It is unique in the large number of basal spines borne by the female gonopods. The precise affinities of the genus seem at present quite problematical. Only the type species is known.

ZINAPOLYS ZIPIUS Chamberlin.

Plate 1, fig. 1–3.

Zinapolys zipius Chamberlin, Can. ent., 1912, 44, p. 14.

DESCRIPTION.—The original color of types, now largely bleached, seems to have been as follows:—dorsum ferruginotestaceous with the caudal segments somewhat darkest; venter and most of the legs more yellowish, the last pairs of legs darkest, the last ventral plates orange or light ferruginous; prosternum and head nearly like last ventral plates; antennae a little darker than legs but paler than head.

Body narrowed considerably cephalad from the tenth to the second segment and conspicuously caudad as usual. Widths of first, third, eighth, and tenth plates to each other as 19 : 18 : 21 : 21.5.

Head wider than long in about ratio 15 : 13. Anterior margin between antennae nearly straight. Head back of eyes subquadrate, the sides a little converging caudad to the rounded posterior corners. The elevated caudal marginal thickening not widening or extending cephalad at middle. Head depressed along frontal suture. A furrow a little caudad of and parallel with the frontal suture. Commonly a median furrow is present with one diverging from it on each side cephalad from the caudal margin.

Ocelli mostly about twenty in four series: *e.g.*, 1 + 5, 5, 5, 4;

1 + 5, 5, 5, 3. Single ocellus not very large. Organ of Tömösvary large, in outline exceeding an ocellus; not contiguous with eye-patch.

Antennae short, reaching the fifth or the sixth segment; composed of twenty articles of medium or short length, the second one being much the largest and those immediately proximad of the ultimate one often very short. Hairs not dense; longer than usual.

Prosternum wider than greatest length in about ratio 5:3; *i.e.*, 1.66 times wider than long. Anterior margin extending cephalad of ectad from middle on each side. Prosternal teeth 5 + 5 to 7 + 7; large, decreasing in size from the most ectal to the most mesal on each side. Spine rather stout at base but acuminate and distally long and slender as shown in the figure.

Major dorsal plates mostly showing a median longitudinal furrow and a little ectad of it on each side one diverging from it from the anterior margin caudad. A depression or wide furrow within each lateral marginal thickening and from the anterior end of this furrow usually a branch extends mesocaudad. A distinct transverse depression a little distance in front of caudal margin, this uniting laterally with the longitudinal furrow on each side. Caudal margin of ninth plate at each end bent obliquely somewhat cephalad; posterior margins of eleventh and thirteenth dorsal plates straight.

Ventral plates with each lateral border bent somewhat ventrad, a furrow marking the line of bending; at least on caudal plates a median longitudinal furrow may be detected. Most plates showing several transverse, irregular impressed lines or furrows of which one or two are ordinarily more pronounced than others.

Coxal pores rather large, very distinct; from circular to transversely elliptic or suboblong in outline; arranged mostly in order 4, 5, 5, 5 or 4, 4, 5, 5.

Gonopods of male moderately large; the proximal article thick, cylindric, with four or five ventral bristles in a transverse row near distal edge. Distal article much narrower than the proximal, conical; bearing mostly two or three long bristles.

Claw of female gonopods proportionately short and broad; deeply excavated or hollowed out on mesal side. Basal spines 6 + 6 or 6 + 5; stout but rather short, subconical.

Spines of first to seventh pairs of legs, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the eighth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth and thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{1, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{1, 1, 3, 3, 1}$ or $\frac{1, 0, 3, 1, 0}{1, 1, 3, 3, 2(?)}$. All legs with three claws. Last two pairs of coxae laterally armed.

Length 17–20 mm. A male 20 mm. long has the tenth plate 2.8 mm.

wide; the antennae 8 mm. long; and the anal leg (exclusive of coxa as usual) 7.8 mm. long.

LOCALITY.—Idaho: Kootenai Co.!

The types of this interesting species embrace five adults.

GONIBIUS, gen. nov.

Antennae moderate to long; articles twenty.

Ocelli numerous, seriate; single ocellus differentiated.

Prosternal teeth numerous (6 + 6 to 9 + 9). Spine ectal in position. No diastema in dental series of each side.

Posterior angles of fourth, sixth, seventh, ninth, eleventh, and thirteenth, or of only the last three mentioned, dorsal plates produced.

Coxal pores large, uniseriate.

Claw of female gonopods tripartite. Basal spines 2 + 2; broad.

Gonopods of male uniarticulate (*glyptocephalus*).

None of coxae ventrally armed; some of posterior pairs armed laterally as well as dorsally.

Third joint of all legs with three dorsal spines, that of some of anterior ones with but one or two ventral ones, some following with two and only the mere caudal with three. Fifth joint of legs from second or about fourth to thirteenth or fourteenth pairs of legs with two dorsal spines. Dorsal spines of anal legs 1, 0, 3, 1, 0; ventral, 0, 1, 3, 3, 2 to 0, 1, 3, 2, 1; claw one. Dorsal spines of penult legs 1, 0, 3, 2, 2 or 1, 0, 3, 1, 1; ventral 0, 1, 3, 3, 2; claws two or three. Dorsal spines of thirteenth legs 1, 0, 3, 2, 2; ventral 0, 1, 3, 3, 2. Ventral spines of twelfth 0, 0, 3, 3, 2 or 0, 1, 3, 3, 2; dorsal 1, 0, 3, 2, 2 or 0, 0, 3, 2, 2.

Length 18–20 mm.

GENOTYPE.—*Lithobius rex* Bollman.

Of the two species grouped in this genus, one, the type, is known only from the female and the other only from the male, an unfortunate circumstance. Analogy makes it seem likely that the two species should go into separate subgenera on the basis chiefly of the difference in angulation of the dorsal plates, the type constituting *Gonibius sens. str.* while *glyptocephalus* may be included in a new subgenus *Tambius*.

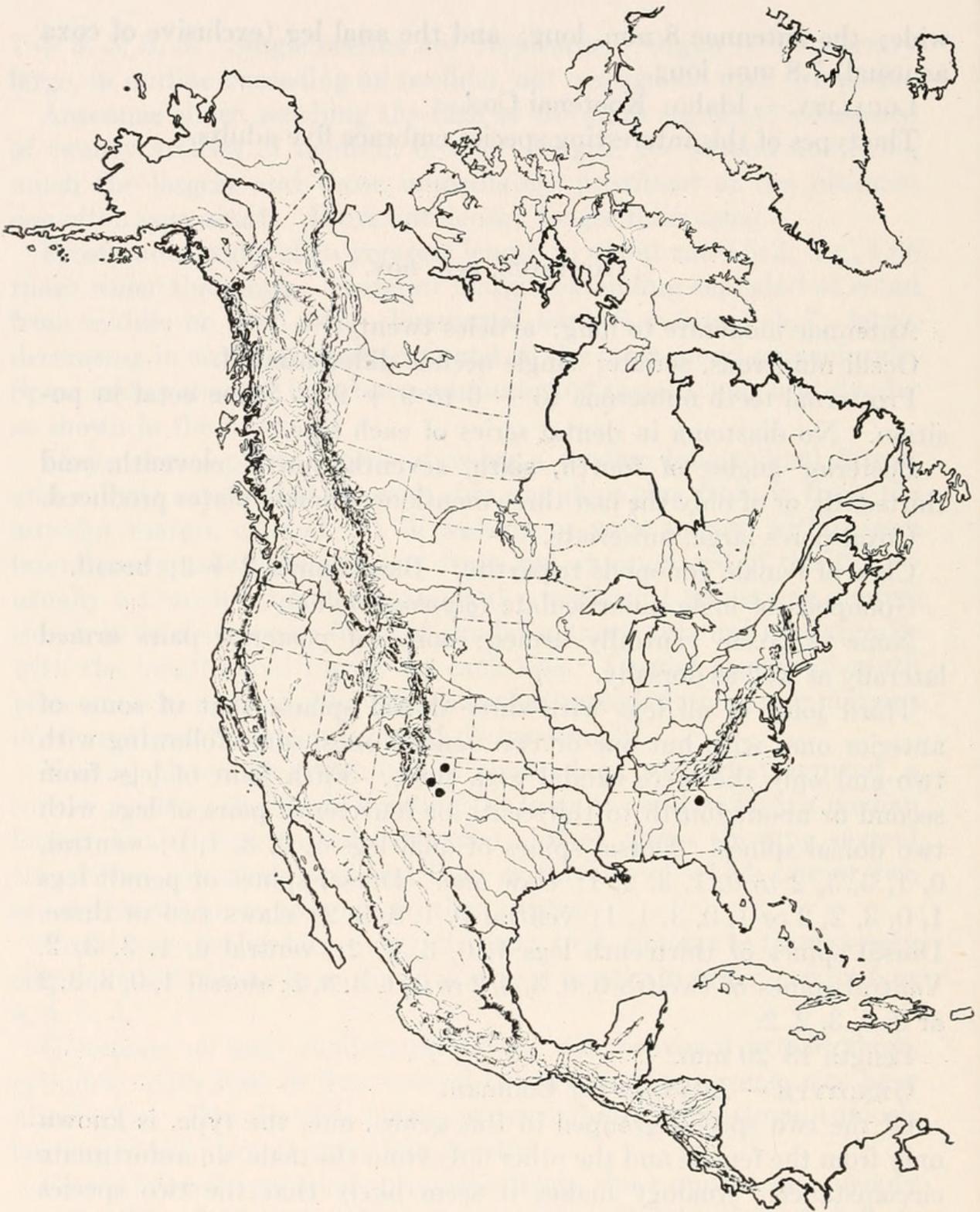


FIG. 2.— Distribution of *Gonibius* Chamberlin.

Key to Species.

- a.* Posterior angles of fourth, sixth, seventh, ninth, eleventh, and thirteenth dorsal plates produced; ventral spines of anal legs 0, 1, 3, 3, 2; dorsal spines of penult legs 1, 0, 3, 2, 2.

G. (Gonibius) rex (Bollman).

aa. Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced; ventral spines of anal legs 0, 1, 3, 2, 1; dorsal spines of penult legs 1, 0, 3, 1, 1.

G. (Tambius) glyptocephalus (Chamberlin):

GONIBIUS REX (Bollman).

Plate 1, fig. 4, 5.

Lithobius rex Bollman, Proc. U. S. N. M., 1888, **11**, p. 350. Bull. **46**, U. S. N. M., 1893, p. 102.

DESCRIPTION.—Original color difficult to make out from type. Apparently greyish brown with head, antennae, and the first dorsal plate and margins of the others darker. Legs light brown or testaceous.

Body robust, in the type being at present only 6.25 times longer than the width of the tenth plate (while the body may have shrunk through drying, the length of 25 mm. given by Bollman in the original description was doubtless too large, as seems to have been true of most measurements given by that author for lithobiids). Widths of head and of first, third, eighth, and tenth plates to each other as 88 : 80 : 76 : 88 : 88.

Head distinctly wider than long (ratio 11 : 9), considerably wider than first dorsal plate but same as width of eighth and tenth plates. Caudal margin nearly straight. Surface uneven, densely, finely punctate.

Ocelli 18–21 in four or five series: *e.g.*, 1 + 5, 5, 4, 3(4), 1 + 5, 6, 5, 3, 1. Single ocellus large, subcircular. Other ocelli also comparatively large and distinct, those of the most dorsal row being largest as usual.

Antennae long, reaching well upon the tenth body segment. Composed of twenty articles all of which are long or very long.

Prosternum about 1.87 times wider than long. Distance between chitinous spots only 1.25 times width at level of bottom of median sinus; two times the length of the dental line. Teeth rather small, nearly uniform, distally narrowly rounded, 9 + 9 in number. Anterior margin wide; each side weakly convex, with mesal end a little farther caudad than the ectal. Spine ectal in position as usual, slender and straight, acute.

First dorsal plate like head; the others very strongly roughened. Posterior angles of the fourth, sixth, seventh, ninth, eleventh, and

thirteenth dorsal plates strongly produced, those of the last three mentioned being especially long and acute.

Coxal pores large, strongly transverse, being narrowly oblong or sometimes keyhole shaped : 8, 8, 8, 7.

Claw of female gonopods short and broad; tripartite, the two more mesal lobes nearly equal in length with the median one but little the longer, the ectal lobe smallest. Basal spines 2 + 2, very wide, somewhat clavately widening to distal third which is abruptly narrowed to an acute point (Plate 1, fig. 5). Mesal side of proximal article straight or nearly so.

Anal legs of female long and slender, the distal articles especially slender. Fifth article or tibia much longer than the fourth article or femur. Ratio of lengths of fourth, fifth, sixth, and seventh articles being to each other as 66 : 79 : 65 : 40.

Spines of first and second legs, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 3, 2}$; of the third either the same or $\frac{0, 0, 3, 2, 2}{0, 0, 1, 3, 2}$; of the fourth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 3, 2}$; of the fifth to eighth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the thirteenth and fourteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; the latter with three claws of which the anterior accessory is very small; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, claw one. Last four pairs of coxae laterally armed.

Length of type (♀) 20 mm.; width of tenth plate 3.2 mm.; length of antennae 13 mm.; length of anal legs 12 mm.

LOCALITY.— Georgia: Tallulah!

Only the single type female above described is known.

GONIBIUS (TAMBIUS) GLYPTOCEPHALUS (Chamberlin).

Lithobius glyptocephalus Chamberlin, Proc. Acad. nat. sci. Phil., 1903, p. 35.

DESCRIPTION.— Dorsum more or less chestnut with a median longitudinal pole stripe. Head more reddish, paler along margins and frontal suture. Antennae reddish brown, paler distad. Prosternum and prehensors brown, the latter somewhat paler ectad. Venter light brown, the caudal plates darker. Legs testaceous, the caudal pairs darker.

Body about seven times longer than the width of the tenth plate. Widths of head and of first, third, eighth, and tenth plates to each other as 65 : 64 : 59 : 65 : 65. The head is thus equal in width to the eighth and tenth plates as in *G. rex*.

Head wider than long in about ratio 13 : 12. The short transverse sulcus near each marginal break is deep with its mesal end curving

cephalad. A short sulcus extending mesocaudad from above eye on each side. A short but well-impressed transverse sulcus a little in front of median portion of caudal margin. A median longitudinal furrow on caudal portion with another one each side of it may be traced. Head a little elevated immediately cephalad of frontal suture, and on this elevation a median pit-like depression. Surface appearing smooth and shining, being only obscurely uneven and punctate. Margining continuous forward to the eyes but the thickening narrower cephalad of the lateral break. Head widest a little caudad of the eyes from where the sides converge to the caudal corners.

Ocelli mostly near fifteen in three series: *e.g.*, 1 + 5, 5, 4; 1 + 5, 5, 3; 1 + 7, 6, 4; 1 + 5, 5, 5. Single ocellus large, obliquely oval. The patch elongate.

The antennae moderate in length, reaching upon the seventh body segment. Articles normally twenty, but may number up to twenty-three on one side; slender and long; the ultimate long and pointed.

Prosternum a little less than 1.6 times wider than long. Distance between chitinous spots about 1.9 times width at level of bottom of sinus; 2.5 times dental line. Teeth mostly 6 + 6 or 7 + 7; stout, acute, decreasing in size and extent of separation mesad. Spine a little ectad and caudad of ectal tooth; bristle-like distad.

First dorsal plate nearly like head, but obscurely uneven, while the other plates are more markedly rugose and subgranulose, the caudal ones, as usual, most so, though none of them are strongly so. The major plates with a short submarginal sulcus on each side at about one third the length from the caudal margin and also a second similar one toward anterior end, there most conspicuous on more posterior plates. A pair of diverging longitudinal sulci on plate with a wider median furrow between them; on each side a more ectal furrow parallel with margin and usually uniting with the oblique sulcus near its middle.

First ventral plate broadly mesally depressed, a sharply impressed median longitudinal sulcus crossing the broader depression. Other plates showing three distinct longitudinal furrows of which the median one on some of the posterior plates may become shortened and even pit-like. Hairs sparse, most abundant on the caudal plates.

Coxal pores rather large, subcircular or transversely elliptic: in number, *e.g.*, 6, 7, 7, 6-6, 7, 8, 8.

Gonopods of male well exposed; broad, distally subtruncate; bearing six or seven bristles.

Gonopods of female with claw tripartite, the lateral lobes relatively much reduced. Basal spines 2 + 2; stout, clavately widening above base.

Anal legs in the male moderately long; slender. Neither the anal nor the similarly slender penult legs bearing any special lobes or furrows.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the second to the tenth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 3, 2}{0, 1, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; claws two, of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$ - $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$, claw one. Last three pairs of coxae laterally armed.

Length 18-22 mm. A male 18 mm. long has anal legs (exclusive of coxae) 9 mm. long; antennae 9 mm. long; and tenth plate 2.6 mm. wide.

TYPE LOCALITY.—New Mexico: Beulah!

KNOWN LOCALITIES.—New Mexico: Beulah! Chicario Canyon near Raton! Las Vegas! (T. D. A. Cockerell).

LITHOBIUS Leach (emend.).

Trans. Linn. soc. London, 1815, **11**, p. 381.

Lithobius (ex part) Gervais, Hist. nat. ins. Aptères, 1847, **4**, p. 229. Newport, Cat. Myr., 1856, p. 2, 15. Meinert, Nat. tidskr., 1868, **5**, p. 258. Latzel, Myr. Österreich-Ungar. monarch., 1880, **1**, p. 31. Verhoeff Bronn's Thierreich, 1907, **5**, p. 239.

Antennae varying in length in ours from short to moderately long articles always more than twenty, and in American species under fifty, being mostly from twenty-five to forty-five.

Seriate ocelli present, mostly numerous. Single ocellus clearly differentiated.

Prosternal teeth 5 + 5 to 10 + 10, or rarely but 4 + 4. Spine ectal in position, slender. No diastema in dental line of each side.

The ninth, eleventh, and thirteenth dorsal plates with posterior angles produced.

Coxal pores uniseriate, circular or, as mostly, transverse; present on last four pairs of coxae.

Claw of female gonopods tripartite. Basal spines 2 + 2 or 2 + 3.

Gonopods of male mostly uniarticulate, but they may be biarticulate.

None of coxae armed ventrally; some of posterior pairs armed dorsally and usually, but not always (*e.g.*, *L. forficatus*), armed laterally.

Third joint of all legs armed with three dorsal spines. Fifth joint of legs from first or second to eleventh or in most to thirteenth and sometimes to fourteenth with two dorsal spines. Dorsal spines of anal legs 1, 0, 3, 1, 0 (or very rarely varying to 1, 0, 3, 1, 1 or 1, 0, 3, 2, 0

FIG. 3. — Distribution of *Lithobius* Leach.

in *L. forficatus*, (according to Latzel); ventral 1, 3, 3, 1 or 1, 3, 3, 2; claws one or two. Dorsal spines of penult legs 1, 0, 3, 1, 1 or 1, 0, 3, 2, 2; ventral mostly 0, 1, 3, 3, 2, less commonly 0, 1, 3, 3, 1 or 0, 1, 3, 3, 3. Dorsal spines of twelfth and thirteenth legs 1, 0, 3, 2, 2 to 1, 0, 3, 1, 1 or coxal spine of twelfth missing.

