

No. 4.— *The Lithobiid Genera Oobius, Kiberbius, Paobius, Aerebius, Nothembius, and Tigobius.*

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THE genera treated in this paper are composed of certain, mostly small, species previously embraced in the artificial group Archilithobius of Stuxberg and in part falling within the similarly artificial but more restricted group separated by Verhoeff in 1905, under the name Monotarsobius. While a considerable number of the species agree with Monotarsobius in the one distinctive character used in defining it, *i. e.*, in having the anterior tarsi undivided, none of them is really congeneric with the designated type, *Lithobius curtipes* C. Koch.

It should be mentioned that there is considerable uncertainty oftentimes in deciding whether a tarsus of a lithobiid is to be regarded as one-jointed or two-jointed, since there is every gradation between species having tarsi composed of two distinct joints freely movable at their junction and those having tarsi with no trace of division whatsoever. Between these two conditions are tarsi with two parts indicated merely by a paler, less chitinous, transverse line, but with no sign of a real suture; tarsi in which the distal part is abruptly somewhat narrower and is also further set off by the pale transverse line; tarsi like the last mentioned but with a more distinct suture-like line of division about the ventral half or less; and, finally tarsi in which the suture is complete or essentially so but in which movement between the two joints is not possible, or is restricted to a more or less limited flexion. It is clear, then, that in speaking of the tarsus simply as divided in a particular lithobiid, one may not be sufficiently definite. On the one hand, the species might be one in which the tarsal division had between them a true articular hinge; or, at the other extreme, one in which two parts to the tarsus are faintly indicated but with no power of any movement between them. In generic definition the character should be used with care and always in conjunction with others. It is advisable to study the condition of the tarsus in specimens that have been cleared and mounted.

The genera here under consideration are, so far as at present known, almost confined to the Pacific coast region of North America, no species having been found as yet east of the Sierra Nevada Mts. excepting in the case of *Paobius*. These small lithobiids occur com-

monly under the bark of logs and especially under layers of fallen leaves in woods and canyons. The smaller forms, as species of *Oabius*, are often to be secured in considerable numbers by sifting. In the eastern and southeastern states they are replaced by genera such as *Tidabius*, *Tunabius*, *Garibius*, etc., of similar general appearance and habits.

DEVELOPMENTAL STAGES.

In all Chilopoda Anamorpha the identification and precise description of the stages between embryo and adult is of much importance. As such immature forms are described for many of the species considered in the present paper, the following brief general account is given.

The eggs of lithobiids are rich in yolk, comparatively large and spherical or subspherical in form. They are laid, as I have observed in several species (*e. g.* in *Oabius pylorus*) one at a time, each as passed from the body being ordinarily grasped between the claws of the gonopods and often carried about for a short time before being deposited in the dirt which adheres to the sticky surface and makes subsequent detection of the egg difficult. In one case I secured a number of eggs of *Oabius pylorus* from individuals kept in captivity; but I have found it generally difficult to secure eggs in any number and with certainty as to the species from which they come. The females pay no attention to the eggs after they have once been deposited. In this they contrast strongly with *Geophilus* and other genera of the Epimorpha in which the eggs are laid in a mass about which the mother coils the body until some time after the young have issued from the eggs. The eggs of lithobiids are laid in the same places as are normally frequented by the adults. But while the eggs themselves are not often seen, the young in all postembryonal stages are very common. The initial determination of the species to which given immature individuals belong is often difficult and must be made with great caution unless found in a place wholly usurped by a particular species or else are closely connected with the adult by intermediate stages. In rare cases a strongly distinctive character may be present even comparatively early.

Pullus I. The term pullus is here used to designate postembryonal stages in which the full number of legs has not yet been acquired.

The development of the central nervous system and of the somites and the appendages of the head and anterior region of the body proceeds in essentials as in the Epimorpha and Insecta. There is,

however, a marked and well-known difference from the Epimorpha, — the chief difference upon which the Anamorpha as a group is based — in that the formation and development of the posterior segments of the trunk does not proceed simultaneously with that of the more anterior ones but occurs in successive and well-marked stages after emergence from the egg. Thus, instead of leaving the egg with the full number of segments and appendages and in the general form of the adult, the lithobiids hatch out with but seven pairs of developed and functioning legs with between the last of these and the telson three pairs of rudimentary limbs or limb-buds. While the anterior spiracles appear early, the posterior ones of necessity appear late and successively with the intercalation of the somites concerned. At the time of hatching the head and its appendages and the prosternum and prehensors have the general adult form and appearance, though, of course, prosternum, eyes, and other parts undergo subsequent progressive modifications. The embryo just before hatching, the so-called foetus, is similar in appearance excepting that only one pair of limb-buds exists caudad of the seventh pair of legs. The total number of segments in the newly hatched individual or pullus of the first stage is eighteen; of these each of the sixteen between protocephalon and telson corresponds to a pair of coelomic sacs and bears a pair of appendages. The eighteen segments are as follows: —

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|----|-----------------------------------|---|-------------------|
| 1. | Protocephalon | } | Head ¹ |
| 2. | Preantennal (first metamere) | | |
| 3. | Antennal (second metamere) | | |
| 4. | Mandibular (third metamere) | | |
| 5. | First maxillary (fourth metamere) | | |
| 6. | Second maxillary (fifth metamere) | | |

¹ Favorable material also of *Scolopendra polymorpha*, *Scolopocryptops gracilis* and *sexspinus*, and *Linolaenia laevipes* seems to show clearly that the head in all chilopods is thus constituted of six primary segments and precisely as in insects. The appendages of the adult head likewise correspond with those of insects excepting that the antennae of insects homologize with the preantennae of chilopods and the premandibular appendages (in Campodea, etc.) with the antennae. The following tabulation shows the homologies.

Segment	Nerve Mass	Appendages in Chilopods	Appendages in Insects
Protocephalon	Procerebrum	0	0
Metamere 1	Deutocerebrum	preantennae	antennae
Metamere 2	Tritocerebrum	antennae	premandibular appendages
Metamere 3	Mandibular ganglion	mandibles	mandibles
Metamere 4	First maxillary ganglion	first maxillae	first maxillae
Metamere 5	Second maxillary ganglion	second maxillae	second maxillae

7. Prehensorial (sixth metamere)
- 8-14. With developed legs (seventh to thirteenth metameres)
15. With partly developed legs (fourteenth metamere)
- 16-17. With limb-buds (fifteenth and sixteenth metameres)
18. Telson.

In this stage (pullus I) and the immediately succeeding ones in all lithobiids there are clearly evident in the anal segment or telson a pair of glands, the so-called anal glands, which degenerate and disappear during the agenitalis stage. These are identical in structure and are unquestionably homologous with the anal glands persisting throughout life in all members of the Henicopidae (cf. Chamberlin, Bull. M. C. Z., 1912, 57, p. 4, 5, pl. 1, fig. 8, 9). The two anal glands open through a single pore on the median ventral line in front of the anus. Each is a simple unbranched sac in structure very much like the coxal sacs of the posterior pairs of legs. Verhoeff (Zool. jahrb. Suppl., 1905, 8, p. 227) believes that the anal glands in the immature lithobiids have the same function as the coxal glands which they supposedly supplement and that the disappearance of the glands is correlated with the appearance of the coxal glands. It should be noted, however, that these glands retain their full development throughout life in all Henicopidae, including Zygethobius in which coxal pores exist on five pairs of legs instead of on only the usual four. A pair of anal glands opening separately has long been known to exist in many adult geophiloids, and in fact it was supposed that they were peculiar to these forms, Haase, for example, asserting in his Indisch-Australischen Myriopoden (Abh. berich. K. zool. anthrop.-ethnogr. mus. Dresden, 1887, no. 5, p. 11) that "Analdrüsen finden sich nur bei den Geophiliden."

Individuals of the first pullus stage may be recognized in general by the following combination of characters:—Seven pairs of fully developed legs, an eighth pair of partly developed and segmented ones, followed by two pairs of simple buds. Anal glands fully developed and conspicuous. Antennae with ten to twelve articles. Prosternal teeth distinct though small, 2 + 2 in number. Nourished by yolk still retained in the alimentary canal.

Pullus II. Eight pairs of functional legs followed by two pairs of unsegmented leg-buds. Anal glands fully developed. Antennae constantly with fourteen articles. Food for the first time ingested at mouth and often found mixed with remnants of yolk in the intestine.

Pullus III. With ten pairs of fully developed and functioning legs followed by two pairs of limb-buds. Anal glands fully developed. Number of articles of antennae variable from species to species and among individuals of the same species.

Pullus IV. With twelve pairs of functioning legs followed by three pairs of limb-buds. A pair of coxal glands opening on the twelfth coxae. Anal glands fully developed. Number of articles of antennae various.

Pullus V. A stage detected only in certain species. Like pullus IV excepting that the thirteenth legs are partly developed and show traces of segmentation, the fourteenth and fifteenth pairs remaining as simple buds and a pair of glands are present on the thirteenth in addition to those upon the twelfth coxae.

Agenitalis I. With the fifteen pairs of legs fully developed and functioning and the two genital segments (genital and pregenital) formed. Thus the full number of segments, namely twenty-five, is first attained in this stage. A single pair of coxal glands on each of the last four pairs of coxae. Anal glands still evident but showing distinct signs of degeneration. No spines on the last trochanters. The gonopods exist as small buds.

Agenitalis II. Like the preceding excepting that a spine is present on the trochanter of each of the fifteenth legs and that there are usually two pairs of coxal pores on each of the last four pairs of coxae. The anal glands have almost completely disappeared.

Immaturus.— In this stage the gonopods of the female have become more distinct and always show two and sometimes three articles; on the first joint of each there is a single small spine or point; claw not yet evident or showing only as a slight point. Gonopods of male simple and wholly glabrous. The anal glands have completely disappeared. It is sometimes desirable to speak of an early as distinguished from a late *immaturus*, the stage seeming often at least not to correspond to a single moult.

Praematurus.— In this stage in the present series of genera the female gonopods have 2 + 2 basal spines with the inner one on each side only half or less the length of the outer one; the three joints of the gonopod are distinct and bear an increased number of bristles; the claw is larger and when lobate in the adult shows at least the beginning of the lobes here. Gonopods of male more distinct and each may bear a bristle. As with the *immaturus*, it is sometimes desirable to speak of early and late *praematurus*.

Pseudomaturus.—It is sometimes important to distinguish individuals that have first attained the external features of the adult but which have not yet produced ripened sex-cells from older and sexually ripe individuals. Such individuals are commonly of smaller size, less strongly chitinized with often paler color, and may show fewer antennal joints and coxal pores and small differences in the gonopods of the female. The spining on some of the legs may also differ.

Key to the Genera.

- a. Tarsi of anterior legs strictly entire with no trace whatsoever of a suture or dividing line.
 - b. Anal legs of male without any lobes or other special modification on any of the joints. *Oabius*, gen. nov.
 - bb. Sixth joint of anal legs of male bearing on dorsal surface at distal end a conspicuous process. *Tigobius*, gen. nov.
- aa. Anterior tarsi with division indicated by transverse pale line, difference in diameter, or by a partial or complete suture, in some permitting more or less flexion.
 - b. The first seven or more pairs of legs with but a single dorsal tibial spine and the penult with none; lateral margin of head continuous, with no abrupt break or interruption or such but obscurely indicated. *Paobius*, gen. nov.
 - bb. Legs between first (or, more rarely, second, third, or fourth) and twelfth pairs with two dorsal tibial spines, one also being always present on penult legs. Head on each side with a distinct marginal interruption or break or this very rarely obscure.
- c. Anal legs in both sexes deeply and broadly longitudinally furrowed along the mesal side or conspicuously flattened; none of the coxae laterally armed. . . *Kiberbius*, gen. nov.
- cc. Anal legs not thus modified; last two pairs of coxae laterally armed.
 - d. Articles of antennae normally 22; tibia of anal legs of ♂ bearing at distal end on ventral side a conspicuous process or lobe; (claw of ♀ gonopods entire).
Nothembius, gen. nov.
 - dd. Articles of antennae normally 20; anal legs of ♂ with no special process or lobe; (claw of ♀ gonopods either entire, or bipartite or tripartite with lateral teeth small). *Arebius*, gen. nov.

OABIUS, gen. nov.

Head with the usual lateral marginal interruptions.

Antennae short, composed normally of twenty articles.

Eyes composed of seriate ocelli which are comparatively few and small; the single ocellus but weakly, differentiated and but little or not at all enlarged (*Oabius sens. str.*); or ocelli larger and the single one conspicuously the largest (subgenus *Nyctobius*).

Prosternal teeth 2 + 2; line of apices usually a little recurved. Spine slender, attenuated distad with apical portion bristle-like. Mesal incision v-shaped, varying in proportionate size.

Posterior angles of none of the dorsal plates produced.

Coxal pores small and circular; uniseriate.