Posterior legs of male essentially unmodified, not lobate or of conspicuously different form.

Length of our species 11.5–30 mm., mostly above 15 mm.

GENOTYPE.—*L. forficatus* (Linné).

In common with the other genera discussed in this paper and, in fact, with all members of the Lithobiidae as restricted by the author, the mouthparts of *Lithobius* have the following characteristics:—

Labrum tridentate, a large median one in the sinus and a smaller one on each side. Laterally the labrum is clothed along margin and over border on the dorsal side with numerous bristles which are in large part ramose or laciniate, but in part are simple.

The first maxillae have the outer branch biarticulate; distal article of this branch densely clothed with simply ramose hairs. Inner branch undivided; set off by a suture from the coxal division; densely clothed over the distal portion with simply ramose hairs similar to those of the outer branch.

Second maxillae with claw of palpus normally five partite. Distal article complanate dorsomesally and clothed over this area with many penicillate and ramose setae similar to those of the first maxillae. Palpus triarticulate with the usual traces indicating two additional proximal articles. Coxosternum commonly with the median portion curved caudad and also bent dorsad; less strongly chitinized than the lateral portions which it widely separates.

The distribution of the genus in North America is shown in Figure 3. It is rare in the Pacific Coast region and in the Southwest, where it is represented by but a single known species, *L. chumasanus* Chamberlin.

Key to Species of Lithobius.

- a. None of the posterior coxae laterally armed. *L. forficatus* (Linné).
- aa. Coxae of the last three pairs of legs laterally armed.
 - b. Claw of anal legs single.
 - c. Penult legs with the claw single; dorsal spines of thirteenth legs 1, 0, 3, 1, 1. *L. atkinsoni* Bollman.
 - cc. Penult legs with three claws; dorsal spines of thirteenth legs 1, 0, 3, 2, 2. *L. celer* Bollman.
 - bb. Anal leg with two claws.
 - c. Ventral spines of anal legs 0, 1, 3, 3, 1.
 - L. chumasanus* Chamberlin.

LITHOBIUS FORFICATUS (Linné).

Plate 2, fig. 1-3.

- Scolopendra forficata* Linné, Syst. nat., ed. 10, 1758, **1**, p. 638. DeGeer, Mém. ins., 1778, **7**, p. 557. Fabricius, Spec. ins., 1781, **1**, p. 532. Latreille, Gen. crust. ins., 1806, **1**, p. 78. Sill, Verh. mitth. Siebenb. ver. nat., 1861, **12**, p. 11.
- Lithobius forficatus* Leach, Edinb. encyc., 1815, **7**, p. 408. Zool. misc., 1817, **3**, p. 39. C. Koch, Deutschl. Crust. Myr. Arach., 1844, hft. 40, p. 20. Newport, Trans. Linn. soc. London, 1845, **19**, p. 367. Gervais, Hist. nat. ins. Aptères, 1847, **4**, p. 230. Newport, Cat. Myr., 1856, p. 18, 19. L. Koch, Myr. gatt. Lithobius, 1862, p. 39. C. Koch, Die Myr., 1863, **1**, p. 113, fig. 104. Palmberg, Sverig. Myr. ord. Chilop., 1866, p. 15. Eisen and Stuxberg, Öfvers. Kongl. vet.-akad. Förh., 1868, **25**, no. 5, p. 376. Meinert, Nat. tidsskr., 1868, **5**, p. 259. Stuxberg, Öfvers. Kongl. vet.-akad. Förh., 1871, **28**, no. 4, p. 496. Meinert, Nat. tidsskr., 1872, **8**, p. 315. Fickert, Myr. arach. kamme Riesengeb., 1875, p. 7. Stuxberg, Öfvers. Köngl. vet.-akad. Förh., 1875, **32**, no. 3, p. 10, 27. Rosicky, Zool. landesd. Bohemen, 1876, p. 16. Latzel, Jahrb. nat. landesmus. Karnten, 1876, **12**, p. 97. Fedrizzi, Atti. Soc. Ven.-Trent., 1877, **5**, p. 205. Stuxberg, Proc. Cal. Acad. sci., 1877, **7**, p. 136. Haase, Schlesiens Chil., 1880, **1**, p. 19. Latzel, Myr. Österreich-Ungar. monarch., 1880, **1**, p. 57. Sografi, Bull. Friends, nat. hist., 1880, **32**, pt. 2, p. 1-33, pl. 1-3. Tömösvary, Zool. Anz., 1880, **3**, p. 617. Fanzago, Boll. Soc. ent. Ital., 1882, **14**, p. 48. Latzel, Boll. Soc. ent. Ital., 1882, **14**, p. 366. Meinert, Proc. Amer. philos. soc., 1886, **23**, p. 176. Bollman, Proc. U. S. N. M., 1887, **10**, p. 260; 1888, **11**, p. 409. Evert's, Tijdschr. ent., 1888, **32**, p. 41. Daday, Term. fuz., 1889, **12**, p. 86, 107. Dalla Torre, Zool. jahrb. Syst., 1889, **4**, p. 80. Pocock, Ann. mag. nat. hist., 1889, ser. **29**, p. 62. Ellingsen, Förh. Vid.-selsensk. Christiania, 1891, no. 10, p. 5. Bollman, Bull. 46, U. S. N. M., 1893, p. 200. Daday, Term. füzetek., 1893, **16**, p. 112. Kenyon, Can. ent., 1893, **25**, p. 162. Pocock, Inst. nat., 1893, **2**, p. 310. Brolemann, Boll. Soc. ent. Ital., 1895, **27**, p. 81. Attems, Sitzb. Kongl. akad. wiss. Wien, 1895, **104**, p. 19. Simacovics, Verh. Siebenb. ver., 1896, **46**, p. 100. Chamberlin, Proc. U. S. N. M., 1901, **24**, p. 24. Rothenbühler, Rev. Suisse zool., 1901, **9**, p. 358. Verhoeff, Boll. Soc. sci. Bucarest-Roumanie, 1901, p. 168, 172. Tonniges, Zeits. wiss. zool., 1902, **71**, p. 328. Williams, Amer. nat., 1903, **37**, p. 299. Verhoeff, Zool. jahrb. Suppl., 1905, **8**, p. 216. Eyans, Proc. Roy. phys. soc. Edinb., 1906, **16**, p. 408. Chamberlin, Ann. Ent. soc. Amer., 1909, **2**, p. 190; 1911, **4**, p. 42. Can. ent., 1911, **43**, p. 69, 101. Gunthorp, Kans. univ. sci. bull., 1913, **17**, p. 165. Chamberlin, Bull. M. C. Z., 1914, **58**, p. 220. Can. ent., 1920, **52**, p. 166.
- Lithobius vulgaris* Leach, Trans. Linn. soc. London, 1815, **11**, p. 382. Johnston, Mag. nat. hist., 1835, **8**, p. 491.

- Lithobius laevilabrum* Leach, Trans. Linn. soc. London, 1815, **11**, p. 382.
- Lithobius americanus* Newport, Trans. Linn. soc. London, 1845, **19**, p. 365, pl. 33, f. 29. Gervais, Hist. nat. ins. Aptères, 1847, **4**, p. 236. Newport, Cat. Myr., 1856, p. 17. Wood, Journ. Acad. nat. sci. Phil., 1863, new ser., **5**, p. 14; Trans. Amer. phil. soc., 1865, **13**, p. 148.
- Lithobius leachii* Newport, Trans. Linn. soc. London, 1845, **19**, p. 368; Cat. Myr., 1856, p. 19.
- Lithobius forcipatus* Gervais, Hist. nat. ins. Aptères, 1847, **4**, p. 229.
- Lithobius muscorum* L. Koch, Myr. gatt. Lithobius, 1862, p. 43.
- Lithobius forcipatus villosus* L. Koch, Myr. gatt. Lithobius, 1862, p. 41.
- Lithobius trilineatus* L. Koch, Myr. gatt. Lithobius, 1862, p. 37.
- Lithobius hortensis* L. Koch, Myr. gatt. Lithobius, 1862, p. 45. Palmberg, Sverig.-Myr., ord. Chilop., 1866, p. 17.
- Lithobius coriaceus* L. Koch, Myr. gatt. Lithobius, 1862, p. 51. Meinert, Nat. tidsskr., 1869, ser. 3, **5**, p. 260. Porat, Öfvers. Kongl. vet.-akad. Förh., 1869, p. 637.
- Lithobius multidentatus* Wood (*non* Newport), Journ. acad. nat. sci. Phil., 1863, n.s., **5**, p. 13.
- Lithobius curtirostris* Eisen and Stuxberg, Öfvers. Kongl. vet.-akad. Förh., 1868, **25**, p. 376.

DESCRIPTION.— In general color varying from brownish yellow to chestnut; dorsal plates showing often. A median dorsal paler line, as also sometimes an oblique line on each side. Head brown to chestnut like the dorsum, with the frontal region sometimes paler. Antennae brownish yellow to chestnut, the tip usually rufous. Prosternum somewhat paler than the head but darker than the venter; prehensors mostly rufous or pale ferruginous distally. Venter brownish yellow to brown; frequently dusky, with the most caudal plates reddish to subferruginous.

Body widest at tenth segment; very gradually narrowing cephalad and more decidedly so caudad as usual. Widths of first, third, eighth, and tenth dorsal plates to each other as 54 : 52 : 57 : 59.

Head a little wider than long (*ca.* 24 : 23); the portion caudad of eyes subquadrate, the sides a little converging caudad of the marginal breaks. Caudal margin slightly incurved mesally. Immediately in front of median portion of caudal marginal thickening a curved sulcus, the free ends of which appear as diverging shallow furrows; this impression sometimes very vague, at others distinct. Surface somewhat uneven; punctate, the puncta being usually more distinct and dense in the frontal region.

Ocelli twenty-two to forty, but mostly twenty-six to thirty-four; in five to eight series, but mostly in six. Single ocellus large, sub-



FIG. 4. — Distribution of *Lithobius forficatus* (Linné).

circular to oval in outline. Seriate ocelli closely arranged but those of the most dorsal one or two rows often with ocelli somewhat separated, especially so the more caudal ones. Examples of arrangement are as follows: 1 + 6, 6, 6, 6, 5, 3; 1 + 4, 5, 5, 5, 4, 2; 1 + 5,

5, 7, 7, 5, 4; 1 + 5, 6, 6, 5, 4, 3; 1 + 5, 6, 6, 6, 4, 3; 1 + 7, 7, 8, 7, 5, 3; 1 + 3, 6, 6, 5, 5, 4, 3.

Antennae short, normally reacting at most to the anterior portion of the seventh segment, consisting of from thirty-six to forty-nine articles, but the number mostly from thirty-nine to forty-five of which those between the second and ultimate are short and very short and closely compacted. Hairs dense, short, straight.

Prosternum wide, being mostly nearly 1.7 times wider than long. Anterior portion narrowed considerably cephalad; anterior margin a little convexly curving from each end to the median sinus. Teeth a little more widely separated ectally than toward median line; stout, moderately subacute: 5 + 5; 5 + 6; 6 + 6; 6 + 7; 7 + 7. Spine in usual position at ectal end, a little caudad of most ectal tooth; slender (Plate 2, fig. 1).

Dorsal plates well arched; surface but little uneven, appearing mostly smooth and shining; the short submarginal transverse impressions or sulci near beginning of caudal third of length commonly weak or obscure. Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced, the processes stout and subacute.

Ventral plates with a longitudinal median sulcus, which is more distinct on the caudal ones. A transverse sulcus on caudal portion of plate which is commonly obscure on anterior plates. In addition there is a weakly impressed line or furrow running obliquely ectocephalad on each side from near the junction of the two previously mentioned sulci, these oblique lines being most distinct on the last plate where they unite at the median furrow, with the caudal portion of which they compose a Y-shaped impression. Caudal plates and genital segment more densely pilose than the others.

Coxal pores large, strongly transversely elongate, the most proximal ones on each coxa smaller and often subcircular; the most distal one mostly distinctly broader distoproximally, broadly elliptic to circular. Sometimes all pores are elliptic or almost circular as is normal in immature specimens. Examples of arrangement: 6, 6, 6, 5; 7, 8, 8, 6; 8, 8, 8, 8; 8, 10, 10, 7; 9, 10, 10, 7; 10, 9, 9, 8; 8, 10, 10, 7; 9, 10, 9, 6; 11, 11, 10, 10; 12, 12, 10, 10.

Gonopods of male biarticulate; first article broad, bearing 4-6 bristles; second article small and wart-like or broadly subconic, usually with a single long bristle.

Claw of female gonopods short and rather wide; the three lobes mostly blunt, the median considerably exceeding the lateral ones which are subequal, but these always well developed (Plate 2, fig. 2).

Basal spines 2 + 2 or 2 + 3, stout, in outline subconical (Plate 2, fig. 3).

Posterior legs rather short, slender, being only slightly thickened. Femur of anal and penult legs with two parallel and rather weak, longitudinal furrows along the dorsal surface; the prefemur similarly but more indistinctly furrowed. Wholly without special lobes or modifications in the male.

Spines of first three pairs of legs, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of fourth to eighth pairs the same or $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 2}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$, claws three, the anterior accessory being minute; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, claw single.

Length 18–30 mm.; width of tenth plate 2.25 to 3.5 mm. A ♂ 22.5 mm. long has the tenth plate 2.8 mm. wide; antennae 10 mm. long and anal legs (exclusive of coxae) 9.6 mm. long.

Pseudomaturus.—Coloration like that of paler adults. From light to dark brown; head darker brown to light mahogany. Antennae like head, except at tips which are pale and usually rufous. Venter and legs paler brown; the caudal pairs of legs mostly darker than the others, often rufous distad.

Antennae reaching from the fifth to seventh segment. Articles in specimens examined varying from thirty-six to forty-four.

Ocelli mostly in five series and twenty to twenty-four in number: e.g., 1 + 3, 6, 6, 5, 3; 1 + 6, 6, 5, 4, 3; 1 + 5, 5, 4, 4, 3; 1 + 4, 5, 6, 4, 2.

Prosternum as in *maturus*. Teeth mostly 5 + 5.

Coxal pores 5, 6, 6, 5; 6, 6, 7, 6.

Gonopods of male biarticulate; distal article in younger specimens glabrous, in older ones with one bristle and the first article mostly with two.

Claw of female gonopods nearly as in adult, but a little thinner and somewhat shorter and paler with the teeth or lobes rather more acute. Spines about as in *maturus* or the mesal one of each pair in smaller specimens may be relatively shorter.

Spining of legs as in *maturus* excepting that the dorsal spines of first legs are prevailingly 0, 0, 3, 2, 1 instead of 0, 0, 3, 2, 2 and the ventral spines of the ninth legs are more commonly 0, 0, 2, 3, 2 instead of 0, 0, 3, 3, 2, a formula in the adults also commonly holding as well for a number of the more anterior legs.

Length 14–18 mm. A ♂ 16.5 mm. long has antennae and anal legs both very near 6 mm. in length. (Watersmeet, Mich.).

Praematurus.—Pale brownish yellow to light brown, the caudal

segments, especially in pale specimens, darker. Head and antennae usually a darker brown with the frontal region frequently paler and the antennae lighter at tips. Venter and most of the legs paler than the dorsum, the caudal plates and legs darker, the latter with tarsi often rufous. Prosternum a darker brown than the venter; the prehensors rufous distally.

Antennae reaching fifth body segment. Articles thirty-four to thirty-eight.

Ocelli twelve to nineteen in three or four series: *e.g.*, 1 + 5, 6, 4, 3. Prosternal teeth 4 + 4 or 5 + 5.

Coxal pores from circular to broadly elliptic: in number mostly 5, 5, 5, 4. Porigerous area only slightly depressed.

Gonopods of male biarticulate, the distal one small and glabrous, the proximal one with usually but one bristle.

Claw of female gonopods short, moderately curved, thin and pale; the three lobes distinct, acute. Spines 2 + 2; the inner one of each pair much smaller than the outer, being only about one half as long and less than half as broad. Bristles more sparse than in the *pseudomaturus*.

Spines of first legs, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 3, 1}$ to $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 2}$ to adult number; of the third and fourth, $\frac{0, 0, 2, 3, 1}{0, 0, 2, 3, 2}$ to adult number; of the fifth and sixth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the seventh to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$, or ventral spines of tenth and eleventh may be 0, 0, 3, 3, 2, and in one specimen ventral spines of eleventh on one side were 0, 0, 2, 2, 2; of the remaining four pairs as in the older stages.

Length 11 to 13.5 mm. A ♀ 13.5 mm. long has antennae 5 and anal legs 5.5 mm. long.

Immaturus.—Brownish yellow to light brown, the caudal segments, especially in paler specimens, darker. Head usually a little darker than dorsum with frontal region paler, often yellowish. Antennae usually of same color as frontal region of head. Venter and legs pale with caudal plates darker; tarsi of last pairs of legs often pale rufous, the whole body in life may be suffused more or less with a violaceous color.

Antennae composed of twenty-nine to thirty-six articles, of which the first three are long and the others mostly short, but commonly showing longer ones at intervals.

Ocelli ten to eighteen in three or four series: *e.g.*, 1 + 4, 4, 3; a common arrangement: 1 + 5, 5, 4, 3. Single ocellus large, elliptic.

Prosternal teeth nearly always 4 + 4; rarely 5 + 5.

Coxal pores all circular or in larger specimens transversely somewhat elliptic: mostly 4, 4, 4, 3, but varying from 3, 3, 3, 3 to 4, 4, 4, 4.

Male gonopod appearing as a small rounded tubercle, often concealed, which is undivided and may bear a single bristle; or in some a trace of the second article.

Claw of female gonopods small, pale, appearing at most as a small acute spine without trace of lateral lobes or in smallest specimens claw wholly absent and then often only two articles developed in gonopod. Basal spines 1 + 1 or occasionally with the merest trace of a second one on one side; pale, often appearing as mere points. The second and third articles may be entirely glabrous or the second may have two or three and the third one or two bristles, the first having from one to four.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 1, 2, 1}$ to $\frac{0, 0, 2, 1, 1}{0, 0, 2, 2(3), 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 2, 1}$ or with ventral spines 0, 0, 2, 3, 2; of the third, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$ or ventral spines to 0, 0, 2, 3, 2; of the fourth, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$ to $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the fifth and sixth, $\frac{10, 0, 2, 2, 2}{0, 0, 2, 2, 2}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the seventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3(2), 2}$; of the eighth and ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the tenth and eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$ or ventral spines 0, 0, 3, 3, 2; of the twelfth, $\frac{1(0), 0, 3, 1, 2}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 2, 1, 1}{0, 1, 3, 3, 2}$, $\frac{0, 0, 3, 1, 1}{0, 1, 3, 3, 2}$ or $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 2, 1, 0}{0, 1, 3, 3, 1(2)}$ to $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 1, 1, 0}{0, 1, 2, 2, 1}$, $\frac{1, 0, 2, 1, 0}{0, 1, 3, 2, 1}$ to $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$.

Length 9–11 mm. A ♂ 10.5 mm. long has antennae 5 mm. and anal legs 3 mm. long. (Watersmeet and Marinette, Mich.).

Agenitalis II.—Dorsum pale; dilute brownish to pale testaceous. Head light brown, the frontal region lighter. Venter and legs a little paler than dorsum, the caudal segments usually darker. In life the entire body is suffused with violaceous.

Articles of antennae twenty-five to thirty-three; those distad of the third varying considerably in size in different individuals, often submoniliform.

Ocelli nine to twelve in two to four series: *e.g.*, 1 + 2, 3, 2; 1 + 4, 3, 1; 1 + 4, 3, 2; 1 + 4, 4, 2; 1 + 4, 3, 2, 1; 1 + 5, 4. Ocelli pale. Single ocellus much largest, elliptic.

Prosternal teeth by far most frequently 4 + 4; occasionally 4 + 5 or 5 + 5.

Coxal pores 2, 3, 3, 2–2, 2, 2; circular.

Gonopod of male very small, glabrous; commonly wholly concealed.

Gonopods of female appearing as subcylindric processes which are undivided and entirely glabrous.

Spines of first legs, $\frac{0, 0, 1, 1, 0(1)}{0, 0, 2, 2, 1}$ to $\frac{0, 0, 0, 1, 1}{0, 0, 1, 1, 1}$; of the second and third, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$ to $\frac{0, 0, 2, 2, 1}{0, 0, 2, 2, 1(2)}$; of the fourth, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 2, 2}$; of the fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 2, 2}$; of the sixth the same to $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 1}$; of the seventh, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 1}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$; of the eighth and ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$; of the tenth and eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 1}{0, 0, 3, 3, 2}$ to $\frac{0, 0, 3, 1, 2}{0, 0, 2, 3, 2}$ 1; of the thir-

¹ In a regenerated leg of one specimen the formula is $\frac{0, 0, 1, 0, 0}{0, 0, 1, 1, 1}$.

teenth, $\frac{0, 0, 2(3), 1, 1}{0, 0, 2, 2, 2(1)}$ to $\frac{0, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{0, 0, 3, 1, 1}{0, 1, 3, 3, 1}$ to $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{0, 0, 2(3), 1, 0}{0, 1, 3, 3, 1}$ to $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$.

Length 7-9 mm. A specimen 7.5 mm. long has antennae 3.25 mm. and anal legs about 2.8 mm. long. (Watersmeet, Mich., July, 1910).

Agentialis I.—Very pale in color. Violaceous in life.

Articles of antennae twenty-one to twenty-seven; those distad of the third short, moniliform.

Ocelli five to seven in two or occasionally in three series: *e.g.*, 1 + 3, 2, the commonest formula; 1 + 2, 2; 1 + 2, 2, 1; 1 + 3, 3. Pale. The single ocellus and the caudal one of top series larger than the others.

Prosternal teeth mostly 4 + 4; more rarely 3 + 4 or 3 + 3.

Coxal pores 1, 1, 1, 1, each toward distal end of its coxa, to 1, 1, 1, 2 and 2, 1, 1, 1. Moderate in size, pale edged.

Anal glands still distinct and rather large.

Caudal angles of ninth, eleventh, and thirteenth dorsal plates produced, but the processes short and somewhat rounded.

Gonopods not evident in either sex.

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 1, 1, 1}$ or $\frac{0, 0, 0, 1, 1}{0, 0, 0, 1, 1}$; of the second, $\frac{0, 0, 1, 1, 1}{0, 0, 0(1), 1, 1}$ to $\frac{0, 1, 2, 1}{0, 0, 1, 1, 1}$; of the third and fourth, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 1, 1}$; of the fifth and sixth, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$; of the seventh and eighth, $\frac{0, 0, 2(1), 2, 1}{0, 0, 1, 2, 1(2)}$; of the ninth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1(2)}$; of the tenth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 1(2)}$; of the eleventh, $\frac{0, 0, 2, 1, 2}{0, 0, 1, 2(1), 1}$; of the twelfth, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 2, 1}$; of the thirteenth, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$; of the penult the same or $\frac{0, 0, 1, 0, 0}{0, 0, 2, 1, 1}$; of the anal, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$.

Length 6-7 mm. (East Peoria, Ill., July, 1910).

Pullus IV (Larva IV).—Very pale testaceous to dilute ferruginous, with head and antennae a little darker.

Antennae composed of twenty-one to twenty-two short articles, moniliform.

Ocelli three to five in two series: *e.g.*, 1 + 1, 1; 1 + 2, 1; 1 + 2, 2.

Prosternal teeth mostly 4 + 4 with the most mesal one on each side very small; occasionally 4 + 5, or 3 + 3.

A single pore on each coxa of twelfth legs.¹

Anal glands large, distinct.

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 0, 1, 1}$; of the second to the fourth, $\frac{0, 0, 0, 1, 1}{0, 0, 0, 1, 1}$; of the fifth, $\frac{0, 0, 1, 2, 1}{0, 0, 0, 1, 1}$; of the sixth, $\frac{0, 0, 0, 2, 1}{0, 0, 1, 1, 1}$; of the seventh, $\frac{0, 0, 2(0), 2, 2}{0, 0, 1, 1, 1}$; of the eighth, $\frac{0, 0, 2(1), 1, 2}{0, 0, 1, 1(2), 1}$; of the ninth, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 1(2), 1}$; of the tenth, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 2, 1}$; of the eleventh and twelfth, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$.

¹ Sometimes older specimens are met with in which the thirteenth legs are considerably farther developed than the fourteenth and fifteenth. In such there may be a pore present on each thirteenth coxa as well as on the twelfth (larva *media*).

² The first dorsal spine to appear on distal end of tibia of legs caudad of the eighth is on the

Last three pairs of legs appearing as pale buds.

Length, 5-6 mm.

Pullus III (Larva III).— In this stage ten dorsal plates are developed with ten pairs of functional legs, two additional pairs of legs appearing as buds caudad of the tenth segment.

Antennae with sixteen to eighteen articles (mostly the larger number).

Ocelli mostly 2 or 3: *e.g.*, 1 + 1; 1 + 1, 1.

Prosternal teeth mostly 3 + 3; sometimes 2 + 2.

Length 4-5 mm.

Pullus II (Larva II).— Very pale yellowish.

Eight dorsal plates and eight pairs of developed legs present, two additional pairs appearing as buds.

Articles of antennae fourteen.

Ocelli two or three: 1 + 1; 1 + 1, 1.

Prosternal teeth 2 + 2 or 3 + 3 (rarely 4 + 4, in which case the most mesal on each side is minute).

Length 3-4 mm.

Pullus I (Larva I).— Individuals as they escape from the egg envelopes are pale yellowish white and are translucent.

Seven dorsal plates and seven developed pairs of legs are present, with three additional pairs of legs appearing as buds.

Articles of antennae twelve in number; moniliform.

Ocelli two, distinct; 1 + 1. The second ocellus represents the first one of the upper series proper and from this the formation of the others, which are always smaller, proceeds in the later stages.

Prosternal teeth 2 + 2, very small and often indistinct.

Length 3-4 mm. (East Peoria, Ill., July, 1910).

TYPE LOCALITY.— Europe.

NORTH AMERICAN LOCALITIES.— Idaho: Pocatello! Utah: Logan! Willard! Ogden! Salt Lake City! Provo! Lake Point! etc. Colorado: Denver! Colorado Springs! North and South Dakota! Iowa: Mongona! Boone! DeWitt! Marshalltown! Taura! Ogden! etc. Nebraska: Omaha! Columbia! Fremont! Grand Island! etc. Kansas: Manhattan! Topeka! Cowley Co. (H. Gunthorp); Labette Co. (R. D. Lindsey); Sumner Co. (W. O. Riley). (Southern limit of species which there seems to be scarce). Minnesota: Winona! Minneapolis! Wisconsin: Janesville! Beloit! Kimballs! Fond du Lac! Marinette!

caudal side while on those cephalad of the seventh it appears on the cephalic side. When but one spine occurs in the adult on the dorsal surface of the tibia it is, of course, in the position indicated. Likewise, the first dorsal spine to appear on the femur of the anterior legs appears on the cephalic side, but on the posterior pairs in the caudal position.

Eau Claire! Hangen! Devil's Lake! etc. Exceedingly abundant throughout the state. Illinois: Peoria! Franklin Grove! Dwight! Sterling! Urbana! (C. C. Adams) Chicago! etc. Missouri: St. Louis! Michigan: Watersmeet! Powers! Menonimee! Ludington; Ann Arbor! Detroit! Douglas Lake! etc. (Apparently abundant throughout the state). Indiana: Lawrenceburgh! Greencastle! Connersville! Westfield! Bloomington! (Common in northern part of state, scarce in the southern). Ohio: Columbus! Cleveland! (Probably common across northern portion of state). New York: Syracuse! Niagara! Penn Yan! Hornell! Ithaca! New York City! Long Island! etc. Pennsylvania: Philadelphia! Harrisburg! etc. New Jersey: Camden! Newark! etc. Maryland: Baltimore! District of Columbia! Virginia: Lynchburg! Balcony Falls! West Virginia: White Sulphur! Kentucky: Bee Spring (F. G. Sanborn) Lexington! Covington! North Carolina: Asheville! Hot Springs! South Carolina: Greenville! Connecticut: New Haven! Rhode Island! Massachusetts: Cambridge! Arlington! Forest Hills! Blue Hills! Wellesley! Malden! Danvers! Springfield! Lowell! Wood's Hole! Cohasset! (Very common throughout the state). Vermont: Brattleboro! Townshend! Jamaica! Hartford! Berkshire! New Hampshire: Lake Winnepesaukee! Fabyans! Intervale! Amherst! etc. Maine: Bangor! Hampden! Orono! Brooklin! Head Island! Old Orchard! Portland! Vinal Haven Island! Bar Harbor! Near Mt. Katahdin! Ontario: London! Toronto! Belleville! OHawa! St. Joseph's Island! Quebec: Montreal! Anticosti Island! Amherst! and Coffin Island! Nova Scotia: Halifax! Ship Harbor! (Arethusa Exped.) Yarmouth! McNair Cove! Cape Breton! Newfoundland!

This species occurs throughout most of Europe. In North America it occurs in Canada and across the northern United States from the Rocky Mountains to the Atlantic as shown in Figure 3. In New England and the northern tier of the United States the species is very abundant and almost wholly replaces other large forms, *e.g.*, in Wisconsin. In the southern part of the range indicated in the figure it becomes scarce, as in southern Indiana, Missouri, and Kansas. In the East the range is carried southward along the mountains as far as North and South Carolina where, however, it seems to be scarce. In Utah it occurs only in and near settlements and cities and does not occur native in the canyons, etc. In the southeastern states it is replaced chiefly by the several species of *Neolithobius* (Figure 5).

Lithobius celer, a species of very similar appearance, occurs in Arkansas and is probably the form Wood reported from that state under the name *L. americanus*.

LITHOBIUS CELER Bollman.

Ent. Amer., 1888, 4, p. 7. Bull. 46, U. S. N. M., 1893, p. 79. Chamberlin, Ann. Ent. soc. Amer., 1911, 4, p. 43.

Lithobius celer Chamberlin, Ann. Ent. soc. Amer., 1909, 2, p. 190 (*non syn.*)

DESCRIPTION.—Dorsum light to dark brown or somewhat chestnut, the posterior plates sometimes darker. Head more or less chestnut, often dusky behind the frontal suture. Antennae concolorous with head, paler distad. Prosternum more or less chestnut, the prehensors somewhat paler. Venter testaceous or light brown, the caudal ones darker and sometimes showing a paler median area. Legs testaceous to chestnut.

Body robust, the type specimens being only between six and seven times longer than the width of the tenth plate. Widths of head and of first, third, eighth, and tenth plates to each other as 51:50:52:61:60.

Head widest a little back of eyes; only very slightly wider than long (51:50). Lateral breaks distinct. Caudal margin straight or nearly so.

Ocelli twenty to forty in from four to seven longitudinal series: *e.g.*, 1 + 4, 6, 6, 4, 3; 1 + 5, 6, 6, 6, 5, 2. Single ocellus of moderate size, elliptic or oval. Ocelli of top series larger than the others as usual, the most caudal one often being as much as three fourths as large as the single one.

Antennae moderate or short; composed of thirty to thirty-four articles. Hairs rather long, dense.

Prosternum between 1.6 and 1.7 times wider than long. Distance between chitinous spots 1.8 times greater than width at level of bottom of median sinus; 2.6 times length of dental line. Teeth 5 + 5 to 7 + 7; rounded apically; the more mesal ones sometimes very small. Dental line on each side nearly straight, bending caudad a little toward middle. Spine inserted ectad of most ectal tooth; straight and acutely pointed; slender.

Dorsal plates smooth and shining. Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced; posterior margin of the seventh plate straight or nearly so, or its corners in some very slightly extended.

Coxal pores all circular; moderate or small in size; number in adults from 3, 4, 4, 3 to 5, 6, 6, 5.

Gonopods of male distally subtruncate or but little convex; the sides diverging proximad.

Claw of female gonopods rather short, well curved; distally tri-

partite, the lateral lobes rather slender and acute, with the median one considerably larger.

Anal legs in the male short; the fourth article somewhat enlarged and ventrally longitudinally furrowed. The anal legs in the female very nearly the same.

Spines of first and second legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the third to fifth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the sixth the same or $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the seventh to ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the tenth and eleventh, $\frac{1, 3, 2, 2}{0, 0, 3, 3, 2}$ or the tenth with dorsal coxal spine missing; of the twelfth and thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$, three claws, the anterior accessory being very small; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, claw one. Last three pairs of coxae laterally armed.

Length 15–25 mm.

TYPE LOCALITY.—Arkansas: Little Rock!

Reported by Bollman as common throughout Arkansas where it seems to replace *L. forficatus*.

The description above given is based upon Bollman's typical material from Little Rock. The specimens are in very bad condition.

LITHOBIUS CHUMASANUS Chamberlin.

Proc. Acad. nat. sci. Phil., 1903, p. 154.

DESCRIPTION.—Dark chestnut to mahogany. The dorsal plates sometimes showing longitudinal paler lines. The head and first dorsal plate like remaining portion of dorsum but commonly more suffused with black in irregular patches. Antennae chestnut; lighter distally where it may be light ferruginous or orange. Venter brown, often very dark, with the caudal plates more reddish in cast. Prosternum and prehensors dark chestnut. Legs nearly like corresponding plates of venter, but with tarsi of all more or less of orange tinge which may also affect the other segments of the anal and penult legs.

Body robust, being only 6.5–7 times as long as width of the tenth plate. Widths of head and of first, third, eighth, and tenth plates to each other as 77 : 75 : 77 : 86 : 88 : 76.

Head much wider than long (77 : 69). Marginal breaks weak or obscure. Sides a little converging caudad from a little behind eyes, only weakly convex. Caudal margin straight or weakly excurved. Uneven; subdensely punctate.

Ocelli fourteen to twenty-one in four or five longitudinal series: e.g., 1 + 4, 4, 3, 2; 1 + 5, 5, 5, 4; 1 + 4, 5, 5, 5, 3. Single ocellus large, subvertically broadly elliptic. Seriate ocelli rather large, distinct and regular, all deeply pigmented.

Antennae short, reaching in most to the seventh body segment. Composed of forty-two to forty-six articles which distad of the first few are mostly very short. Hairs dense excepting on the few first articles.

Prosternum 1.6 times wider than long. Distance between chitinous spots 1.75 times width at level of bottom of median sinus; 2–2.25 times as great as the dental line. Teeth in types 6 + 6 or 7 + 7; large and nearly uniform, distally rounded.

Dorsal plates shining, weakly roughened, the caudal ones more strongly so as usual. The short submarginal transverse sulci evident on plates caudad of the seventh. Posterior angles of ninth, eleventh, and thirteenth dorsal plates strongly produced, those of no other at all extended.

Ventral plates all densely punctate, the most caudal ones and the genital segments more densely clothed with longer hairs than those found on the other ventral and on the dorsal plates. The usual three longitudinal impressions clearly indicated, the median one mostly reduced to a short subcircular depression immediately caudad of the middle of plate.

Coxal pores strongly transverse (elliptic in young specimens); in types from 7, 8, 8, 6 to 8, 8, 8, 7.

Gonopods of male short, but little exposed; bearing few long bristles.

Claw of female gonopods long and stout; with two short and nearly equal lobes and in some, at least, with a third small, almost obliterated lobe on mesal side. Basal spines stout, acutely pointed.

Anal legs in both sexes short and only little thickened; the third, fourth, and fifth articles longitudinally furrowed dorsally, these furrows a little better developed in the male. Penult legs more slender, the corresponding articles also dorsally furrowed.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 2}$ to $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the second to seventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the eighth to tenth, the same or $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$ (in the tenth often one formula applying to the right leg, the other to the left); of the eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth and thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$, claws two; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$, claws two. Last three pairs of coxae laterally armed.

Length of types 21–23 mm. A ♂ 21 mm. long has tenth plate 3.2+ mm. wide; antennae and anal legs 9 mm. long.

LOCALITY.—California: Santa Barbara! (1902).

Only the types are known. This is a large and strongly marked species presenting many points of similarity to *L. forficatus*. From this species it is easily distinguished by the presence of lateral spines

on the posterior coxae, and especially the two claws of the anal legs as well as in various other features.

LITHOBIUS ATKINSONI Bollman.

Plate 1, fig. 6.

Lithobius atkinsoni Bollman, Proc. U. S. N. M., 1887, **10**, p. 625; 1888, **11**, p. 349. Chamberlin, Ann. Ent. soc. Amer., 1911, **4**, p. 42.

DESCRIPTION.—Dorsum light yellowish brown to chestnut, sometimes of subferruginous cast. Caudal portion of head a little darker than dorsum of body but in front of suture always distinctly lighter, often clear yellow or orange. First two articles of antennae nearly always yellow or light ferruginous; the remaining portion brown to yellow. Prosternum brown to light chestnut; the prehensors lighter, especially along ectal edge and distally, of reddish tinge. Venter from yellow to light orange, the caudal plates darker, more strongly reddish. Legs of color similar to that of corresponding plates of venter; anal and penult pairs very commonly much lighter on mesal surfaces and especially distally where often bright yellow, but otherwise the posterior legs are usually darker than the anterior ones.