Claw of ♀ gonopods tripartite, the lateral lobes typically equal and at or near the same level, the median lobe moderate, larger than the lateral but not greatly so. Basal spines 2 + 2, in the more typical group of species slender and acuminate, but varying to short and proportionately broad (*e. g.* subgenus *Nyctobius*).

Tarsi of anterior legs entire with no trace of division. (Plate 1, fig. 2).

Posterior legs moderately uniformly inflated, with no special lobes or other modifications. Last one or two pairs of coxae laterally armed. Excepting in *O. sastianus*, which is of somewhat doubtful position, the third joint of none of the legs cephalad of the twelfth or eleventh pairs bearing three dorsal spines (rarely three present on tenth). Fifth joint of all legs between first (rarely second) and twelfth pairs armed with two dorsal spines. Dorsal spines of anal legs 1, 0, 3, 1, 0 or rarely 1, 0, 3, 0, 0; ventral nearly always 0, 1, 3, 2, 0, rarely 0, 1, 3, 3, 1; claw single or more rarely two. Dorsal spines of penult legs 1, 0, 3, 1, 1 or 1, 0, 2, 1, 1; ventral 0, 1, 3, 3, 1 or 0, 1, 3, 3, 2; claws only 2, or an anterior obsolescent one appearing as a mere point. Dorsal spines of thirteenth legs 1, 0, 3, 1, 1 or 1, 0, 2, 1, 1; ventral, 0, 1, 3, 3, 2 or 0, 0, 3, 3, 2 and sometimes even to 0, 0, 2, 3, 2 or 0, 0, 2, 3, 1. Dorsal spines of twelfth legs 1, 0, 3, 1, 2 and 1, 0, 2, 1, 2 or 0, 0, 2, 1, 2 to 1, 0, 3, 1, 1 and 1, 0, 2, 1, 1; ventral, 0, 0, 3, 3, 2 to 0, 0, 2, 3, 2 and 0, 0, 2, 3, 1. Dorsal spines of eleventh legs 0, 0, 3, 2, 2 and 0, 0, 2, 2, 2, rarely to 0, 0, 0, 2, 2; ventral, 0, 0, 2, 3, 2 to 0, 0, 1, 2, 1. Dorsal spines of first legs mostly 0, 0, 2, 2, 1, more rarely 0, 0, 2, 2, 2 or 0, 0, 1, 1, 1; ventral, 0, 0, 1, 2, 1 or 0, 0, 2, 3, 1, rarely to 0, 0, 0, 1, 1.

Length 12 mm. and under.

TYPE.—*O. pylorus*, sp. nov.

It may be found desirable further to restrict this genus when the lithobiids of the Northwest, in particular, are more exhaustively known. The larger number of the species and the more typical group occur in California; but other species are known from as far north as Alaska (Forrester Island). The species are small forms of which most are of some shade of yellow or orange, the latter color being more commonly confined to the head and caudal region. The posterior pairs of legs are nearly always brightly colored, being mostly bright yellow or orange, at least distally.

The following key is applicable, only to adults. It seems hardly necessary to suggest the examination of several individuals as a guard against error. A specimen cleared and mounted in balsam is commonly very convenient for examination of spining, prosternum, etc.

Key to Species of Oabius.

- a. Anal leg with but one claw; single ocellus not at all or but slightly enlarged. *Oabius sens-str.*
- b. Dorsal spines of anal legs 1, 0, 3, 0, 0. . . . *O. tabiphilus*, sp. nov.
- bb. Dorsal spines of anal legs 1, 0, 3, 1, 0.
- c. Ventral spines of anal legs 0, 1, 3, 3, 1 or 0, 1, 3, 2, 1.
O. sastianus (Chamberlin)
- cc. Ventral spines of anal legs 0, 1, 3, 2, 0. (Third joint of only the last 2 to 4 pairs of legs with 3 dorsal spines, the others with but 2 or 1).
- d. Third joint of third to near tenth pairs of legs unarmed either dorsally or ventrally.
- e. Dorsal spines of twelfth legs 0, 0, 2, 1, 2; ventral spines of first legs 0, 0, 0, 1, 1 or 0, 0, 1, 1, 1.
- f. Ocelli normally in a single elongate series, but this sometimes irregular. . . . *O. patonius* (Chamberlin)
- ff. Ocelli normally in 2 short series with more in the upper one than in the lower.
O. patonius flavus, var. nov.
- cc. Dorsal spines of twelfth legs 1, 0, 3, 1, 1; ventral spines of first legs 0, 0, 1, 2, 1 or 0, 0, 0, 2, 1. Ocelli in 1 series or with 1 or 2 ocelli above the others.
O. patonius micrus, var. nov.

- dd. Third joint of all legs armed dorsally and ventrally.
- e. Dorsal spines of twelfth legs normally 1, 0, 3, 1, 2 or 1, 0, 2, 1, 2.
- g. Ventral spines of penult legs normally 0, 1, 3, 2, 1; third joint of twelfth and thirteenth legs normally with three ventral spines; head and tenth dorsal plate of nearly same width. *O. pylorus*, sp. nov.
- gg. Ventral spines of penult legs normally 0, 1, 3, 3, 1; third joint of twelfth and thirteenth legs normally with two ventral spines; head distinctly narrower than the tenth plate. *O. fratris*, sp. nov.
- ee. Dorsal spines of twelfth legs normally 1, (0), 0, 3, 1, 1 or 1, 0, 2, 1, 1.
- f. Ventral spines of penult legs 0, 1, 3, 3, 1.
O. dissimulans, sp. nov.
- ff. Ventral spines of penult legs 0, 1, 3, 3, 2.
- g. Basal spines of ♀ gonopods not much differing in size, long, being nearly five times longer than width at middle (Plate 2, fig. 5); head equal in length and breadth; first dorsal plate not narrower than the third. *O. tiganus* (Chamberlin)
- gg. Basal spines of ♀ gonopods with the inner considerably smaller than the outer, proportionately but three fourths or less as long as in *O. tiganus* (Plate 2, fig. 9); head wider than long; first plate narrower than the third.
O. ulcorus, sp. nov.
- aa. Anal leg with two claws; single ocellus considerably largest; basal spines of ♀ gonopods short and broad.
Nyctobius, subgen. nov.
- b. Outer basal spine of ♀ gonopod conspicuously longer and more robust than the inner (Plate 3, fig. 5); prosternum less than 1.5 times wider than long; length 8-10 mm.
O. decipiens, sp. nov.
- bb. Outer spine of ♀ gonopod but little longer than the inner and not more robust (Plate 3, fig. 4); prosternum near 1.65 times wider than long; length typically 7.5 mm. or less.
O. ineptus, sp. nov.