Robust, wide in region of eighth and tenth plates; narrowed cephalad to second plate, more strongly narrowed caudad. Widths of first, third, eighth, and tenth plates to each other as 50 : 47 : 52 : 53.

Head a little wider than long (47 : 45). Lateral marginal breaks distinct as usual. Caudal portion of head subquadrate, the sides a little converging from eyes caudad to caudal corners. Caudal margin straight. The usual transverse curved mark just in front of caudal marginal thickening, its ends diverging cephalad. Smooth and shining; not punctate.

Ocelli thirteen to twenty-three (apparently mostly from fourteen to eighteen) in four or three series (three series mostly in *pseudomaturus* stage): *e.g.*, 1 + 3, 4, 6, 4; 1 + 5, 4, 4, 1; 1 + 5, 6, 5, 1; 1 + 5, 5, 5, 3; 1 + 3, 4, 4, 3; 1 + 6, 6, 5, 3. Ocelli thus very variable in size and arrangement, but mostly small and irregular, the series often confused. Single ocellus small, commonly not larger than largest of seriate ocelli.

Antennae short, reaching from fifth to seventh body segments; conspicuously attenuated distal, the distal portion being more slender than is usual. Articles twenty-one to thirty-three but mostly, twenty-six to thirty; articles immediately distad of the first several are short

and closely united, but distad in slender portion of antennae the articles become more loosely joined and proportionately somewhat longer. Hairs moderately long.

Prosternum 1.75 times wider than long. Teeth small, distinct, the more mesal ones closer together than the ectal ones: 4 + 4 to 7 + 7 in number. Median sinus moderate, rounded at bottom. Spine smaller than neighboring bristles, slender, pale, in usual ectal position.

Major tergites, excepting the first, with two longitudinal furrows, or also an additional one on each side close to border. Plates otherwise not at all roughened, smooth and shining. Posterior angles of ninth, eleventh, and thirteenth dorsal plates produced.

Coxal pores of moderate size; circular or, occasionally, a little transversely elongate or broadly subelliptic: 3, 4, 4, 3; 4, 5, 5, 4; 4, 6, 6, 4; 6, 7, 7, 5.

Gonopods of male appearing as low rounded eminences commonly covered by the preceding sternite.

Claw of female gonopods but little curved; broad; the three lobes subacute with the median one much the largest; commonly dark distad. Basal spines small, thin; sides from base to short acuminate tip subparallel; edges minutely serrate; dark, often blackish, distad (Plate 1, fig. 6).

Anal and penult legs short; moderately inflated in both sexes, especially distad of the prefemur and excepting the second tarsal article. Distinctly longitudinally sulcate along mesal surface of articles of tarsi and usually also tibia similarly sulcate, the tibiae and tarsi of penult legs similarly sulcate but sulcus on tibia usually more distinct than in anal legs. Glands on articles of last two pairs of legs strongly developed with the pores distinct.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 2, 2}$ or ventral spines also 0, 0, 1, 2, 1; 0, 0, 2, 2, 1 or 0, 0, 2, 2, 2; of the second, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the third to eighth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$ or a dorsal spine sometimes present on coxa of eleventh pair while in one specimen four ventral spines were noted on the fourth article of one of ninth legs; of the twelfth, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$; of the thirteenth and penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$, the thirteenth with three claws and the penult with but one; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, claw one.¹

Length 11.5 to 15 mm. A ♀ 14 mm. long has tenth plate 2 mm. wide; antennae 6.5 mm. long; and anal legs 5.7 mm. long.

¹ Bollman reports specimens from Macon, Ga., as having anal and penult legs armed with 0, 0, 1, 3, 3, 1 ventral spines; but none of many adults which I have examined from Georgia and elsewhere shows this spining, though it is present in immature stages.

Pseudomaturus.—Coloration as noted for adult or a little paler throughout.

Antennae as in *maturus* with articles a little more commonly toward the lower limit.

Ocelli frequently in but three series: *e.g.*, 1 + 3, 4, 6; 1 + 5, 4, 4; 1 + 5, 4, 3; 1 + 5, 6, 4; but also in four as in most mature specimens, as 1 + 6, 6, 4, 2; 1 + 6, 5, 5, 4.

Prosternal teeth mostly 5 + 5.

Coxal pores smaller, circular, the most proximal one often very small: 3, 4, 4, 3; 4, 5, 5, 4; 4, 6, 5, 5; etc.

Claw of female gonopods a little smaller and thinner and especially paler distally than in adult. Spines in form as in *maturus*; pale throughout.

Spines of legs as in *maturus* excepting that the ventral ones of the twelfth legs are frequently 0, 0, 2, 3, 2 instead of 0, 0, 3, 3, 2.

A specimen 10 mm. long has antennae 4.5 mm. long and anal leg 4 mm. long.

Praematurus.—Pale testaceous; head and most caudal segments very light ferruginous or orange with frontal region of head lightest as usual in older stages. Caudal pairs of legs light, yellow or sometimes yellowish white distad. Other legs and the venter pale with most caudal plates and the prosternum of orange tinge.

Articles of antennae twenty-four to twenty-eight.

Ocelli nine to twelve in three or more rarely in but two series: *e.g.*, 1 + 4, 3, 3; 1 + 4, 3, 2.

Prosternal teeth 5 + 5; the most mesal on each side often much reduced.

Coxal pores small, circular; mostly 3, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 2, 2, 1}$ to $\frac{0, 0, 1, 1, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 1, 2, 1}{0, 0, 2, 2, 1}$ to $\frac{0, 0, 2, 2, 1}{0, 0, 2, 2, 1}$; of the third $\frac{0, 0, 2, 2, 1}{0, 0, 2, 2, 1}$ to $\frac{0, 0, 2, 2, 2}{0, 0, 2, 2, 1}$; of the fourth to sixth $\frac{0, 0, 2, 2, 2}{0, 0, 2, 2, 1}$ (or vent. 0, 0, 1, 2, 1); of the seventh, the same as preceding or $\frac{0, 0, 2, 2, 2}{0, 0, 2, 2, 2}$; of the eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 1(2), 2, 1}$ to $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the ninth, $\frac{0, 0, 2, 2, 2}{0, 0, 2(1), 2, 1}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 2(1), 2, 2}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the eleventh, $\frac{0, 0, 2, 1(2), 2(1)}{0, 0, 1, 2, 2}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 1}{0, 0, 2, 3, 2}$ or coxal spine missing; of the thirteenth, $\frac{1, 0, 2, 1, 1}{0, 1, 2, 3, 2}$ to formula for adult; of the penult and anal as in adult.

Length 8.5–10 mm. A specimen 8.75 mm. long has antennae 4 mm. and anal legs 3.5 mm. long.

Immaturus.—Pale yellowish or testaceous; in some a whitish median longitudinal dorsal line; caudal plates light ferruginous or orange. Head light ferruginous or pale orange, lighter in front of suture. Antennae like head proximally, pale yellowish elsewhere.

Venter a little paler than dorsum, the caudal segments and the prosternum light ferruginous. Last pair of legs lighter distad, especially on mesal surface.

Articles of antennae twenty-one to twenty-six.

Ocelli six to fourteen in two or less commonly in three or even in four series: *e.g.*, 1 + 4, 4, a common formula; 1 + 3, 2; 1 + 4, 4, 1; 1 + 2, 5, 6 (or 1 + 2, 5, 5, 1).

Prosternal teeth 5 + 5; small, well spaced, the most mesal one on each side commonly reduced.

Coxal pores 3, 4, 4, 3; small, the most proximal one on each coxa often minute.

Gonopods of female with the three articles distinct. Distal article glabrous; the second with two or three bristles; and the first with four of five. Claw short, pale, distally narrow and acute; entire, there being as yet no trace of the lateral teeth. Basal spines 1 + 1 or on one side there may be a second one indicated as a mere point; small, pale, acute.

Mesal longitudinal sulcus not showing on anal legs; but showing on both tarsal joints of the penult legs and more weakly on the tibia.

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 1, 1, 1}$ or $\frac{0, 0, 0(1), 1, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 1, 2(1), 1}{0, 0, 2, 2, 1}$; of the third and fourth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 2, 2, 1}$; of the fifth to ninth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$; of the tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$ to $\frac{0, 0, 2, 2, 2}{0, 0, 1(2), 2, 2}$; of the eleventh, $\frac{0, 0, 2, 2(1), 2(1)}{0, 0, 1, 2, 2}$; of the twelfth, $\frac{0, 0, 3(2), 1, 1}{0, 0, 2, 2, 1}$; of the thirteenth, $\frac{1, 0, 2, 1, 1}{0, 1, 2, 3, 2}$; of the penult as in the adult; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$.

Length 8 to 9 mm. A specimen 8.5 mm. long has antennae 4 mm. long.

Agenitalis II.—Color similar to that of the *immaturus* but paler. Head and most caudal segments yellow or very dilute orange. Body of violaceous tinge in life.

Articles of antennae twenty-two to twenty-six.

Ocelli five or six in two series: *e.g.*, 1 + 3, 1; 1 + 3, 1. Single ocellus paler and smaller than the others or about equalling the one of bottom series.

Prosternal teeth 4 + 4 or 5 + 5; small, distinct, the most mesal on each side smallest. Spine of usual form and in some position as in older stages.

Coxal pores small: 2, 3, 3, 2 or 3, 3, 3, 2.

Anal and penult legs already inflated relatively about as in adult; sulcus evident on mesal surface of second tarsal article of penult legs, but on no others.

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 0, 1, 1}$; of the second to the seventh, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$;

of the eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$; of the ninth and tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 2}$; of the eleventh, $\frac{0, 0, 2, 1, 2}{0, 0, 1, 2, 2}$; of the twelfth, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 2, 2}$; of the thirteenth, $\frac{1, 0, 2, 1, 1}{0, 1, 2, 2, 2}$; of the penult, $\frac{1, 0, 2, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 2, 1, 0}{0, 1, 3, 2, 1}$.

Length of specimen described 7 mm.; antennae 3.5 mm.

TYPE LOCALITY.—North Carolina: Jackson Co., Balsam!

KNOWN LOCALITIES.—Georgia: Macon (L. M. Underwood), Atlanta! Lula! Tallulah Falls! Bremen! North Carolina: Balsam (G. F. Atkinson); Saluda! Hot Springs! South Carolina: Taylors! Greenville! Seneca!

NEOLITHOBIUS STUXBERG (emend.).

Öfvers. Kong. vet.-akad. Förh., 1875, **32**, no. 3, p. 8, 10, 26. Proc. Cal. acad. sci., 1877, **7**, p. 135. Latzel (in part), Myr. Österreich-Ungar. monarch., 1880, **1**, p. 35. Bollman (in part), Proc. U. S. N. M., 1887, **10**, p. 262, 626. Bull. 46, U. S. N. M., 1893, p. 29, 43, 129, 164.

Eulithobius Verhoeff (in part), Myr. Bronn's Thierreich., 1907, **5**, p. 240.

Antennae moderate or long; articles thirty to fifty.

Ocelli numerous, seriate. Single ocellus clearly differentiated.

Prosternal teeth 5 + 5 to 10 + 10. Spine ectal in position, slender and mostly bristle-like distally. No diastema in dental line on each side.

Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates produced.

Coxal pores uniseriate, mostly transverse, but sometimes circular.

Claw of female gonopods tripartite. Basal spines 2 + 2 or, rarely, 3 + 3.

Gonopods of male uniarticulate or mostly so.

None of the coxae of legs armed ventrally. In all known species some of the posterior coxae are armed both dorsally and laterally.

Third joint of all legs armed with three dorsal spines. Fifth joint of legs from first or second to eleventh or sometimes to thirteenth armed with two dorsal spines. Dorsal spines of anal legs mostly 1, 0, 3, 1, 0, more rarely 1, 0, 3, 2, 0 or even 1, 0, 3, 2, 2 (sometimes in *mordax*); ventral 0, 1, 3, 3, 1 or 0, 1, 3, 3, 2; claw one or two. Dorsal spines of penult legs 1, 0, 3, 1, 1 to 1, 0, 3, 2, 2; ventral 0, 1, 3, 3, 2 or 0, 1, 3, 3, 3; claws one, two, or three. Dorsal spines of twelfth and thirteenth legs 1, 0, 3, 2, 2 or, less often, 1, 0, 3, 1, 1.

Anal legs of male with fourth joint enlarged, at least distally, being in most conspicuously widened, and especially bowed ventrad, or at least with dorsal surface depressed and incurved, rarely with dorsal surface not depressed but elevated at distal end.

Length 17–30 mm.



FIG. 5.—Distribution of *Neolithobius* Stuxberg.

GENOTYPE.—*Lithobius vorax* Meinert.¹

Neolithobius includes a compact and homogeneous group of species having a seemingly unbroken distribution (Figure 5).

¹ Stuxberg specified no type. The three species originally included by that author are *vorax* Meinert, *mordax* L. Koch, and *transmarinus* (L. Koch). The first mentioned is here selected as the type.

Key to Species of Neolithobius.

- a. Anal legs with the claw single.
- b. Penult legs with but one claw.
- c. Tibia of all or of nearly all legs excepting the anal with three ventral spines, dorsal spines of penult legs (usually also of twelfth and thirteenth) 1, 0, 3, 1, 1.
N. transmarinus (L. Koch).
- cc. Tibia of none of legs normally with more than two ventral spines
- d. Dorsal spines of penult legs 1, 0, 3, 2, 2 or 1, 0, 3(2), 2(3), 1
- e. Ventral spines of anal legs 0, 1, 3, 3, 1, the dorsal normally, 1, 0, 2, 0; dorsal spines of penult legs 1, 0, 3, 2, 2.....*N. mordax* (L. Koch).
- ee. Ventral spines of anal legs 0, 1, 3, 3, 2, the dorsal normally 1, 0, 3, 1, 0; dorsal spines of penult legs 1, 0, 3, 2(3), 1.....*N. helius* Chamberlin.
- dd. Dorsal spines of penult legs 1, 0, 3, 1, 1; ventral spines of anal and penult legs 0, 1, 3, 3, 2.
- e. Fourth joint of anal leg of male strongly produced dorsad at distal end (Plate 3, fig. 5).
N. xenopus Bollman.
- ee. Fourth joint of anal leg of male moderately bowed ventrad but not conspicuously produced at distal end above.....*N. suprenans*, sp. nov.
- bb. Penult legs with two or three claws.
- c. Dorsal spines of penult legs normally 1, 0, 3, 2, 2.
- d. All legs from the thirteenth forward at least as far as the sixth pair with three ventral spines at distal end of the tibia.....*N. latzelii* (Meinert).
- dd. Either none of the legs with tibia bearing three ventral spines or at most the tibiae of thirteenth and of one or two preceding pairs thus armed.. *N. tyrannus* Bollman.
- cc. Dorsal spines of penult legs normally 1, 0, 3, 1, 1 or at most 1, 0, 3, 2, 1.
- d. Tibiae of all legs from second or first to thirteenth armed with three ventral spines.....*N. vorax* (Meinert).
- dd. Tibiae of all legs from first to thirteenth with but two ventral spines, none with three.
- e. Dorsal hairs of anal segment of ♂ strongly curled or uncinat.....*N. devorans* (Chamberlin).

- cc.* Dorsal hairs of anal segment of ♂ straight, not at all curled or uncinata. *N. voracior* (Chamberlin).
- aa.* Anal leg with two claws.
Dorsal spines of penult legs 1, 0, 3, 1, 1; tibiae of twelfth and thirteenth and sometimes of one or two preceding pairs of legs with three ventral spines. *N. underwoodi* (Bollman).

NEOLITHOBIUS MORDAX (L. Koch).

Plate 3, fig. 1, 2

- Lithobius mordax* L. Koch, Myr.-gatt. Lithobius, 1862, p. 34. Wood, Trans. Amer. phil. soc., 1865, **13**, p. 149. Meinert, Nat. tidsskr., 1872, **8**, p. 294.
- Lithobius (Neolithobius) mordax* Stuxberg, Öfvers. Kongl. vet.-akad. Förh., 1875, **32**, no. 3, p. 10, 26. Proc. Cal. acad. sci., 1877, **7**, p. 135. Bollman (in part), Proc. U. S. N. M., 1887, **10**, p. 262, 627. Ent. Amer., 1888, **4**, p. 8. Bull. 46, U. S. N. M., 1893, p. 29, 44, 46, 146, 185. Kenyon, Can. ent., 1893, **25**, p. 162. Chamberlin, Can. ent., 1911, **43**, p. 101. Psyche, 1918, **25**, p. 24.
- ?*Lithobius howei* Bollman, Amer. nat., 1887, **21**, p. 81. Proc. U. S. N. M., 1887, **10**, p. 255, 259. Bull. 46, U. S. N. M., 1893, p. 19, 22, 26.
- Lithobius spinipes* Bollman (in part), Bull. 46, U. S. N. M., 1893, p. 146.
- Lithobius mordax louisianae* Brolemann, Ann. Ent. soc. France, 1896, **65**, p. 48 (♂).
- Lithobius transmarinus perarmatus* Brolemann, Ann. Ent. soc. France, 1896, **65**, p. 48 (♀).
- Lithobius transmarinus* Chamberlin (in part), Ann. ent. soc. Amer., 1911, **4**, p. 45.

DESCRIPTION.—Dorsum from light to dark brown and chestnut; nearly uniform, or, in the paler specimens, with the first plate and several moot caudal ones darker than rest of dorsum; plates frequently paler along lateral and caudal margins and in a median longitudinal line, with sometimes one on each side of it. Head a little darker, and more reddish than the dorsum. Antennae chestnut, paler, often yellow, distad. Prosternum and prehensors chestnut. Venter testaceous to dark brown; the posterior plates darker, reddish or chestnut. Legs testaceous or brown, the posterior pairs darker, mostly same shade of chestnut like corresponding plates of venter.

Body moderate, commonly 8 or 8.25 times longer than width of the tenth plate. Nearly parallel-sided, but little narrowed cephalad from the eighth plate to the third, which is narrower than the first. First plate wider than head. Widths of head and of first, third, eighth, and tenth plates to each other as 94 : 96 : 88 : 94 : 95.

Head wider than long in ratio near 11.75 : 10.75; widest immedi-

ately caudad of eyes. Caudal margin mesally a little, widely incurved. Marginal breaks abrupt and distinct. Sides caudad of breaks moderately converging caudad to the rounded corners, nearly straight; between breaks and eyes convex. Surface rather finely but distinctly and uniformly punctate; not rugose or roughened otherwise. The usual semicircular impression a little in front of caudal marginal thickening with one or two pit-like depressions on median line in front of suture and usually a similar impression a little each side of the median line just caudad of the suture.

Ocelli twenty-seven to fifty, mostly in from six to eight series: *e.g.*, 1 + 5, 8, 7, 6, 5, 3; 1 + 6, 6, 6, 5, 3, 2; 1 + 5, 7, 9, 8, 8, 6, 5; 1 + 4, 7, 9, 10, 9, 6, 5. Single ocellus very much larger than any other; subvertically narrowly oval with the narrow end ventrad; often paler than the other ocelli. Seriate ocelli compactly arranged, the series often confused; an ocellus (usually the most caudal one of the fourth row) immediately in contact with single ocellus always considerably larger than any other of the seriate ocelli but smaller than the single one. Organ of Tömösvary often in contact with most anterior ocellus of bottom row and in some line or ventrad of it.

Antennae long, reaching the eighth body segment. Articles mostly thirty-five to thirty-nine.¹ Articles mostly moderately short, decreasing distad. Hairs rather short, dense.

Prosternum 1.8 times wider than long. Distance between chitinous spots 2+ times width at level of bottom of median sinus and up to as much as three times the dental line. Median sinus rather deep, its sides subparallel and its bottom rounded. Line of apices of teeth mesally distinctly reëntrant, each side being slightly convex. Outer teeth on each side more widely separated from each other than the more mesal ones which are often closely crowded: 6 + 6, perhaps most common; 6 + 7; 7 + 7; 7 + 8; 8 + 8; 7 + 9. Spine in usual ectal position; slender and acute, stouter than the bristles.

First dorsal plate smooth and shining like the head. Other plates finely roughened with tubercular elevations, the plates becoming more and more strongly tuberculate toward caudal end of body. Posterior angles of seventh, ninth, eleventh, and thirteenth plates strongly produced. Dorsal hairs of anal segment sparse, straight.

Ventral plates each with a distinct transverse furrow which reaches on each side only part way to the lateral margin and which is a little caudad of the middle of the plate. The usual lateral and median longitudinal furrows distinct.

¹ Reported with as few as thirty-two (Meinert) and even thirty (Bollman); but probably the specimens were immature.

Coxal pores elliptic to strongly transverse, slit-like or keyhole-shaped much as in *L. forficatus*: 6, 6, 6, 5; 7, 8, 7, 7; 7, 8, 8, 7; 8, 8, 8, 8; 11, 11, 11, 9.

Gonopods of male wide; caudal margin more or less convex, bearing mostly five or six bristles.

Claw of female gonopods long, but little curved; tripartite with the median lobe long and acute, but the lateral teeth small, far proximad, and often almost obliterated. Basal spines 2 + 2; subequal, stout, a little widening from base to beginning of acuminate distal portion, the edges of which are commonly minutely serrulate.

In the female the anal and penult legs are moderately long and slender; the femur of each is distinctly longitudinally sulcate along dorsal surface; the prefemur and femur less distinctly so; ectal surface of all articles longitudinally sulcate but most distinctly so on prefemur, femur, and tibia; also mesal surface, especially of more distal articles longitudinally sulcate; tibia and first tarsal joint of anal legs slightly bowed ventrad. In the male the femur of anal legs is thickened with the dorsal surface flattened and depressed or more or less bowed ventrad, longitudinally sulcate, more thickened at distal end; tibia slender and unmodified. In the male the same sulcations are present on the anal legs as in the female but those of the mesal surface are deeper and more distinct. Tibia of anal legs always considerably longer than the femur.

Spines of first and second legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the third to eighth pairs, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of eighth or with ventral spines of seventh and eighth or of eighth alone 0, 0, 3, 3, 2; of ninth, $\frac{1, 0, 3, 2, 2}{0, 0, 2, 3, 2}$ or with ventral spines 0, 0, 3, 3, 2; of the tenth and twelfth, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$ (also noted on one side of one specimen as $\frac{1, 0, 3, 2, 1}{0, 1, 3, 3, 1}$, the leg possibly regenerated); of the anal, $\frac{1, 0, 3, 2, 0}{0, 1, 3, 3, 1}$, the dorsal spining occasionally varying to 1, 0, 3, 2, 2 and 1, 0, 3, 1, 0; claw one. Last three or four pairs of coxae laterally armed.

Length 20–30 mm. A ♀ 29 mm. long has antennae and anal legs each 14 mm. long; and tenth plate 3.5 mm. wide.

Pseudomaturus.—Dorsum testaceous to dark brown, marked with the usual longitudinal pale lines. Head brown to dull chestnut, contrasting more with the dorsal plates than in adults; frontal region paler. Antennae brown or light chestnut proximally, elsewhere light chestnut. Prosternum dull brown. Venter paler than dorsum, darker caudad, the legs like corresponding plates.

Antennae as in *maturus*.

Ocelli noted as 1 + 6, 6, 5, 4, 1; 1 + 6, 6, 6, 5, 4; 1 + 3, 5, 6, 6, 4, 2;

1 + 3, 6, 6, 5, 5, 3, 1; etc. Then in five to seven series, the larger number less common.

Prosternal teeth 5 + 6 to 8 + 8; as in *maturus*.

Coxal pores less strongly transverse than is usual in *maturus*, being more often elliptic to subcircular.

Claw of female gonopods shorter and less deeply colored than in *maturus* with lateral teeth more distinct and the median one relatively shorter. Spines nearly as in *maturus* or somewhat narrower proximad of apical division.

Spines of legs as in *maturus*. One specimen was noted with spines of both penult legs, $\frac{1, 0, 3, 2, 1}{0, 1, 3, 3, 1}$. In one the ventral spines of tenth legs were 0, 0, 2, 3, 2. As many as the last seven pairs of coxae may be dorsally armed. Posterior legs of male as in *maturus* but femur mostly less enlarged.

Length 16–19 mm.

Praematurus.—Testaceous or brown; showing the usual pale lines. Head a little darker; frontal region paler. Antennae brown, yellow distad. Prosternum and prehensors brown, a little darker than venter. Venter testaceous to brown, posterior plates a deeper brown. Posterior legs dilute ferruginous, often dark brown proximally.

Articles of antennae thirty-two to thirty-four; mostly short, in distal portion longer single articles alternating with groups of shorter ones.

Ocelli thirteen to twenty-three in three to five series: *e.g.*, 1 + 5, 4, 3; 1 + 3, 4, 3, 2; 1 + 3, 6, 5, 5, 3. All distinct. Single ocellus largest but the first one of second series, which is contiguous with it, not much smaller.

Prosternal teeth 5 + 5 to 7 + 7. Sides of median sinus considerably converging caudad.

Coxal pores circular to elliptic: 5, 5, 5, 4; 5, 5, 5, 5.

Claw of female gonopods small, pale, narrowly acute with no indications of lateral teeth or one indicated as a small acute point. Spines 2 + 2; slender, conical, sides converging from base to apex; inner spine much shorter and more slender than the outer.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 2, 2}$ or ventral spines 0, 0, 2, 3, 2; of the second and third, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the fourth and fifth the same or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the sixth to eighth as in *maturus*; of the ninth and tenth as in *maturus* or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of eleventh, twelfth, and thirteenth as in *maturus*; of penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$, sometimes with mere traces of accessory claws; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$. Last five to seven pairs of coxae dorsally armed, last three or four pairs laterally. (Jackson, Alabama).

Immaturus.—Dorsum light brown, nearly uniform, the light lines much as in older stages. Head darker, somewhat reddish brown, with frontal region paler. Antennae light brown proximally, the distal two thirds lighter. Prosternum dusky brown. Posterior legs light, yellowish distad.

Articles of antennae thirty-one; beyond the first few short and very short ones are intermingled.

Ocelli twelve to sixteen in three or four series: *e.g.*, 1 + 3, 5, 5; 1 + 4, 5, 4, 2.

Prosternal teeth 5 + 5.

Coxal pores 4, 4, 4, 3; circular or a little elliptic.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 2, 1}$; of the second and third, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 2, 1}$; of the fourth to ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 1}$; of the tenth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the eleventh, $\frac{1, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 2, 1}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 2, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{0, 0, 3, 1, 1}{0, 1, 3, 3, 1}$, claw unarmed or with mere traces of accessory claws; of the anal $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$. Last two pairs of coxae, at least, laterally armed.

Length of specimen described 10 mm.; antennae and anal legs 5 mm. long.

TYPE LOCALITY.—Louisiana: near New Orleans.

KNOWN LOCALITIES.—Louisiana: New Orleans! Mississippi: Biloxi! Holly Springs! Fernwood! Canton! Brookhaven! Alabama: Jackson! Selma! Mobile! Tennessee: Nashville! Arkansas: Little Rock to Ultima Thule (Bollman) Iowa! Kansas! Nebraska! Minnesota: Fort Snelling! Winona!

Lithobius howei Bollman was based upon a single male from Fort Snelling, Minn. The specimen in the U. S. N. Museum labeled type is a male of *N. mordax* Koch, differing so much from the original description that it is very doubtful whether some transfer of specimens may not have been made. It differs in size, being 20 mm. long instead of 15 mm.; in having the posterior angles of the seventh, ninth, eleventh, and thirteenth dorsal plates produced instead of only the ninth, eleventh, and thirteenth; and in having the prosternal teeth twelve (six on each side) instead of six all together (or three on each side). Bollman said that his type was in bad condition, a statement true of the specimen under consideration. The antennae are broken off; but the original description states that twenty articles are present which, of course, could not apply to a specimen of *mordax*. Later Bollman dropped the name *S. politus* (McNeil) and applied the name *L. howei* to the same specimen that had previously borne the former name; but there are some differences between the original description and *S. politus*, so that if the specimen above mentioned be rejected as

the type, it is difficult to apply the name *L. howei* with certainty. Bollman himself, however, in his later writings, without any explanation of the change, applied it to *Sonibius politus* (McNeil).

NEOLITHOBIUS TRANSMARINUS (L. Koch).

Plate 3, fig. 3, 4.

Lithobius transmarinus L. Koch, Myr. gatt. Lithobius, 1862, p. 33, 34.

Lithobius (*Neolithobius*) *transmarinus* Stuxberg, Öfvers. Kongl. vet.-akad. Förh., 1875, **32**, no. 3, p. 26, 32. Bollman (in part), Proc. U. S. N. M., 1887, **10**, p. 626. Ent. Amer., 1888, **4**, p. 8. Bull. 46, U. S. N. M., 1893, p. 43, 80. Chamberlin (in part), Ann. Ent. soc. Amer., 1911, **4**, p. 45. Psyche, 1918, **25**, p. 24. Gunthorp (in part), Kans. univ. Sci. bull., 1913, **17**, p. 166.

Lithobius spinipes Bollman (in part), Bull. 46, U. S. N. M., 1893, p. 146.

DESCRIPTION.—Dorsum from yellowish brown to deep brown; in darker specimens the major scuta often more deeply colored along caudal borders, blackish; a median pale line with one each side of it, as in *mordax*, more or less traceable; nearly uniform, the posterior plates commonly not darker. Head with a more reddish cast; frontal region paler. Antennae brown or dilute chestnut proximally, becoming pale distad. Prosternum light chestnut, the prehensors commonly more reddish. Venter yellow or light brown, sometimes almost slate colored, the last few plates a very little darker. Legs in general like corresponding parts of venter; the tarsi in specimens in full color more or less orange; posterior pairs from yellowish or very dilute orange in paler specimens to deep orange or somewhat ferruginous in the darker ones.

Body in an average male 8.5 times longer than width of tenth plate. First plate widest widths of head and of first, third, eighth, and tenth plates to each other as 78 : 82 : 76 : 79 : 79.

Head a little wider than long (*ad* 78 : 75). Distinctly and uniformly punctate, the puncta fine. Not rugose; shining. A fine and indistinct sulcus parallel with the frontal suture and a little caudad of it. Also a weak sulcus parallel with and a little in front of sulcus, its median portion angularly bent forward and continuous with a median line that bifurcates cephalad. The usual semicircular impression in front of median part of caudal marginal thickening, the free ends extending cephalad subparallel with each other.

Ocelli twenty-five to thirty-six in five to seven series: *e.g.*, 1 + 6, 6, 5, 4, 3; 1 + 5, 6, 5, 5, 4, 4, 2. Single ocellus very large, oval,

contiguous with seriate ones. Ocelli of top series larger than others, the most caudal one of this series or of the second one largest but proportionately smaller than the large one contiguous with the single ocellus in *mordax*.

Antennae reaching seventh segment. Articles thirty to forty; but mostly thirty-five to thirty-eight, thirty-six being a frequent number. Proximal articles long, others decreasing distad and becoming short and very short; in the distal portion a longer article may occur at intervals among the shorter ones.

Prosternum in one specimen only 1.54 times wider than long. Distance between chitinous spots 2.3 times width at level of bottom of sinus; 2.65 times dental line. Teeth stout, black, distally rounded: 5 + 5; 6 + 6; 6 + 7; 7 + 7. Spine slender and bristle-like, scarcely shorter than the bristles.

First dorsal plate with a depression near beginning of caudal third of length on each side, this bending forward nearly parallel with margin; surface finely punctate like head, otherwise smooth. The next two or three major plates with a similar but deeper depression on each side, mesally bending forward and continuing as a furrow each side of middle. Major plates also with the usual short, transverse, sharply impressed submarginal sulcus and most also showing a short curved sulcus at anterior corner. Anterior plates only slightly uneven but the more caudal ones becoming more and more distinctly roughened, with the rugae or low and broad tubercles, but the roughening never very strong. Posterior major plates showing a median longitudinal furrow and one each side of it.

Ventral plates showing the usual lateral sulci and the curving suture at caudal ends. A transverse furrow a little in front of caudal margin.

Coxal pores strongly transverse to elliptic, the most mesal one on each coxa commonly much smaller and subcircular: 6, 7, 7, 5; 5, 8, 7, 5; 8, 9, 8, 7.

Gonopods of male well exposed; sides subparallel; distal edge but little convex; bristles three or four.

Claw of female gonopods long; tripartite; the median division much the longest, acute; lateral lobes small, dentiform, toward middle of claw. Basal spines 2 + 2, long, attenuated from base to acute tip.

Anal legs of male slender and moderately long; femur not enlarged though dorsally somewhat elevated at distal end, its dorsal surface not depressed or bowed ventrad (Plate 3, fig. 3); femur, tibia, and the tarsal articles distinctly longitudinally sulcate along dorsal surface, the prefemur with two longitudinal dorsal sulci; prefemur and femur

sulcate ventrally; the last four articles also very distinctly longitudinally sulcate along the mesal surface. Penult legs similarly furrowed but the dorsal furrow usually weak or absent upon tarsal articles. Posterior legs of the female similar throughout, or a little longer and femur not distally at all elevated.

Spines of first legs, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 3}$; of the second to the seventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the eighth the same or $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the ninth to eleventh, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the twelfth and thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 3}$, or dorsal spines less often 1, 0, 3, 2, 2, while spine of trochanter may be absent from twelfth legs or from one of them; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 3}$, claw single; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, claw single. Last three pairs of coxae laterally armed.

Length on average near 24 mm. A ♂ of this length has antennae 11.8 mm. long; anal leg 10.8 mm. long; and tenth plate 2.8 mm. wide.

TYPE LOCALITY.—Louisiana: New Orleans.

KNOWN LOCALITIES.—Louisiana: New Orleans! Mississippi: Canton! Brookhaven! Arkansas: Little Rock, etc. (*seq.* Bollman). Texas!

The material of this species studied is insufficient for a wholly satisfactory account, and more specimens would doubtless considerably extend the range of variation indicated for a number of the characters and measurements.

NEOLITHOBIUS VORAX (Meinert).

Plate 2, fig. 4-6.

Lithobius vorax Meinert, Nat. tidsskr., 1872, 8, p. 292.

Lithobius (Neolithobius) vorax Stuxberg, Öfvers. Kongl. vet.-akad. Förh., 1875, 32, no. 3, p. 26, 32. Proc. Cal. acad. sci., 1877, 7, p. 135. Bollman, Proc. U. S. N. M., 1887, 10, p. 627. Ent. Amer., 1888, 4, p. 8. Bull. 46, U. S. N. M., 1893, p. 44, 80. Chamberlin (in part), Ann. Ent. soc. Amer., 1911, 4, p. 45.

DESCRIPTION.—Dorsum from brown to deep chestnut, the head and first dorsal plates the same or a little darker and more reddish. Antennae chestnut, slightly paler distad. Prosternum chestnut, the prehensors clearly more reddish. Venter from yellowish brown to dark brown, the posterior plates somewhat darker, more reddish, but these darker plates each with a median pale area, a similar one showing also on the other plates in darker individuals.

Body robust, being from 7 to 7.5 times longer than the width of the tenth plate. Widths of head and of first, third, eighth, and tenth plates to each other as 64 : 65 : 64 : 76 : 78, the head being thus

narrower than the first plate and much narrower than the eighth and tenth.

Head only slightly wider than long. Subquadrate caudad of the eyes, the sides a little converging caudad of the breaks and the posterior corners well rounded. The usual narrow, semicircular impression on caudal part of plate and the small, pit-like median impression cephalad of frontal suture. Surface very finely and sparsely punctate.

Ocelli twenty-eight to fifty in six to ten series but mostly in seven to nine: *e.g.*, 1 + 5, 4, 5, 5, 4, 3, 3; 1 + 3, 5, 5, 5, 6, 4, 4, 2(1); 1 + 5, 4, 5, 5, 5, 4, 3; 1 + 6, 5, 5, 5, 3, 3; 1 + 5, 4, 5, 6, 6, 5, 4, 2; 1 + 5, 5, 6, 6, 5, 2. Single ocellus large, oval. Seriate ocelli closely crowded, black, those of top row clearly largest. The eye-patch is unusually high dorsoventrally and the number of series correspondingly large. Organ of Tömösvary small, well removed ventrocephalad of eye-patch.

Antennae rather long, reaching well upon the eighth body segment; attenuated and becoming very slender distad. Articles mostly from thirty-eight to forty-three in number, rarely as many as forty-eight. Articles beyond the second moderate, decreasing in size toward the distal end.

Prosternum 1.7 times wider than long. Distance between chitinous spots 1.9 times width at level of bottom of median sinus; 2.4 times the dental line. Teeth rather stout, black, acute, the innermost on each side usually much smallest, those toward the middle of the series on each side somewhat largest: 5 + 5; 6 + 6; 6 + 7; 7 + 7. Spine at ectal angle; slender but truly spine-like being much stouter than the adjacent bristles, acutely pointed.

Dorsal plates to the naked eye appearing mostly smooth and shining, especially the first one; under a lens the more caudal plates appear finely roughened or weakly tuberculate; clothed with short hairs which are more dense on caudal ones as usual. Hairs of dorsal surface of anal segment straight, few in number. Major plates with the usual short submarginal transverse sulci near caudal third, these indistinct on anterior plates. Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates strongly produced.

Ventral plates showing the lateral longitudinal sulci as usual. The median sulcus most clearly impressed at anterior end of each plate and caudal of middle, this second portion often pit-like, the sulcus as a whole more extensive on the more caudal plates.