FIG 1.—Distribution of *Oabius*.

OABIUS PYLORUS, sp. nov.

Plate 1, fig. 6; Plate 2, fig. 1, 2.

DIAGNOSIS.—Very slender, with head and tenth tergite of nearly same width. Yellow to pale testaceous; head light orange with frontal region paler. Ocelli three to six in one series, rarely in two; caudal ocellus not enlarged. Prosternum 1.62 to 1.68 times wider than long; distance between chitinous spots 3.5 times dental line; sinus very narrow. Claw of female gonopods with lobes not much differing in length; basal spines very slender, distal division long, acute. Coxal pores 2, 3, 3, 2 to 2, 4, 4, 3. Anal leg with claw single. Third joint of all legs armed dorsally and ventrally, the ventral spines of twelfth and thirteenth normally three. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 2, 1 or, rarely, 0, 1, 3, 3, 1; of twelfth, dorsal, 1, 0, 3, 1, 2 or 1, 0, 2, 1, 2; of first, ventral, 0, 0, 3 (2), 1 or 0, 0, 2, 3, 1. Length 10 to 12 mm.

DESCRIPTION.—Dorsum yellow to pale testaceous. Head light orange, the frontal region paler. Antennae like head proximally, usually becoming yellow distally. Prosternum and prehensorial feet light orange. Venter yellowish, with the posterior plates light orange. Legs dilute yellow, more deeply pigmented distad, the last two pairs usually bright yellow.

Body very slender with the sides subparallel, the tenth plate being of same width as head or nearly so; third plate narrower than the first; eighth and twelfth of same diameter. Body usually fully 9.5 times or more longer than width of tenth plate. Widths of head and of first, third, eighth, tenth, and twelfth plates, to each other nearly as 31:29:27.5:30:31:30.

Head as long as wide or somewhat longer (31:30 or occasionally even 32:30), apparently relatively broader in males than in females; widest a little back of eyes from where the sides converge to breaks and again at about same angle to the rounded caudal corners. Hairs long and sparse on anterior portion, becoming both shorter and fewer caudad.

Antennae very short, reaching to fourth segment when shortest or toward middle of fifth when longest. Moderately narrowing distad but the terminal portion not very slender. Articles short and subcylindric or each a very little enlarging distad. Hairs long and rather coarse, only moderately dense.

Each eye (Plate 1, fig. 6) consisting mostly of from four to six ocelli arranged in a single series or rather rarely with one or two crowded into a more dorsal position and producing a double series. The most common number and arrangement noted is 1 + 3; others are 1 + 4; 1 + 2; 1 + 5; 1 + 1, 3; 1 + 2, 2; and 1 + 2, 3.

Prosternum from 1.62 to 1.68 times wider than long. Distance between chitinous spots 2.3 times the width at level of bottom of mesal incision; 3.5 times the length of dental line. Median sinus narrow; the sides nearly parallel or but little converging caudad; rounded at bottom. Teeth moderate, 2 + 2, distally rounded, the inner larger than the outer and the line of apices straight or slightly recurved. Spines distally bristle-like, becoming stout at base.

First dorsal plate about 1.63 times wider than long. Sides weakly excurved, diverging from the rounded caudal corners cephalad to near the anterior end where they bend in a little. Anterior minor plates with the caudal corners simply rounded; posterior minor plates with caudal corners obliquely excised.

Ventral plates with a median impressed pit caudad of middle, showing rather weakly on the more posterior plates. Lateral furrows are also traceable. A v-shaped impression may be evident on the last two plates.

Coxal pores small, circular, 2, 3, 3, 3; 2, 3, 4, 3; 2, 4, 4, 3. The most proximal on each coxa often minute.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 1}$, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the second to eleventh pairs, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 2}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$ or occasionally on one side only, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 2, 1}$ or very rarely, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$, with the claw single. Last two pairs of coxae laterally armed.

Posterior legs short. In both male and female the anal and penult legs are uniformly and only moderately enlarged, with the third, fourth, and fifth, but especially the fourth, joints simply and rather weakly longitudinally dorsally furrowed. The penult legs in the female tend to be more slender relatively than in the male.

Gonopods of male small and pale, wart-like, often concealed; each bearing normally two bristles.

Claw of female gonopods (Plate 2, fig. 1) proportionately wide, concave and well curved; tripartite, with the divisions not much differing in length. Spines (Plate 2, fig. 2) slender, the sides subparallel from base to beginning of the long and acutely acuminate distal portion. Bristles of third article three or four; of the second, four

or five; of the first mostly six. Median process of pregenital sternite short, distally truncate.

Length 10 to 12 mm. A female 11 mm. long has antennae 4 mm. and anal leg also 4 mm. long, the tenth plate being 1.13 mm. wide.

Pseudomaturus.—Coloration as in *maturus* excepting as a rule more pale or dilute.

Each eye composed of three or four ocelli; thus, 1 + 2 or 1 + 3; with the single ocellus much smaller than the second.

Coxal pores 2, 2, 2, 2 to 3, 4, 4, 3.

Gonopods of female practically as in adult; claw a little smaller and paler; spines also slightly more slender and paler; fewer long bristles present.

Spining of legs as in *maturus*.

Praematurus.—Coloration more dilute than in *maturus* with the legs whitish or yellowish white, excepting the posterior pairs which are yellow.

Antennae having the full number of twenty articles, these being somewhat shorter relatively than in the adult and each proportionately somewhat thicker distad.

Each eye in all specimens studied consisting uniformly of three ocelli; thus, 1 + 2, the posterior eye of series, *i. e.*, the median one of the three, much the largest, the single ocellus being very small.

Line of apices of prosternal teeth straight. (Measurements in one specimen gave prosternum as but 1.55 times wider than long).

As in adult, body slender, being from 9.5 to 10 times longer than width of tenth plate. Head may be relatively slightly narrower. Widths of head and of first, third, eighth, tenth, and twelfth plates in a female are to each other as 42:38:38:42:43:43.

Coxal pores 2, 2, 2, 2, to 2, 3, 3, 3.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 1, 2, 1}$; of the second and third, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$; of the fourth to seventh inclusive, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$; of the eighth, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 2}$ or $\frac{0, 0, 1, 2, 2}{0, 0, 1, 3, 2}$; of the ninth and tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of the eleventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 2, 1, 2}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 2, 1, 1}{0, 0, 2, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 2, 0}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$. Last two pairs of coxae laterally armed.