Coxal pores strongly transverse or in some narrowly oval: in number *e.g.*, 6, 7, 7, 6; 6, 7, 8, 6; 8, 9, 9, 7; 9, 10, 10, 8, etc.

Gonopods of male well exposed, sides only slightly converging distad; distal surface gently convex, bearing five or six bristles.

Claw of female gonopods rather wide; tripartite, the divisions all acute, the median longest but relatively considerably shorter and smaller than, *e.g.*, in *mordax*. Basal spines rather long, acuminate from base to tip (Plate 2, fig. 5, 6).

Anal legs of male short; the fourth article (or femur) conspicuously thickened, being abruptly broader than the tibia, proximal portion as a whole bowed ventrad, its dorsal surface deeply longitudinally sulcate; tibia also dorsally longitudinally sulcate and the prefemur less conspicuously so; ectal and mesal surfaces of articles longitudinally sulcate; prefemur, femur, and tibia also ventrally longitudinally sulcate, the tibia least distinctly so. Penult legs sulcate similar to the anal; but the femur not enlarged or but little so and not at all bowed ventrad, its dorsal sulcus relatively deep. In the female the femur of the anal legs is not thickened or bowed; the furrows are less strongly marked than in the male excepting those along the mesal surface.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 3}$; of the second, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 3}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the third to ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the tenth and eleventh, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 3}$ or coxal spine of tenth absent; of the twelfth and thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 3}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$, claws two or a minute anterior accessory detectable in addition; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, claw one. Last three or four pairs of coxae laterally armed.

Length 18–24 mm. A ♂ 21 mm. long has antennae 10.5 mm. long; anal legs 8.25 mm. long; and tenth plate 3 mm. wide.

Pseudomaturus.—Color like that of adult but paler throughout; dorsal plates showing the characteristic longitudinal pale lines. Posterior legs yellowish brown to chestnut, the distal articles mostly light orange, a color also affecting the tarsi of the other legs as well.

Articles of antennae thirty-two to thirty-six.

Ocelli 1 + 5, 6, 4, 4, 4; 1 + 5, 6, 6, 4, 2; 1 + 5, 6, 5, 4, 3, 1; 1 + 6, 6, 5, 5, 4, 3; 1 + 5, 6, 6, 5, 4, 3, etc. Most caudal ocellus, of top row commonly much larger than others excepting the single one.

Prosternal teeth much most commonly 5 + 5; also observed as 4 + 6 and 6 + 6; the most mesal and sometimes the most ectal tooth on each side often reduced.

Coxal pores varying from subcircular to transversely oblong in larger specimens: 6, 6, 6, 5, most commonly; also 7, 7, 7, 6 to 7, 8, 8, 6 and 8, 8, 8, 7.

Claw of female gonopods considerably shorter than in adult; the median lobe relatively shorter and smaller, often not greatly exceeding

the lateral. Spines as in *maturus* but lighter and often appearing less acuminate above base.

Gonopods of male bearing on average fewer bristles than in adult, there being but two in the smallest specimens but the number rising to five in the larger and nearly adult ones.

Anal legs of male as in *maturus* but femur less bowed as a rule.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the second the same or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the third, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the fourth and fifth the same or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 3}$; of other legs as in *maturus*.¹

Length 15–17 mm.

Praematurus.—Somewhat paler throughout than older specimens.

Articles of antennae, thirty-four, mostly very short.

Ocelli 1 + 5, 5, 4, 3, 1; 1 + 5, 4, 5, 3, 2, 1.

Prosternal teeth 5 + 5, uniform, paler than in adult.

Coxal pores small, circular: 6(5), 6, 6, 5.

Claw of female gonopods small, nearly straight, rather pale; distinctly tripartite, the lateral divisions or teeth small and acute, the median one also acute. Basal spines 2 + 2, the inner one shorter and much more slender than the outer one.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 2}$; of the second, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the third and fourth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the fifth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 3}$; of the sixth the same or $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the seventh to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the twelfth to fourteenth as in the *maturus*; of the anal as in *maturus* (or with ventral spines on one side 0, 1, 3, 3, 1). Last three coxae laterally armed.

Length 13.5 mm.; antennae 6 mm.; anal leg 5 mm. (Fernwood, Miss.).

Agentialis II.—Dorsum from pale whitish yellow to pale brown, the posterior plates darkest. Body in life suffused with violaceous. Head a little darker than dorsum, frontal region palest. Antennae yellowish or pale brown, in latter case lighter distad. Legs whitish, the caudal pairs more yellow.

Articles of antennae twenty-five; those beyond the first few short, moniliform; sometimes longer articles occurring at intervals among shorter ones.

Ocelli six or seven to twelve in two or three series: *e.g.*, 1 + 2, 3; 1 + 2, 3, 1; 1 + 4, 4, 3. The first ocellus of second series, as large as or larger than the single one. Ocelli distinct, separated.

Prosternal teeth mostly 4 + 4; also noted as 4 + 5; small, the ectal ones more widely separated than the mesal.

¹In twelfth legs the trochanter of the *right* one lacks a spine, the ventral formula being 0, 0, 3, 3, 3.

Coxal pores small, circular: 2, 2, 2, 2 or 3, 2, 2, 2.

Gonopods of female appearing as slender cylindric processes which are glabrous and undivided or with first subdivision but weakly indicated.

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 1, 1, 1}$; of the second the same or $\frac{0, 0, 1, 1, 1}{0, 0, 1, 1, 1}$; of the third the same or $\frac{0, 0, 1, 2, 1}{0, 0, 1, 1, 1}$; of the fourth and fifth, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 1, 1}$ or $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$; of the sixth, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 1, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the seventh to tenth, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 1, 1}$; of the eleventh, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 2, 1}$ or dorsal spines 0, 0, 2, 1, 0; of the twelfth, $\frac{0, 0, 2, 1, 0}{0, 0, 1, 2, 1}$ to $\frac{0, 0, 2, 1, 1}{0, 1, 1, 2, 1}$; of the thirteenth, $\frac{0, 0, 2, 1, 0}{0, 0, 1, 1, 1}$ to $\frac{0, 0, 2, 1, 0}{0, 1, 1, 1, 1}$; of the penult, $\frac{0, 0, 2, 1, 0}{0, 1, 2, 1, 0}$ or $\frac{0, 0, 2, 1, 0}{0, 1, 3, 3, 0}$ or $\frac{0, 0, 2, 1, 0}{0, 1, 3, 2, 1}$; of the anal, $\frac{0, 0, 2, 0, 0}{0, 1, 3, 2, 0}$ and $\frac{0, 0, 2, 1, 0}{0, 1, 3, 2, 0}$. No lateral coxal spines detected on any legs and a dorsal spine on only anal coxae of some specimens.

Length 7-7.5 mm. A specimen 7 mm. long has antennae 3 mm. long, the anal leg being about the same. (Jackson, Ala.)

TYPE LOCALITY — Mississippi: Biloxi.

KNOWN LOCALITIES — Mississippi: Biloxi! Ocean Springs! Fernwood! Longbeach! Grenada! Jackson! Byram! Brookhaven! Alabama: Jackson! Florida: Pensacola! (Types of *clarus* McNeill, which is *pseudomaturus* of present species). Tennessee: Nashville!

NEOLITHOBIUS LATZELII (Meinert).

Lithobius latzelii Meinert, Proc. Amer. philos. soc. 1886, **21**, p. 175. Bollman, Proc. U. S. N. M., 1887, **10**, p. 626; 1888, **11**, p. 350.

Lithobius vorax Chamberlin (in part), Ann. Ent. soc. Amer., 1911, **4**, p. 45.

DESCRIPTION.—Dorsum dark brown, the posterior plates a little deeper in color; the dorsal plates, especially the more caudal ones, may show a median longitudinal black line with a less deep one each side of and parallel with it. Head dark chestnut. Antennae more brownish than the head, somewhat paler distad. Prosternum dark brown, the prehensors more reddish. Venter light brown or testaceous, the posterior plates darker but usually not reddish. Legs colored like the corresponding plates of venter, the posterior pairs being thus darker.

Body rather robust, being near 7.5 times longer than width of the tenth plate. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 98 : 95 : 80 : 84 : 84 : 80 (♂); 69 : 65 : 63 : 73 : 73 : 68 (♀).

Head unusually broad, being in ♂ commonly clearly broader than any dorsal plate, but not in ♀, and its width 1.25 (♂) or 1.2 (♀)

times greater than its length. Caudal margin rather strongly incurved mesally. Anterior margin incurved between bases of antennae. The usual short, transverse, semicircular impression a little in front of caudal margin and the short median sulcus in front of the suture. Head polished; very sparsely finely punctate.

Ocelli thirty-five to forty-eight in seven to nine longitudinal series: *e.g.*, 1 + 5, 5, 6, 6, 5, 5, 3; 1 + 6, 6, 6, 6, 5, 5, 3. Single ocellus large, ovate. Ocelli of top row larger and paler than others.

Antennae mostly moderate in length, reaching upon seventh segment or more rarely to near end of eighth; less strongly attenuated distad than in *vorax*. Articles thirty-one to thirty-four; the proximal ones long, the others decreasing in size to the ultimate, mostly short, longer ones sometimes occurring at intervals. Hairs rather short, dense.

Prosternum twice as wide as long or nearly so (σ^7) to 1.8 times wider (σ^8). Distance between chitinous spots 1.9 times as wide as width at level of bottom of sinus; 2.33 times dental line. Teeth, from 6 + 6 to 10 + 10, often differing in number on the two sides; narrowly rounded distally; irregular in size and spacing.

Dorsal plates weakly roughened, especially the more caudal ones, the rugae rather coarse but not high. The usual short, transverse submarginal sulci near caudal third of length on major plates. Posterior angles of seventh, ninth, eleventh, and thirteenth plates produced. Dorsal hairs of anal segment few, straight.

Ventral plates subdensely though rather irregularly finely punctate. Lateral sulci distinct as usual. Median sulcus also evident, this commonly deepest near middle.

Coxal pores large, transversely elliptic with proximal ones circular or else all circular: 4, 7, 7, 5; 5, 5, 6, 5; 5, 6, 7, 5; 6, 6, 6, 5; 5, 7, 6, 4; 5, 6, 7, 5; and 5, 6, 6, 5 which seems to be the most frequent arrangement.

Claw of female gonopods short and broad; tripartite, the lateral divisions rather large, the median longer and mostly more acute. Basal spines 2 + 2 or rarely 3 + 3, decreasing in size from most ectal to most mesal on each side; stout, acuminate from base to tip.

Anal legs of the male short; fourth article a little enlarged, dorsal surface conspicuously incurved and longitudinally sulcate; fifth joint or tibia somewhat bowed ventrad, dorsally longitudinally sulcate; the dorsal sulcus of femur and first tarsal article more indistinct; third and fourth articles ventrally longitudinally sulcate and all articles sulcate along mesal surface. Penult legs similarly sulcate

but the fourth article not enlarged or having dorsal surface incurved nor in the tibia at all bowed ventrad.

Spines of first legs, $\frac{0, 0, 3, 2(1), 1}{0, 0, 2, 3, 2}$; of the second, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$ or dorsal 0, 0, 3, 2, 2; of the third to fifth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$ or ventral of fifth sometimes 0, 0, 2, 3, 3; of the sixth to ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 3}$ or ventral of sixth to eighth rarely 0, 0, 2, 3, 2; of the tenth and eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the twelfth, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 3}$ or ventral 0, 1, 3, 3, 3; of the thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 3}$; of the penult, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$, two accessory claws present; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, or rarely with the dorsal spines 1, 0, 3, 2, 0 or 1, 0, 3, 2, 1; claw single. Last three pairs of coxae laterally armed.

Length 19–25 mm. A ♂ 24.5 mm. long has anal legs 9.5 mm. long; antennae 13 mm. long; and tenth plate 3.2 mm. wide (head 3.75 mm. wide). A ♀ 20 mm. long has tenth plate 2.67 mm. wide.

Pseudomaturus.— Similar in color to *maturus* but on average paler throughout, the dorsum being light brown or testaceous and the head chestnut. Venter yellowish brown, the caudal ones darker. Legs corresponding in color to adjacent plates of venter.

Antennae as in *maturus*; articles thirty-one or thirty-two.

Ocelli fifteen to thirty-two in five to seven series: *e.g.*, 1 + 3, 4, 5, 3, 2, 1; 1 + 3, 4, 4, 2, 1; 1 + 3, 5, 6, 4, 4, 3, 2; 1 + 2, 3, 5, 6, 6, 4, 4.

Prosternal teeth 5 + 5 or 6 + 6. Spine short and fine as in *maturus*.

Coxal pores circular, of moderate size to small: 5, 5, 5, 4; 5, 5, 5, 5.

Gonopods of female as in adult but claw somewhat smaller and paler and the lateral lobes more acute. Bristles somewhat fewer.

Spines of legs as in adult.

Length 16–19 mm. A ♀ 19 mm. long has antennae 10 mm. long; anal legs 7 mm. long; and tenth plate 2.5 mm. wide. Widths of head and of the series of plates 1, 3, 8, 10 and 12 to each other as 62 : 60 : 56 : 65 : 67 : 60.

TYPE LOCALITY.— Virginia: Crandall.

KNOWN LOCALITIES.— Virginia: Crandall! Luray and Marksville (L. M. Underwood). North Carolina: Brown's Summit! Chapel Hill!

NEOLITHOBIUS TYRANNUS Bollman.

*Lithobius (Neolithobius) tyrannicus*¹ Bollman, Proc. U. S. N. M., 1887, **10**, p. 626.

Lithobius (Neolithobius) tyrannus Bollman, Bull. 46, U. S. N. M., 1893, p. 43.

Lithobius mordax Bollman (in part), Proc. U. S. N. M., 1887, **10**, p. 262.

Chamberlin (in part), Ann. Ent. soc. Amer., 1911, **4**, p. 45.

¹ A misprint for *tyrannus*.

DESCRIPTION.— Dorsum dark brown, sometimes approaching chestnut. Head similar or a little more reddish or chestnut, the frontal region paler. Antennae pale chestnut, lighter distad. Prosternum dark brown, prehensors more reddish. Venter brown, the posterior plates somewhat darker; most plates with a pale median area. Legs fulvous.

Body robust, typically only about 6.5 times longer than width of the tenth plate. Tenth plate widest; first and third plates equal or nearly so (♀). Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 84 : 87 : 87 : 90 : 92 : 87 (♀).

Head wider than long in ratio 12 : 11. Widest immediately caudad of eyes, from where the sides manifestly converge to the rounded caudal corners. Caudal margin straight. Lateral marginal breaks distinct. Surface punctate, the puncta moderate, deeply impressed. The caudal semicircular impression in caudal region distinct. A rather obscure furrow parallel with and a little caudad of the frontal suture and a shorter furrow parallel with the median portion just in front of the suture, then angularly bent forward at middle and there continuous with the median sulcus.

Ocelli thirty to forty-seven in six to nine, but mostly in seven or eight series: *e.g.*, 1 + 5, 5, 6, 6, 4, 4; 1 + 4, 5, 5, 7, 6, 5, 4, 3. The eye-area thus relatively high dorsoventrally as in *vorax*. Single ocellus large, vertically oval. The ocelli of top series decidedly largest, especially the more caudal ones, than those of the other series and usually paler.

Antennae moderate, reaching upon the seventh body segment; attenuated distad but the terminal portion relatively less slender than *e.g.*, in *vorax* but nearly same as in *latzelii*. Articles from thirty-one to thirty-six but apparently most often thirty-two as in *latzelii*; moderate to short.

Prosternum 1.6 times wider than long. Distance between chitinous spots two times width at level of bottom of sinus; 2.5 times the dental line. Dental line convex on each side. Teeth rather larger, subuni-form, subacute: 6 + 6 to 8 + 8. Spine very slender and bristle-like, inserted immediately ectad of most ectal tooth.

Dorsal plates punctate. All roughened but the posterior ones more strongly so. Excepting the first, all major plates show clearly the transverse submarginal sulcus on each side.

Ventral plates rather subdensely punctate the puncta deeply impressed; same finely roughened. The usual longitudinal sulci plainly indicated. Commonly more or less depressed or furrowed transversely near or caudad of middle of plate.

Coxal pores transverse, narrowly elliptic or slit-like: 6, 7, 7, 5; 7, 8, 8, 7; 8, 8, 8, 6; 8, 9, 8, 7; 10, 10, 8, 7; 10, 10, 7, 6.

Claw of female gonopods long and stout, moderately curved; tripartite, but the median lobe much longest, acute, and the lateral ones very small and sometimes almost obliterated, giving the claw the appearance of entirety; the inner tooth usually smaller than outer. Basal spines long and stout; equal or nearly so; acuminate uniformly from base or somewhat more strongly acuminate over distal third.

Posterior legs of female short and rather stout. Anal legs with tarsal joints longitudinally sulcate along mesal surface, the other only obscurely so; third, fourth, and fifth joints sulcate ventrally; the fourth and, less distinctly, the fifth joints dorsally longitudinally sulcate. Penult legs similarly sulcate. In the male the posterior legs are as in the female excepting that the fourth joint of the anal legs is conspicuously enlarged and its dorsal surface, or to some extent the whole article, is bowed ventrad and longitudinally more deeply sulcate as in *latzelii*.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the second to tenth, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$ or ventral spines 0, 0, 3, 3, 3; of the twelfth, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 3}$ or the ventral spines 0, 0, 3, 3, 2; of the thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 3}$ or the ventral spines may be 0, 1, 3, 3, 2; of the penult, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$. Last 3 pairs of coxae laterally armed.

Length 18–26 mm. A ♀ 22.5 mm. long has antennae 12.5–13 mm. long; anal leg 10 mm. long; and tenth plate 3.5 mm. wide.

TYPE LOCALITY.—Indiana: Bloomington!

KNOWN LOCALITIES.—Indiana: Bloomington! Greencastle; Salem! Lafayette; New Providence (Bollman collection).

This species is very close to *latzelii* Meinert. It differs in the spining of legs as well as in the proportions of head, prosternum, and body as a whole and in the form of the claw of the female gonopods. Description based on the type material.

NEOLITHOBIUS DEVORANS Chamberlin.

Lithobius devorans Chamberlin, Ann. Ent. soc. Amer., 1912, 5, p. 147.

DESCRIPTION.—Dorsum from brown to chestnut and, in largest specimens in full color, almost mahogany. In lighter specimens the head is chestnut and clearly darker than the dorsal plates excepting the first one in some, in which the latter plate may approach the same color; in the more deeply colored specimen the head is deep chestnut

or mahogany of scarcely deeper shade than that of dorsal plates. Antennae chestnut, usually paler at the very tips only. Prosternum chestnut, the prehensors more rufous. Venter fulvous to brown, the caudal plates always darker and either reddish or very deep brown. Legs colored like corresponding plates of venter, the caudal pairs being thus always darker.