Claw of female gonopods short and thin; the three teeth present, these acute, the outer or most ventral somewhat smallest and nearest base, the others differing but little from each other. Distal joint with two bristles, the second with three, the first with four or five. Basal spines 2 + 2, attenuated regularly from base to the acutely

pointed apex; inner spine at most but little exceeding half the length of the outer and from that varying, in the younger forms to a mere point. Process of preceding sternite as in *maturus*.

Length from about 6.75 mm. to 7.75 mm. In a specimen 6.8–7 mm. long, the antennae are 2.5 mm. and the anal legs 2.3 mm. long.

Immaturus.—Coloration as in the *prae-maturus* or but slightly paler.

Head distinctly longer than wide (39:37 to 36:33.5).

Antennae with the twenty articles already present, but these relatively shorter and more closely compacted than in the adult. Ultimate article relatively very long. Bristles rather sparse.

Each eye composed of three ocelli; *e. g.*, 1 + 2. Single or most caudal ocellus smallest, the second one, or first of series proper, largest. Ocelli not contiguous.

Prosternal teeth and median sinus very nearly same as in adult, the line of apices being straight or sometimes even slightly procurved. (Prosternum 1.55 times wider than long; distance between chitinous spots 2.4 times width at level of bottom of median sinus and 3.1 times dental line).

Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 33.5:30:31:33:33:32, the body being slender and with sides subparallel as in the older stages. Body in specimen described ten times longer than width of tenth plate.

Coxal pores very small or minute; 1, 2, 2, 2 or 2, 2, 2, 2.

Spines of first legs, $\frac{0,0,0,0,0}{0,0,0,1,1}$; of second to sixth inclusive, $\frac{0,0,0,1,1}{0,0,0,1,1}$; of seventh, $\frac{0,0,0,2,2}{0,0,0,1,1}$; of eighth, $\frac{0,0,0,2,2}{0,0,0,2,1}$; of ninth, $\frac{0,0,0,2,2}{0,0,1,2,1}$; of tenth and eleventh, $\frac{0,0,0,2,2}{0,0,1,1,1}$; of twelfth, $\frac{0,0,1,1,2}{0,0,1,2,1}$; of thirteenth, $\frac{0,0,2,1,1}{0,0,1,3,1}$; of penult, $\frac{0,0,2,1,1}{0,1,2,2,0}$, claws two; of the anal, $\frac{1,0,3,1,0}{0,1,3,2,0}$. Last pair of coxae laterally armed.

Female gonopods short, the three articles present. Claw represented by a small, acute point. Second and third articles glabrous; first with one or two bristles. Spines 1 + 1, small and acute, pale.

Length of specimen described 6.5 mm.

Genitalis II.—Color very dilute yellowish white. Head and prehensorial feet yellow. Antennae whitish or in some pale yellow proximally. Legs whitish, with tarsi pale yellowish; posterior pairs of legs pale yellow especially distally.

The twenty articles of antennae already present, the ultimate being very long, the others decreasing from the second distad. Bristles relatively long, not dense.

Ocelli 1 + 2, small.

Prosternal teeth 2 + 2, the line of apices straight or even slightly procurved, the inner one being the larger. Spine pale, stouter at base as usual and drawn out apically in bristle-like form, straight, very close to the tooth. (Prosternum 1.5 times wider than long; distance between chitinous spots 2.87 times greater than width at level of bottom of sinus; 3.28 times the dental line).

Coxal pores minute, 1, 2, 2, 2 — 2, 2, 2, 2.

Spines of first legs, $\frac{0,0,0,0,0}{0,0,0,1,1}$ or $\frac{0,0,0,0,1}{0,0,0,1,1}$; of the second to fifth $\frac{0,0,0,0,1}{0,0,0,1,1}$; of the eighth, $\frac{0,0,0,1,1}{0,0,0,1,1}$ (anterior); of the ninth, $\frac{0,0,0,1,1}{0,0,0,1,1}$ or $\frac{0,0,0,1,2}{0,0,0,1,1}$; of the tenth, $\frac{0,0,0,1,2}{0,0,0,1,1}$ or $\frac{0,0,0,2,2}{0,0,0,1,1}$; of the eleventh, $\frac{0,0,0,1,2}{0,0,0,1,1}$ or $\frac{0,0,0,0,2}{0,0,0,1,1}$; of the twelfth, $\frac{0,0,1,1,1}{0,0,1,1,1}$; of the thirteenth, $\frac{0,0,1,1,1}{0,0,1,1,1}$ or $\frac{0,0,2,1,1}{0,0,1,1,1}$; of the penult, $\frac{0,0,1,0,0}{0,1,2,1,0}$ or $\frac{0,0,2,0,0}{0,1,2,1,0}$; of the anal, $\frac{0,0,2,0,0}{0,1,3,1,0}$ or $\frac{0,0,3,0,0}{0,1,3,1,0}$. None of the coxae armed.

Anal glands absent or in some still evident.

Length 5 to 6 mm.

Agenitalis I.—Color much as in the preceding stage.

Articles of antennae eighteen, all excepting ultimate and the first two or three very short. Bristles long, not dense.

Ocelli pale; 1 + 2.

Prosternum as described for *agenitalis II.*

Width of head and of first, third, eighth, tenth, and twelfth plates to each other as 29:24:24.5:25:25:23, the head being proportionately much larger than in older stages.

Coxal pores minute; 1, 1, 1, 1.

Spines of first legs, $\frac{0,0,0,0,0}{0,0,0,0,1}$ to $\frac{0,0,0,0,1}{0,0,0,1,1}$; of the second to eleventh, $\frac{0,0,0,0,1}{0,0,0,1,1}$; of the twelfth, $\frac{0,0,0,0,1}{0,0,1,1,1}$; of the thirteenth, $\frac{0,0,0,0,0}{0,0,1,1,1}$; of the penult and anal, $\frac{0,0,0,0,0}{0,0,1,1,0}$. None of the coxae armed.

Anal glands present, well developed, pale; the common median opening slit-like.

Length 4-5 mm.

Pullus III (Larva tertia).—Body, legs, and antennae whitish or already slightly yellowish. Head pale yellow.

Head in comparison with dorsal plates much wider than in the *maturus* and intermediate stages.

Antennae very short; composed of fourteen articles of which the first three and the ultimate are longest, the others being very short.

Ocelli but one on each side, this small and often indistinct.

Prosternum as in *agenitalis* stages.

Coxal pores restricted to one on each coxa of the twelfth pair of legs.

Only ten pairs of developed legs present, those of the eleventh and twelfth pairs being present as slender buds in which the coxa is already distinctly set off. Spines of first legs, $\frac{0,0,0,0,0}{0,0,0,0,0}$ or $\frac{0,0,0,0,1}{0,0,0,0,0}$; of the second, $\frac{0,0,0,0,1}{0,0,0,0,0}$ or $\frac{0,0,0,0,1}{0,0,0,0,1}$; of the third, $\frac{0,0,0,0,1}{0,0,0,0,1}$ or $\frac{0,0,0,0,1}{0,0,0,1,1}$; of the fourth to eighth, $\frac{0,0,0,0,1}{0,0,0,1,1}$; of the ninth and tenth, $\frac{0,0,0,0,0}{0,0,0,1,1}$.

Anal glands present but less well developed than in immediately succeeding stages.

Length near 3.5 mm.

TYPE.—M. C. Z., No. 318, California: Capitola. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 316, 317, California: Berkeley; M. C. Z., No. 384, Sausalito; M. C. Z., No. 381, Santa Cruz; M. C. Z., No. 382, Brookdale; M. C. Z., No. 383, Felton; Big Trees; M. C. Z., No. 385, Capitola. R. V. Chamberlin.

Also taken at Mill Valley, California. R. V. Chamberlin.

OABIUS FRATRIS, sp. nov.

Plate 1, fig. 8; Plate 2, fig. 10.

DIAGNOSIS.—Moderately slender, with head clearly narrower than tenth plate. Dorsum from pale to dark brown, often olivaceous; head dusky caudad of suture. Ocelli in two series, rarely in one, five or six in number; caudal ocellus usually smaller than second. Prosternum 1.5 times wider than long; distance between chitinous spots 4+ times dental line; sinus v-shaped, widely open. Lateral lobes of female genital claw much narrower than median, a little shorter; basal spines moderate, apical portion abruptly acuminate. Coxal pores 2, 3, 3, 3-3, 4, 4, 3. Anal leg with claw single; third joint of all legs armed dorsally and ventrally, the ventral spines of twelfth and thirteenth normally two. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 3, 1; of twelfth, dorsal, 1, 0, 3, 1, 2; of first, ventral, 0, 0, 1, 2, 1. Length, 7.5-8.6 mm.

DESCRIPTION.—Pale brown of dilute olivaceous tinge to dark brown. Head dusky caudad of the suture, tending toward dull orange in the frontal region in specimens in full color; first dorsal plate often darker along with head. Antennae brown or orange-brown, usually somewhat paler distally. Prosternum dusky testaceous, the prehensorial feet clearer. Venter pale, suffused with purplish over the anterior

half or more, the last few plates darker. Posterior legs more brightly colored, yellow, as usual.

Body moderate, mostly 8 times longer than width of tenth plate or a little less. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other about as 51:50:51:59:60:59; the body thus considerably narrowing cephalad with the first plate a little narrower than the third.

Head equal in length and breadth.

Antennae short; articles moderate or short, decreasing in length distad in usual way, each somewhat clavately widening from its proximal end. Ultimate article typically slightly longer than the two preceding together.

Each eye (Plate 1, fig. 8) consisting of mostly five or six ocelli arranged in two series or in one very irregular one: *e. g.*, 1 + 2, 2; 1 + 3, 2; 1 + 4. Single or most caudal ocellus mostly smaller than one or more of the others.

Prosternum near 1.48 times wider than long. Distance between chitinous spots 2.4 times width at level of bottom of sinus; 4.1 times the dental line. Median sinus widely open, v-shaped. Spine in usual position and of usual form. Teeth small, equal; line of apices slightly recurved.

First dorsal plate only moderately and gradually narrowed caudad; 1.7 times wider than long. Caudal corners of ninth, eleventh, and thirteenth dorsal plates straight, or those of the first two may be rounded.

Coxal pores 2, 3, 3, 3-3, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 3, 1}$; of the third and fourth, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 3, 2}$; of the fifth to eighth inclusive, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of the ninth, tenth, and eleventh, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 2}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 2, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$. Last two pairs of coxae laterally armed.

Claw of female gonopods short and relatively wide, well curved; tripartite with the median lobe not much extending distad of the lateral, but much wider than these. Basal spines of medium length, gradually narrowing from base distad to the more abruptly acuminate distal portion, the apex of which is narrowly rounded (Plate 2, fig. 10).

Length 7.5 to 8.6 mm.

Pseudomaturus (Early).—Dilute brown, with the last two plates darker, as also may be two or three anterior ones along their caudal

borders. Head brown, with antennae similar excepting at tips which are lighter. Posterior legs bright yellow, the others very pale.

Antennae as in *maturus* proper or articles a little shorter.

Ocelli 1 + 2, 1; somewhat angular.

Prosternum as in *maturus*.

Coxal pores 2, 3, 3, 3.

Spines of first legs, $\frac{0,0,1,1,1}{0,0,1,2,1}$ or $\frac{0,0,1,2,1}{0,0,1,2,1}$; of the second, $\frac{0,0,1,2,1}{0,0,1,2,1}$ or $\frac{0,0,1,2,2}{0,0,1,2,1}$; of the third to fifth inclusive, $\frac{0,0,1,2,2}{0,0,1,2,1}$; of the sixth to eighth, $\frac{0,0,1,2,2}{0,0,1,3,2}$; of the ninth, $\frac{0,0,2,2,2}{0,0,2,2,2}$ or $\frac{0,0,2,2,2}{0,0,2,3,2}$; of the remaining pairs as in the *maturus* proper.

Claw of female gonopods more slender and paler than in the adult, with the teeth more acute. Spines as in adult, but mesal ones proportionately shorter, about three fourths the length of the ectal ones.

Length about 6.75 mm.

Praematurus (♂).—Head light yellow, with the antennae a paler yellow. Rest of body pale, almost unpigmented. Posterior legs white, of yellowish cast.

Antennae essentially as in older stages.

Ocelli 1 + 2, 1, smaller and paler than in the *pseudomaturus*.

Prosternum as in *maturus*.

Coxal pores, 2, 2, 2, 2.