Body appearing to vary considerably in relative width, the length being mostly as much as eight times longer than width of tenth plate, but in some falling a little below this (7.75) and in others as much as 8.4 times longer. Moderately attenuated cephalad from eighth plate, with the first plate a very little wider than the third and usually a little narrower than the head, occasionally as wide as latter; the average ratio of widths of head, first and tenth plates is 30 : 29 : 35. In one male the widths of head and first, third, eighth, tenth, and twelfth dorsal plates stand to each other as 72 : 72 : 70 : 78 : 78 : 72.

Head slightly wider than long (36 : 35). Caudal margin straight or nearly so; posterior corners conspicuously and widely rounded, the sides immediately in front of them but little excurved, diverging forward to the lateral interruptions which are distinct. The short curved transverse submarginal sulcus opposite interruption of each side evident. The usual semicircular impression on caudal portion clearly marked. There is also present a transverse sulcus immediately caudal of and subparallel with frontal suture, the sulcus being most distinct at the sides. Surface sparsely punctate and moderately uneven.

Eyes composed of from twenty-eight to forty-two, but mostly from thirty to thirty-six, ocelli which are arranged in from five to eight series; *e.g.*, 1 + 3, 4, 6, 6, 6, 5; 1 + 3, 4, 6, 6, 6, 6, 3; 1 + 6, 5, 6, 5, 4, 4, 4; 1 + 6, 5, 6, 5, 5. Single ocellus moderately large, oval. All seriate ocelli deeply pigmented excepting those of first row which are commonly paler as in related species. Of seriate ocelli the caudal ones of first row are clearly the largest.

Antennae reaching the beginning of the eighth segment; attenuated, very slender distally. Composed of mostly from thirty-two to thirty-five articles which, distad of the first few, are rather short, considerably shorter ones occurring at intervals among longer ones as in related species.

Prosternum about 1.7 times wider than long. Distance between chitinous spots 1.8 times the width at level of bottom of mesal incision, and 2.5 to 2.7 times as great as length of dental line, the variation depending on number of teeth. Teeth 5 + 5 or 6 + 6, or occasionally 5 + 6; distally narrowly rounded. The prosternal spine situated

immediately ectad of outer tooth as usual, slender and bristle-like, and curved as in *voracior*.

Posterior dorsal plates conspicuously roughened; the anterior ones less strongly so and the first uneven only in about same degree as head. The short transverse sulci most distinctly impressed on the more caudal plates, mostly weak on the anterior ones. Caudal plates with short hairs more numerous than on the anterior. Posterior angles of the seventh, ninth, eleventh, and thirteenth dorsal plates strongly produced; processes of ninth, eleventh, and thirteenth long and acute, those of the seventh obtusely rounded, the inner or mesal edges being convex and long with its ectal or distal portion nearly transverse.

The three longitudinal sulci of ventral plates distinct, being on most broadly and deeply impressed to a little in front of caudal margin. Last plate more densely clothed with short hairs. Sternite of genital segment also densely clothed with hairs especially in the male.

Anal segment in the male densely clothed above with rather long hairs, most of which are curved or uncinatate at tips, this being a very characteristic feature of the species. In the female the dorsal hairs of this segment are sparse and straight.

In larger specimens the coxal pores are very large and strongly transverse, while in the smaller adults the form may approach that of the *pseudomaturus* stage, being transversely elliptic and with those at ends of rows often subcircular. In number and arrangement from 6, 6, 6, 5 to 8, 8, 8, 7, other arrangements noted being 6, 7, 7, 6 to 7, 7, 7, 5, and 7, 8, 8, 6.

The single article composing the gonopod of male well exposed, directed caudoectad; sides nearly parallel; distally subtruncate; bearing mostly about four bristles.

In the gonopods of the female the claw is comparatively short; strongly bent; tripartite, the three lobes distinct, the median being considerably larger much as in *vorax* but not so greatly exceeding the lateral as in *mordax*, etc. Basal spines stout and moderately long; mostly uniformly attenuated from base to apex. Mesal side of first article straight, diverging cephalad from mesal side of fellow but little.

The anal legs in the male are short. Fourth article considerably thickened, more so than in *voracior*; dorsal or dorsomesal surface conspicuously bowed ventrad or depressed over middle and posterior portion, or the depression often almost strictly mesal, longitudinally furrowed along depressed surface; also longitudinally furrowed along dorsal surface toward ectal edge of latter. Third and fourth articles rather deeply sulcate longitudinally on ventral surface. Tibia longi-

tudinally furrowed dorsally. Tarsal joints not clearly sulcate mesally. Penult legs very similar to anal but the fourth article but slightly enlarged and not at all excavated mesodorsally or caudodorsally, though the dorsal longitudinal furrow is conspicuous.

Length from 18 to 26 mm. A male 25 mm. long has antennae about 12.5 mm. long, anal legs 8.5-9 mm. long and the tenth dorsal plate 2.9 mm. wide.

Last three pairs of coxae laterally armed. Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the second, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the third, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$, or $\frac{0, 0, 3, 2, 2}{0, 0, 3, 2, 2}$; of the fourth and fifth, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$, or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the sixth to the eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$, the thirteenth being the same; of the penult, $\frac{1, 0, 3, 1, 1(0)}{0, 1, 3, 3, 2}$, or $\frac{1, 0, 3, 2, 1}{0, 1, 3, 3, 2}$, the anterior or ectal dorsal spine of the fourth joint in the latter case being mostly very small, claws two or three, in latter case the anterior accessory being very small; of anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, the claw single.

Pseudomaturus.—Testaceous with the first plate and the last few darker or not; major plates showing three longitudinal light lines of which the median is more obscure. Head light chestnut-brown. Antennae brown or light chestnut proximally, light brown to yellowish elsewhere. Prosternum dilute chestnut, the prehensors paler. Venter brown to pale brown, posterior plates darker, light chestnut to deep brown, not reddish. Legs fulvous, the posterior pairs usually not darker than the others.

Antennae as in *maturus*; articles thirty-two or thirty-three short and very short ones intermingled.

Ocelli twenty to twenty-eight in five to seven series.

Prosternal teeth, in all specimens examined, 5 + 5.

Coxal pores in most 5, 5, 5, 4 but also 6, 6, 6, 5; small, circular or in part somewhat elliptic.

Gonopods of male small; bristles one or two.

Claw of female gonopods smaller than in *maturus* with divisions more slender and acute. Spines as in *maturus*.

Spines of first legs, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 1, 1}$, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 2, 2}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 2}$; of the second, $\frac{0, 0, 2(3), 2, 1}{0, 0, 2, 2, 1}$ to $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the third to fifth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the sixth to eighth, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$ or ventral spines 0, 0, 2, 3, 2 or even 0, 0, 2, 2, 2; of the remaining pairs uniformly as in the *maturus*.

Length 14-18 mm. A female 15 mm. long has antennae 8.5 mm. long; and anal legs 6 mm. long. Widths of head and of first, third, eighth, tenth and twelfth plates to each other as 53 : 48 : 47.5 : 57 : 57 : 52.

Immaturus (early).—General color pale yellowish white, the head

scarcely darker than rest of dorsum and venter also nearly same as dorsum. Legs light, uniform. Antennae slightly darker than the legs, palest distally.

Head wider than long, in ratio 32 : 30.

Articles of antennae thirty-one; short and very short, the shortest ones often occurring in pairs among the somewhat longer ones in distal portion.

Ocelli pale; 1 + 2, 5, 4, 2; 1 + 2, 5, 3, 1.

Prosternal teeth 4 + 4, uniform in size and spacing. (In a measured specimen 1.66 times wider than long. Distance between chitinous spots 1.9 times width at sinus and 2.77 + times the dental line).

Coxal pores small, circular; 3, 3, 3, 2.

Gonopods of female as yet consisting of but two articles but of these the distal one shows slight indications of subdivision and at its apex the claw appears as a pale, acute point. A single basal spine on each side, this being very small and appearing as a mere acute point. First article bearing one or two bristles, the distal one glabrous.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 1, 1, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 1, 1}$; of the third and fourth, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 1, 1}$, the posterior dorsal spine of the tibia being very small; of the sixth the same or with ventral spines 0, 0, 1, 2, 2; of the seventh and eighth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 1}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$; of the twelfth, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$, as in adult; and of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$. Last pair of coxae laterally armed.

Length of specimen described 9.5 mm.; length of anal legs 4.25 mm.; of antennae 5.5 mm. (Widths of head and of first, eighth, tenth, and twelfth plates to each other as 32 : 29 : 33 : 33 : 29).

LOCALITY.—Alabama: Jackson!

This species is very close to *voracior*. Usually both sexes of fully grown specimens of these species are to be distinguished quite readily by the form of the coxal pores, these in *voracior* being circular or broadly elliptic whereas in *devorans* they are larger and mostly strongly transverse. In some cases, however, it is difficult to separate the females; but the males are always distinguishable.

NEOLITHOBIUS VORACIOR (Chamberlin).

Lithobius voracior Chamberlin, Ann. Ent. soc. am., 1912, 5, p. 150.

DESCRIPTION.—Dorsum brown, the first plate and the several most caudal ones commonly darker and more reddish or chestnut; plates often showing three longitudinal pale lines. Head conspicu-

ously darker than the dorsum, cherry-red or chestnut, or in others often very dark, nearly mahogany. Antennae chestnut, much lighter distad. Prosternum dark brown or dilute brownish chestnut, with the prehensors paler. Venter yellowish brown, the posterior plates much darker, burnt brown. Legs yellowish brown, the posterior pairs darker, being often somewhat chestnut with distal articles a little paler.

Body more robust than in *devorans*, the length being mostly less than seven times as great as width of tenth dorsal plate (6.8). Considerably attenuated cephalad from eighth plate, with the third plate narrower than the first and the latter clearly narrower than the head. Average ratio between widths of head and first and tenth dorsal plates 68 : 65 : 74.3. Widths of head and of first, third, eighth, tenth, and twelfth plates in a ♂ to each other as 68 : 65 : 63 : 75 : 75 : 68.

Head wider than long. Widest immediately back of eyes. Sides rather strongly convex and converging caudad of the well-marked marginal breaks to the rounded posterior corners. Caudal margin nearly straight or but slightly incurved mesally. The usual subcircular impression on caudal portion. Surface subsparingly punctate, the puncta varying in size but mostly fine; obscurely uneven.

Eyes composed mostly of from thirty to thirty-five ocelli, rarely as few as twenty-three, arranged in from five to seven longitudinal series; e.g., 1 + 3, 5, 5, 5, 4; 1 + 3, 4, 5, 6, 5, 4, 2; 1 + 5, 5, 6, 6, 4, 3; 1 + 3, 5, 6, 6, 6, 4, 3; 1 + 4, 6, 7, 6, 5, 4, 1. Single ocellus large subvertically oval. Ocelli of most dorsal row larger and paler as in related species.

Antennae of moderate length, reaching mostly to the end of the seventh or beginning of eighth segment. Attenuated considerably but the distal portion not very fine. Articles beyond the first several rather short. Hairs moderately long. Articles thirty-two to thirty-six in number.

Prosternum 1.6 times wider than long. Distance between chitinous spots 1.9 times wider than long of prosternum at level of bottom of mesal incision; 2.3 or 2.4 times as great as length of dental line usually, this varying with number of teeth present. Prosternal teeth 6 + 6 to 8 + 8, other numbers noted being 6 + 7, 7 + 7, and 7 + 8; either uniform or varying irregularly in size; subacute, being but narrowly rounded at tips. Spine proximally clearly stouter than the hairs, but distally bristle-like, curved; situated immediately ectad of outer tooth.

First dorsal plate with surface similar to that of head. All finely

punctate. Plates roughened, more especially the caudal ones as usual, the elevations or irregular tubercles small. Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates strongly produced, processes of the seventh much as in *devorans*.

Ventral plates densely punctate and with numerous fine impressed lines which mostly run out from the puncta. The usual longitudinal furrows clearly developed. Hairs of posterior plates more numerous and longer.

Anal segment in male dorsally densely clothed with rather long and strictly straight hairs, these not being at all distally curved or uncinata. In the female the dorsal hairs of this segment are but sparse.

Coxal pores transversely elliptic or in part subcircular; of medium size; in largest specimens more strongly transverse as in the preceding species. In number from 6, 6, 6, 4 to 8, 8, 8, 6, other arrangements frequently noted being 6, 7, 7, 5; 6, 7, 6, 5; 6, 6, 6, 5; 7, 7, 7, 6, and 7, 8, 8, 7.

Gonopods of male rather small; distally strongly rounded or broadly subconic; bearing six or seven long bristles.

Gonopods of female with claw long and rather strongly bent or curved near middle; tripartite, the median division long and acute, the lateral small and also usually acute, the inner or more dorsal one considerably more distal in position than the outer one which is near the middle of length of claw. Basal spines long and stout, subequal, attenuated uniformly from base distad. Basal article with inner side nearly straight.

Anal legs in female short and rather slender; the third, fourth, and fifth articles longitudinally sulcate dorsally, the fourth being most deeply so; the third and fourth articles sulcate ventrally. Penult legs similarly but less strongly sulcate. In the male the penult legs are as in the female; but the anal legs are more strongly modified. Fourth article with dorsal surface depressed or bowed ventrad over middle and proximal portion; relatively thicker than in female; articles longitudinally sulcate along mesal surface, especially so in the more distal ones.

Last three pairs of coxae laterally armed. Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of second, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of third, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of fourth to eighth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of twelfth, $\frac{1(0), 0, 3, 2, 2}{0, 1, 3, 3, 2}$ or $\frac{1(0), 3, 2, 2}{0, 0, 3, 3, 2}$, a spine sometimes borne by trochanter of one leg while absent from the other; of thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$ or $\frac{1, 0, 3, 2, 1}{0, 1, 3, 3, 2}$, the anterior spines of fourth joint in latter case being mostly very small, tarsi ending in three claws but the anterior accessory one

mostly minute as in related species; of anal $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$, or, less often, ventral spines 0, 1, 3, 3, 2, the claw single.

Length from 17 to 24 mm. A ♀ 19 mm. long has antennae 10.5–11 mm. long; anal legs 8.5 mm. long; and tenth tergite 2.8 mm. long. Males have similar relative proportions.

Immaturus (very late).—Dorsum yellow to brown with the caudal plates, and mostly also the first one, darker and in the darker specimens more or less reddish; major plates in most specimens showing the usual paler lines. Head brown to dull chestnut, the frontal region a little paler. Antennae brown, yellowish or sometimes rufous distad. Prosternum testaceous to dark brown, the prehensors paler ectally. Venter yellow to light brown, the caudal plates darker, brown to dull chestnut. Legs in general like venter; the posterior pairs yellowish or dilute orange, or, in darker specimens, dark brown proximally with the tarsi and tibiae, in part, remaining light.

Articles of antennae thirty-one; a tendency for two shorter articles to alternate with single longer ones in distal portion.

Ocelli, *e.g.*, 1 + 5, 5, 4, 3. Single ocellus paler and much larger than the others. Seriate ocelli decreasing in size cephalad as usual; the most caudal one of second series largest but much smaller than single ocellus.

Prosternal teeth 4 + 4 or less often 5 + 5.

Coxal pores small, circular, pale edged: 3, 4, 4, 3; 4, 4, 4, 3; 4, 4, 4, 4.

Gonopods of male distinct, pale, glabrous.

Claw of female gonopods small, narrow and acute with one or both lateral teeth indicated as small acute points at base. Basal spines 1 + 1, slender and acute. Hairs of articles few.

Spines of first legs, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 3, 2}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 2}$; of the third to ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the tenth and eleventh as in adult; of the twelfth, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the other pairs as in adult, but those of anal being, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$; last three pairs of coxae laterally armed.

Length 10.5–13 mm. A ♂ 12.5 mm. long has antennae 6 mm. long and anal legs 5 mm. long.

Agenitalis II.—Yellowish brown; the head a little darker, palest over the frontal region. Antennae pale brown, lighter distally. Venter yellowish, with the legs similar. Prosternum and prehensors a little darker than venter. Body in life suffused with violaceous.

Head slightly longer than wide (51 : 50).

Articles of antennae twenty-six; in distal portion the shortest articles often occur in twos at intervals among the others. Hairs long, subdense.

Ocelli in three series: 1 + 4, 3, 1; 1 + 4, 4, 2. Single ocellus large, vertically elliptic.

Prosternal teeth 4 + 4, the innermost on each side smallest, the other three subequal, subacute. (Width of prosternum 1.6 times wider than long. Distance between chitinous spots two times width at sinus and 3.2 times the dental line).

Angulation of dorsal plates as in *maturus* but processes of seventh not conspicuous.

Coxal pores very small, the most proximal one minute, circular: 2, 2, 2, 2.

Spines of first legs, $\frac{0, 0, 0, 0(1), 1}{0, 0, 1, 1, 1}$; of the second, $\frac{0, 0, 0, 2, 1}{0, 0, 1, 1, 1}$; of the third, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 1, 1}$; of the fourth and fifth, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 1, 1}$ or dorsal spines of fourth 0, 0, 1, 2, 1, posterior dorsal spines of fourth and fifth articles very small; of sixth to eleventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 2}$, the anterior dorsal spines of fourth and fifth joints of the eleventh pair being very small; of the twelfth, $\frac{0, 0, 3, 1, 1}{0, 0, 1, 1, 1}$; of the thirteenth, $\frac{0, 0, 3, 1, 1}{0, 1, 1, 1, 1}$; of the penult, $\frac{0, 0, 2, 1, 0(1)}{0, 1, 2, 2, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$. No lateral spines detected on any coxae.

Length 6.5 mm. Widths of head and of first, eighth, tenth, and twelfth dorsal plates to each other as 50 : 44 : 44 : 51 : 49 : 43, the proportions being thus considerably different from those of *maturus*.

Pullus IV (Larva IV).—Light yellow or somewhat yellowish white throughout, but the head a little darker than the dorsum.

Head slightly wider than long.

Articles of antennae twenty-one, the ultimate long, the other short and very short, moniliform.

Ocelli in two series: 1 + 3, 1; 1 + 3, 2. Ocelli well separated, all pale. Single ocellus largest, vertically elliptic, but the caudal ocellus of upper row not much smaller.

Prosternal teeth 4 + 4, small. Ectal spine bristle-like and curved as in older stages. (Prosternum 1.6 times wider than long. Distance between chitinous spots 1.9+ times greater than width at sinus; only 2.46 times the dental line).

Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates weakly extended, obtuse.

One small pore on each twelfth coxa.

Last three pairs of legs appearing as closely oppressed cylindrical buds in which segmentation is beginning to be indicated.