Spines of first legs, $\frac{0,0,0,1,1}{0,0,0,1,1}$; of the second, $\frac{0,0,0,2,2}{0,0,0,1,1}$; of the third to seventh inclusive, $\frac{0,0,0,2,2}{0,0,0,2,1}$; of the eighth, $\frac{0,0,1,2,2}{0,0,0,2,1}$; of the ninth to eleventh, $\frac{0,0,1,2,2}{0,0,1,2,1}$; of the twelfth, $\frac{1,0,2,1,2}{0,0,2,3,1}$; of the thirteenth, $\frac{1,0,2,1,1}{0,0,2,3,1}$; of the penult, $\frac{1,0,3,1,1}{0,1,3,3,1}$; of the anal, $\frac{1,0,3,1,0}{0,1,3,2,0}$. Last two pairs of coxae already laterally armed.

Gonopods of male distinct; each bearing one bristle.

TYPE.—M. C. Z., No. 313, California: Friant, March, 1913. R. V. and S. C. Chamberlin.

PARATYPES.—M. C. Z., No. 314, 315, California: Friant, March, 1913. R. V. and S. C. Chamberlin.

OABIUS TIGANUS (Chamberlin).

Plate 1, fig. 7; Plate 2, fig. 5.

Lithobius utahensis var. *tiganus* Chamberlin, Pomona college journ. ent., 1910, 2, p. 374.

DIAGNOSIS.—Slender; first dorsal plate as wide as third; head equal in length and breadth. Yellow, caudal plates and head with

first plate orange. Ocelli about six in two series. Prosternum between 1.5 and 1.6 times wider than long; distance between chitinous spots $3\frac{2}{3}$ times dental line; sinus v-shaped. Lobes of genital forceps short, blunt; basal spines long, subequal. Coxal pores 2, 4, 4, 3 to 3, 4, 4, 3. Claw of anal leg single. Third joint of all legs armed dorsally and ventrally. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 3, 2; of twelfth, dorsal, 1, 0, 3, 1, 1; of first, ventral, 0, 0, 1, 3, 1. Length 8 to 11 mm.

DESCRIPTION.—Dorsum yellow. Head, caudal plates and commonly also the first dorsal plate, light orange, with the frontal region lighter, yellowish. Antennae yellow to brown. Prosternum pale orange to subferruginous with the prehensorial feet lighter. Venter dilute yellow, the posterior plates orange. Legs nearly like venter, the posterior pairs thus more deeply pigmented, light orange to bright yellow at least distally.

Body of moderate slenderness, 8.5 or sometimes less, times longer than width of tenth plate.

Head as long as wide or nearly so; subcordate; caudal margin slightly excurved; considerably narrowed cephalad. Two sulci diverging cephalad on caudal portion. Smooth.

Antennae very short, reaching only to the fourth or sometimes fifth segment. Articles short, from a little clavate to subcylindric, the sides straight. Bristles long.

Each eye (Plate 1, fig. 7) consisting mostly of six or seven ocelli arranged in two series: *e. g.*, 1 + 2, 3; 1 + 3, 2; 1 + 3, 3. Ocelli all of about same size black, the series somewhat oblique.

Prosternum 1.57 times wider than long. Distance between chitinous spots twice the width at level of bottom of sinus; $3.66 +$ times as long as the dental line. Teeth small, dark tipped; line of apices a little recurved. Spine slender, straight. Median sinus v-shaped.

First dorsal plate with sides considerably convex; widest a little cephalad of middle. 1.86 times wider than long in average specimen. Minor plates all with margins straight, the corners in part rounded or obliquely excised. Plates smooth and shining or posterior ones but weakly roughened.

Coxal pores small, 3, 4, 4, 3; 2, 4, 4, 3; 3, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$; of the second to sixth pairs inclusive, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of the seventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the eighth to eleventh, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$ or rarely, in *pseudomaturus*, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$. Last two pairs of coxae laterally armed.

Anal and penult legs moderately and uniformly thickened; faintly longitudinally sulcate dorsally.

Claw of female gonopods rather broad relatively; moderately curved. Tripartite, the lobes blunt, the median but slightly longer than the dorsal, than which the ventral is a little smaller and more proximad. Spines long and differing slightly in length, more or less converging from base to acuminate distal portion the apex of which is narrowly rounded (Plate 2, fig. 5). Median process of preceding sternite distally truncate. Distal article with mostly two bristles visible in ventral view; second with four; and the first with ten or twelve.

Length 8 to 11 mm. A female (type) 10 mm. long has antennae and anal legs 3 mm. long, and tenth dorsal plate 1.17 mm. wide.

TYPE.—M. C. Z., No. 393, California: Pacific Grove. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 319, 391, 392, California: Pacific Grove. R. V. Chamberlin.

Also taken in California at Santa Barbara (M. C. Z., No. 320, 390); Berkeley (M. C. Z., No. 321); Santa Cruz (M. C. Z., No. 389), and Monterey. R. V. Chamberlin.

OABIUS PATONIUS (Chamberlin).

Plate 1, fig. 1-4.

Lithobius patonius Chamberlin, Can. ent., 1911, 43, p. 381.

DIAGNOSIS.—Slender to very slender; first dorsal plate much narrower than third and head than tenth. Brown, the head more reddish. Ocelli four to seven, in one or two series; caudal ocellus not enlarged. Prosternum between 1.5 and 1.6 times wider than long; distance between chitinous spots 3.25 times dental line; sinus narrowly rounded at bottom. Lobes of female genital claw short, lateral ones small; outer basal spine considerably longer than inner. Coxal pores 2, 3, 3, 2-2, 3, 3, 3. Claw of anal leg single. Third joint of legs from third to near tenth pair unarmed either dorsally or ventrally. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 3, 1; of twelfth, dorsal, 0, 0, 2, 1, 2; of first, ventral, 0, 0, 0, 1, 1. Length 5-7.5 mm.

DESCRIPTION.—Dorsum brown, typically dark. Head more reddish than dorsum and lighter, especially in front of suture. An-

tennae brown proximally, pale brown or yellowish distally. Venter brown, usually of paler cast than dorsum, with the last plates darkest and often very deep in color. Legs greyish brown, the ultimate pairs bright yellow excepting proximally.

Body slender, being from 8.5 to 9.5 times longer than the width of the tenth dorsal plate. The males seem to average smaller and to be proportionately a little wider than the females. First plate always distinctly narrower than the third and than the head. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other, about as 46 : 42 : 45 : 52 : 54 : 52 (♀) or 35 : 32 : 34 : 38 : 39 : 38 (♂).

Head slightly longer than wide (35 : 34). Caudal margin straight. Sides between eyes and lateral breaks only slightly curved. Sides back of breaks moderately converging.

Antennae short. Articles mostly very short, decreasing from the second distad. Hairs not dense.