Spines of first legs, $\frac{0, 0, 0, 0, 0}{0, 0, 0, 1, 1}$; of the second to fourth, $\frac{0, 0, 0, 0, 0}{0, 0, 1(0), 1, 1}$; of the fifth to twelfth, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$. The ventral spine of third article very small or minute.

Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 42 : 32 : 32 : 33 : 24.

TYPE LOCALITY.— Mississippi: Fernwood!

KNOWN LOCALITIES.— Mississippi: Fernwood! Canton! Byram!

Very easily distinguished by the character of the hair clothing the anal segment dorsally, the hairs in *devorans* being long and dense with nearly all hairs uncinata distally whereas in *voracior* they are all straight. *Neolithobius devorans* averages larger. It is also relatively more slender and the width of the head as compared with that of the tenth dorsal plate is as 68 : 70 whereas the corresponding average ratio in *voracior* is 60 : 65.5. The ventral spines of anal legs in *devorans* seem to be constantly 0, 1, 3, 3, 2 whereas normally in *voracior* they seem to be 0, 1, 3, 3, 1, though variations to 0, 1, 3, 3, 2 occur.

NEOLITHOBIUS XENOPUS (Bollman).

Plate 3, fig. 5.

Lithobius xenopus Bollman, Proc. U. S. N. M., 1888, **11**, p. 349. Bull. 46, U. S. N. M., 1893, p. 101.

DESCRIPTION.— Dorsum dusky brown, a median longitudinal light line and less distinct lateral ones evident on some of the plates. Head similar but more reddish. Antennae proximally like head, paler distad. Venter brown, the posterior ones darker and more dusky. Legs fulvous, the posterior pairs darker.

Body of type (♂) about 7.75 times longer than the width of the tenth plate. Widths of head and of the first, third, eighth, tenth, and twelfth plates to each other as 49 : 47 : 48 : 55+ : 56 : 52, the first plate thus being narrower than the head and than the third plate.

Head a little wider than long (49 : 47) Of the form usual in related species. Caudal margin widely though but slightly incurved. Sides converging caudad from lateral breaks. The usual semicircular impression on caudal portion and the median impression in front of sulcus. Finely punctate.

Ocelli about twenty-five in five longitudinal series: 1 + 6, 4, 5, 5, 3 and 1 + 5, 4, 6, 6, 3. Single ocellus large, obliquely elliptic.

Antennae short; articles thirty, short, decreasing distad.

Prosternum 1.5+ times wider than long. Distance between chitinous spots 1.9 times width at level of bottom of median sinus; 2.66+ times the dental line. Teeth subacute, 5 + 7. Tubercle of spine moderately large, situated ectad of outermost tooth; spine less bristle-like than usual, moderately stout proximally (on one side stouter than on the other and evidently counted by Bollman as a tooth since he gives the formula as 6 + 7 instead of 5 + 7).

Dorsal plates shining; under lens showing a fine roughening or tuberculation which is more pronounced caudad as usual.

Coxal pores small, circular: 6, 6(7), 6, 4.

Gonopods of male of moderate size, distally strongly convex; bearing five bristles.

Anal legs of male short; the third article crassate, especially distally above and on mesal side, the median dorsal spine at distal end large, distally serrate; fourth article short and stout, dorsomesal surface strongly concavely excavated or rather joint as a whole convexly bowed ventrad, dorsally a rounded thickening contiguous with third joint and at distal end a conspicuous, twisted and in part plate-like process which extends dorsomesad, the article dorsally characteristically furrowed (Plate 3, fig. 5); a spine at tip of process extending caudad, short, distally rounded and characteristically serrate. Tibial and tarsal joints longitudinally sulcate on mesal side and less strongly so on the ectal. Penult legs also with the distal articles longitudinally sulcate on the mesal side; third, fourth, and fifth articles conspicuously longitudinally sulcate along dorsal surface; none of articles enlarged or lobate.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the second, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the third to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth and thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$. Last three pairs of coxae laterally armed.

Length of ♂ (type) 15.5 mm.; width of tenth plate 2 mm.; length of antennae 6.5 mm.; length of anal legs 6 mm.

LOCALITY.—Georgia: Macon!

The type, a male, is the only specimen of this interesting species at present known. The anal legs are more strongly modified than are those of any other species of the genus.

NEOLITHOBIUS HELIUS Chamberlin.

Ann. Ent. soc. Amer., 1918, 11, p. 379.

DESCRIPTION. — General color of dorsum brown, the head chestnut. Antennae chestnut, paler, yellowish, distally. Legs yellowish, the posterior pairs darker, brown to chestnut, but with the distal joints bright orange or yellowish.

Head subcordate, but anteriorly truncate between the antennae and the caudal margin excepting at ends straight or nearly so. Wider than long in the ratio 7.5 : 6.

Ocelli forming a compact oblong area. Ocelli arranged mostly in four to six longitudinal series with the single ocellus much larger, pale: *e.g.*, one 6, 5, 5, 4, and one 6, 7, 6, 5, 3.

Antennae moderately long, reaching to the seventh pediferous segment. Articles typically from thirty to thirty-three in number, short and very short, the ultimate variable in proportionate length, sometimes equalling the two preceding ones and sometimes much shorter. Subdensely setose distally, more sparsely setose proximally.

Prosternum with distance between chitinous spots three times the length of the dental line. Lateral sloping margins conspicuously incurved. Prosternal teeth mostly rather small, mostly 5 + 5, but also 5 + 6, 6 + 6, 6 + 7, and 7 + 7, the most mesal teeth on each side often much reduced and lower in position. Mesal incision very narrow.

First dorsal plate across its anterior end only a little narrower than the head and equal in width to the third plate.

Coxal pores very small, circular. Examples of arrangement and number: 4, 5, 5, 4; 5, 6, 6, 4.

Claw of female gonopods rather small, tripartite, the lobes acute, the median obviously longer and stouter than the others. Basal spines 2 + 2; moderately slender, in ventral view with sides parallel to acute distal portion.

In the male the anal legs have the third article strongly clavately enlarged distad of the base, the thickening chiefly represented by a high ridge situated dorsomesally and bearing distally a stout spine bifid serrate at the apex somewhat as in *xenopus*, and a patch of long bristles. This rounded, ridge-like lobe extends mesad well beyond inner side of the succeeding or fourth article. Fourth article conspicuously excavated and longitudinally furrowed along the dorsomesal surface as usual, but the joint as a whole not bowed; at ends and along sides of furrow are long setae.

Spines of the anal legs, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, claw single; penult, $\frac{1, 0, 3, 3, 1}{0, 1, 3, 3, 2}$, claw single; thirteenth, $\frac{1, 0, 3, 2, 1}{0, 1, 3, 3, 2}$ — $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 2}$; twelfth, $\frac{1, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; second to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; first, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 1}$. Last three pairs of coxae laterally armed.

Length 14 to 18 mm.

TYPE LOCALITY.—Georgia.

KNOWN LOCALITIES.—Georgia: Okefinokee Swamp: Billy's Island, June; Honey Island, May 31 and June 1, 1912.

NEOLITHOBIUS SUPRENANS, sp. nov.

DESCRIPTION.—Dorsum dark brown to nearly black. Head clearer brown, in some of chestnut tinge. Antennae brown, paler distad. Legs light brown.

Body in the female moderately narrowing cephalad from the tenth plate, in the male more strongly so.

Head wider than long in ratio 55:52; suborbicular. Caudal margin nearly straight, curving forwards at ends. Marginal breaks distinct. Head widest in front of breaks.

Ocelli numerous, small and regular, arranged much as in *transmarinus* but averaging fewer. Single ocellus much the largest.

Antennae moderately long. Articles in type thirty-one; moderate, proportions nearly uniform. Ultimate article about equalling the two preceding ones together.

Prosternal teeth uniform, the outermost ones on each side a little more widely separated from each other than the more mesal ones: 5 + 6; 6 + 6; 6 + 7; 7 + 7.

Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates produced.

Coxal pores from circular to transverse; porigerous area on each coxa considerably depressed.

Claw of female gonopods tripartite but the lateral lobes much smaller and appearing as small teeth near middle of length; the large median lobe subacute.

Anal legs of the male with the fourth article a little enlarged; its dorsal surface bowed ventrad and longitudinally furrowed, the other articles slender. Anal and penult legs with ventral spines 0, 1, 3, 3, 2. Dorsal spines of penult legs 1, 0, 3, 1, 1. Tibiae of all legs with but two ventral spines.

Basal spines long and slender, acutely conically acuminate from base or from a little above it.

Length 17–19 mm.

TYPE LOCALITY.—New Mexico: Las Vegas Hot Springs!

KNOWN LOCALITIES.—New Mexico: Las Vegas Hot Springs! San Geronimo! (T. D. A. Cockerell.) Colorado: Hayden's Exped., Camp 1! (May 23, 1873) Boulder Co.! (T. D. A. Cockerell). Texas: Brownsville!

NEOLITHOBIUS UNDERWOODI (Bollman).

Plate 3, fig. 6.

Lithobius underwoodi Bollman, Proc. U. S. N. M., 1888, **11**, p. 350. Chamberlin, Ann. Ent. soc. Amer., 1911, **4**, p. 46.

DESCRIPTION.—Dorsum fulvous to deep brown; usually most of the plates with a median longitudinal pale line and a more diffuse one on each side diverging from it caudad; first plate prevailing darker than the others and approaching the head in color, the most caudal plates also commonly darker and sometimes reddish or chestnut. Head pale ferruginous to chestnut and dark cherry-red, often dusky over its middle portion. Antennae proximally concolorous with head, distally becoming slightly paler or more rufous, the ultimate article sometimes abruptly much lighter. Prosternum testaceous to deep brown and chestnut, the anterior border and the prehensors usually paler. Venter yellow to testaceous and brown; the caudal plates darker, deep brown to dark reddish brown, in all with a paler median area. Legs of nearly same color as corresponding plates of venter, the posterior pairs being thus darker, dark brown to chestnut, the tarsus mostly paler.

Body robust, averaging in ♂♂ 7.1 and in ♀♀ 7.2 times longer than width of tenth plate, the variation in proportion being but slight. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other on average in males as 67 : 66.8 : 70.6 : 79 : 80 : 74; in females as 64 : 61.6 : 64.6 : 73 : 73.3 : 67. Thus in males the first dorsal plate is seen to be wider relatively to the head than in females, or rather it is really the head that is narrower.

Head wider than long in ratio 33 : 32. Caudal margin straight or slightly excurved. Marginal breaks distinct. The semicircular furrow toward caudal border distinct. The usual longitudinal median impression in front of the suture. Surface not at all roughened, smooth and shining. Sparsely clothed with hairs of about same length as those upon the antennae.

Ocelli mostly from twenty-six to thirty-six in number; usually in six series, less often in seven: *e.g.*, 1 + 5, 6, 6, 7, 5, 5; 1 + 7, 7, 5, 5, 6, 4; 1 + 6, 6, 5, 5, 6, 4; 1 + 4, 5, 6, 6, 5, 5, 1; 1 + 5, 5, 4, 4, 5, 3; 1 + 5, 5, 7, 6, 6, 3. Single ocellus moderately large, oval. Of seriate ocelli those of top row are considerably larger than the others. Series somewhat arched dorsad. Organ of Tömösvary pale, distinct; immediately in front of most ventral row of ocelli; in outline larger than the adjacent ocelli.

Antennae from moderate to long, mostly reaching the eighth and sometimes the ninth body segment, but also in some only attaining the seventh. Articles from thirty-two to forty in number, thirty-six being apparently the number most frequent. Articles all rather short; in the distal portion longer and shorter articles may be intermingled.

Prosternum from 1.75 to 1.85 times wider than long, averaging the same in both sexes. Distance between chitinous spots 1.9–2 times width at level of bottom of median sinus; 2.16–2.43 times the dental line. Prosternal teeth 5 + 5 to 8 + 8, most frequently 6 + 6; often differing on the two sides, as 5 + 6, 6 + 7 or 8 + 7. Teeth uniform, moderately large, narrowly rounded distally. Spine slender distally bristle-like and somewhat curved, inserted ectad and a little caudad of most ectal tooth.

Dorsal plates shining, nearly smooth, but the most caudal ones becoming rather obscurely finely tuberculate and bearing more numerous short hairs. Posterior angles of seventh, ninth, eleventh, and thirteenth dorsal plates strongly produced, the processes becoming more elongate and acute from the seventh to the thirteenth.

Ventral plates shining; subdensely punctate with fine puncta. The lateral longitudinal sulci distinct, the caudal oblique portion being especially sharply impressed. Median furrow obscure or absent on anterior plates but often showing on the caudal ones.

Coxal pores of moderate size, transversely elliptic, those at ends of rows often circular: *e.g.*, 6, 6, 6, 4; 6, 6, 6, 5; 6, 7, 7, 5; 7, 7, 7, 6; 7, 8, 8, 6; 7, 8, 7, 6.

Oblique distal face of male gonopods bearing mostly five or six moderately long hairs.

Claw of female gonopods moderately long and stout, well excavated mesally; tripartite but the lateral teeth very small and commonly indistinct, the inner one near distal end of claw and small and obtuse, the outer one more proximal in position and more acute. Basal spines rather large; inner and outer subequal or the inner slightly shorter; of nearly uniform width from base to beginning of about distal third of length, then abruptly converging to an acute point.

Anal legs short. In the female, slender throughout; the third and fourth articles ventrally longitudinally sulcate. In the male the legs are also slender excepting the fourth article which is moderately thickened; the fourth article also has the dorsal surface concavely depressed or bowed ventrad, in the way usual in other species of *Neolithobius*, longitudinally sulcate or sulcus obscure, the anterior end of article above more densely pilose; third and fourth articles

ventrally sulcate as in the female. Penult legs of male somewhat thicker proximally than those of female, the fourth article moderately complanate above and with a weak longitudinal furrow.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$; of the second and third, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the fourth to the eighth the same or $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$ (often having the first formula for left leg, the second for the right, or *vice versa*, of a given pair); of the ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the tenth the same, or with spines on one side, at least, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 3}$; of the eleventh, $\frac{1, 0, 3, 2, 2}{0, 0, 3, 3, 3}$ or with the ventral spines on one side 0, 0, 3, 3, 2; of the twelfth and thirteenth, $\frac{1, 0, 3, 2, 2}{0, 1, 3, 3, 3}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$, claws two or three, a minute anterior accessory sometimes being detectable; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 2}$, claws two. Last three pairs of coxae laterally armed.

Length 17–24 mm.; mostly from 19 to 21 mm. Average length of measured males 20.6 mm.; width of eighth plate 2.9 mm.; length of antennae 12.16 mm.; length of anal legs 8.5 mm. Average length of measured females 19.33 mm.; width of eighth plate 2.68 mm.; length of antennae 10.63 mm.; length of anal legs 8 mm.

Pseudomaturus.—Yellow to brown, the first plate darker, but paler than head as in adult. Head chestnut. Antennae light chestnut. Venter yellow to brown, with caudal plates darker. Legs like venter, the caudal pairs usually correspondingly darker.

Antennae as in *maturus*.

Ocelli: *e.g.*, 1 + 3, 4, 5, 5, 3; 1 + 5, 5, 5, 4, 3; 1 + 5, 5, 5, 4, 4; 1 + 5, 5, 5, 5, 4, 2; 1 + 6, 6, 5, 5, 3, 1(0); 1 + 6, 4, 5, 5, 3. Single ocellus broadly subtriangular with apex ventrad and upper side convex.

Prosternal teeth 5 + 5, to 7 + 7, as in adult or with mesal teeth a little more frequently reduced.

Coxal pores circular to slightly elliptic: 5, 5, 5, 3; 5, 5, 5, 4; 5, 6, 6, 5; 6, 7, 7, 5; 6, 7, 7, 6.

Gonopods of male somewhat smaller and paler than in adults with bristles not usually exceeding four.

Claw of female gonopods somewhat smaller and thinner than in adults and the lateral teeth more distinct and more acute. Basal spines as in *maturus* or nearly so.

Anal legs of male modified as in *maturus* but with the dorsal depression of the fourth joint commonly less marked.

Spines of second and third legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$ or as in *maturus*. Spines of other legs as in *maturus*.

Length 15–17 mm.

Immaturus.—Dilute yellow to light brown, the most caudal plates a little darker in most specimens but not so the first one. Head from

an orange-brown to dilute chestnut. Venter yellow, the most caudal plates more brownish to somewhat orange. Legs from nearly white to yellowish, the caudal pairs usually darker with the distal joints light.

Articles of antennae twenty-nine to thirty-one, most frequently the second number; all short, very short ones often occurring in pairs, these representing recently subdivided single ones.

Ocelli eleven to eighteen in three or four series: *e.g.*, 1 + 4, 4, 3; 1 + 4, 4, 2; 1 + 3, 4, 5, 2; 1 + 5, 5, 4, 3. Single ocellus in shape as in older stages; usually pale. Ocelli of top row commonly pale.

Prosternal teeth 4 + 4 to 5 + 5 but mostly either 4 + 5 or 5 + 5; moderate, uniform or with most mesal one when teeth on a side number five reduced. Distance between chitinous spots 2.75 times dental line.

Angulation of the dorsal plates already as in the adult.

Coxal pores small, circular, pale edged; mostly 3, 3, 3, 3.

Gonopods of female bi- or triarticulate, pale. The two distal articles, where three are present, are glabrous while the proximal one bears one or two hairs in addition to the single spine which may be minute. Claw appearing as a small, pale, acute point without indications of the lateral teeth or quite absent when only two articles are present in the gonopod.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 1, 1, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 2}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 1, 1, 1}$; of the third, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 2}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the fourth and fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 2}$; of the sixth and seventh, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$ to $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 2}$; of the eighth and ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$ or with ventral spines 0, 0, 1, 2, 2; of the tenth and eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$; of the twelfth, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the remaining ones as in the *maturus*.

Length 9.5–12.5 mm. A ♀ 10 mm. long has anal leg 5 mm. long; antennae 6 mm. long; and tenth plate 1.4 mm. wide. The widths of head and of the first, third, eighth, tenth and twelfth plates to each other as 35 : 32 : 35 : 39 : 39 : 34.

TYPE LOCALITY.—Georgia: Macon.

KNOWN LOCALITIES.—Alabama: Selma! Morgan! Mapleville! Thomasville! Jackson! Anniston! Georgia: Macon (L. M. Underwood); Atlanta! Tallulah Falls! South Carolina: Landrum! Seneca!



Chamberlin, Ralph V. 1925. "The genera *Lithobius*, *Neolithobius*, *Gonibius* and *Zinapolys* in America north of Mexico." *Bulletin of the Museum of Comparative Zoology at Harvard College* 57, 441–504.

View This Item Online: <https://www.biodiversitylibrary.org/item/21161>

Permalink: <https://www.biodiversitylibrary.org/partpdf/27984>

Holding Institution

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

Sponsored by

Harvard University, Museum of Comparative Zoology, Ernst Mayr Library

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.