Ocelli on each side from four to seven in number. Arranged in two series, with in most cases fewer in the upper than in the lower: *e. g.*, 1 + 1, 4, which is the commonest arrangement; 1 + 1, 3; 1 + 2, 4; 1 + 2, 5; 1 + 3; 1 + 4; 1 + 2, 2; 1 + 3, 2. When there is but one ocellus in the upper series, this may be larger than any other. Ocelli mostly separated, well pigmented. Single ocellus not enlarged.

Prosternum (Plate 1, fig. 3) in an average individual 1.56 times wider than long. Distance between chitinous spots 2, or slightly more, times greater than width at level of bottom of sinus; 3.25 times the dental line. Teeth broad proximally, sides straight and apices angular; line of apices recurved. Sides of sinus straight and converging at an acute angle but sinus narrowly rounded at bottom. Spine considerably stouter at base than bristles, but hair-like distally; curving mesad over tooth.

Sides of first dorsal plate evenly rounding from about caudal corners to middle, moderately diverging, while in the anterior portion they are subparallel or at anterior end slightly bending mesad; 1.7 times wider than long. Minor plates with corners subrectangular or evenly rounded, more straight on caudal side, none with corners obliquely excised.

Coxal pores mostly 2, 3, 3, 2 or 2, 3, 3, 3.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 0, 1, 1}$; of second, $\frac{0, 0, 1, 2, 1}{0, 0, 0, 1, 1}$ or $\frac{0, 0, 1, 2, 2}{0, 0, 0, 1, 1}$; of the third, $\frac{0, 0, 1, 2, 2}{0, 0, 0, 1, 1}$; of the fourth, $\frac{0, 0, 0, 2, 2}{0, 0, 0, 1, 1}$; of the fifth to ninth, $\frac{0, 0, 0, 2, 2}{0, 0, 0, 2, 1}$; of the tenth, $\frac{0, 0, 0, 2, 2}{0, 0, 0, 2, 1}$ or $\frac{0, 0, 0, 2, 2}{0, 0, 1, 2, 1}$; of the eleventh, $\frac{0, 0, 0, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 0, 2, 2}{0, 0, 2, 2, 1}$; of the twelfth, $\frac{0, 0, 2, 1, 2}{0, 0, 2, 3, 1}$; of the thirteenth, $\frac{1, 0, 2, 1, 1}{0, 0, 2, 3, 1}$ or $\frac{1, 0, 2, 1, 1}{0, 0, 2, 3, 2}$; of

the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$. Last two pairs of coxae laterally armed or occasionally only the anal pair.¹

Gonopods of male small and rounded, wart-like, bearing but a single bristle.

Claw of female gonopods short and proportionately wide, well curved, concave. Tripartite, with the lateral teeth small, sometimes only weakly differentiated. Outer basal spine of each pair uniformly considerably larger than the inner one, attenuated from base to distal end where the sides round in somewhat to apex. Articles glabrous on dorsal side or nearly so.

Length from 5 to 7.5 mm. A female 7 mm. long has antennae 1.7 mm. long, anal leg 2 mm. long, and tenth plate .73 mm. wide. The maximum male observed is 6.5 mm. long, the females appearing to average larger and ranging to 7.5 mm. in length.

TYPE.—M. C. Z., No. 324, California: Mill Valley. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 401, California: Berkeley; M. C. Z., No. 402, Mill Valley. R. V. Chamberlin.

Also taken in California at Pacific Grove (M. C. Z., No. 398); Santa Barbara (M. C. Z., No. 399); Brookdale (M. C. Z., No. 400); Felton Big Trees, and Sausalito. R. V. Chamberlin.

OABIUS PATONIUS FLAVUS, var. nov.

Plate 1, fig. 5; Plate 2, fig. 7.

DESCRIPTION.—Pale yellowish, caudal plates sometimes a little darker, varying to dilute orange. Head and prosternum bright yellow or orange, clearer in frontal region. Antennae yellow. Legs pale and essentially unpigmented excepting the posterior pairs which, as usual, are brighter.

Head little longer than wide.

Antennae short; articles short but not closely compacted, irregularly decreasing in size distad. Ultimate article almost equal in length to the two preceding together.

Ocelli pale; four to six in number; arranged in mostly two series with more in the upper than in the lower one: *e. g.*, 1 + 3, 2, the most

¹ The spine of the third joint of the first three pairs of legs is on the caudal side and may appear at first rather ventral than dorsal but its size and precise position show it to belong really to the dorsal set.

common arrangement; 1 + 2, 3; and 1 + 3; the patch not elongate. Single ocellus sometimes a little largest, in other cases smaller than the caudal one of series.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 1, 1, 1}$; of the second, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$; of the third, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$; of the fourth, $\frac{0, 0, 1, 2, 2}{0, 0, 0, 2, 1}$ or $\frac{0, 0, 1, 2, 2}{0, 0, 0, 1, 1}$; of the fifth to ninth, $\frac{0, 0, 0, 2, 2}{0, 0, 0, 2, 1}$; of the tenth, $\frac{0, 0, 1, 2, 2}{0, 0, 0, 2, 1}$ or $\frac{0, 0, 1, 2, 2}{0, 0, 1, 3, 1}$; of the eleventh, $\frac{0, 0, 1, 2, 2}{0, 0, 2, 3, 1}$ or $\frac{0, 0, 1, 2, 2}{0, 0, 2, 2, 1}$; of the twelfth, $\frac{0, 0, 2, 1, 2}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 2, 1, 1}{0, 1, 2, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$. Last pair of coxae laterally armed.

Gonopods of female as in the species proper or very nearly so. Basal spines of type (Plate 2, fig. 7).

Length 6.5-7 mm.

TYPE.—M. C. Z., No. 395, California: Santa Barbara. R. V. Chamberlin.

PARATYPE.—M. C. Z., No. 327, California: Santa Barbara. R. V. Chamberlin.

It may prove inadvisable to maintain this form as a separate variety when more material has been examined; but the specimens studied are sufficiently divergent in ocelli, spining of legs, etc. to warrant tentative separation.

OABIUS PATONIUS MICRUS, var. nov.

Plate 1, fig. 10; Plate 2, fig. 6.

DESCRIPTION.—Dorsum chestnut, more brownish near middle. Head dusky behind suture, the frontal region clearer, dark orange. Legs light brown, the posterior pairs more brightly pigmented, yellowish orange except proximally. Venter dusky brown, not at all reddish, most caudal plates darker as usual. Prosternum much darker than venter. Antennae distally orange, proximally dark brown.

Body proportionately rather broad, being typically between 7.5 and 8 times longer than width of tenth plate. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 45 : 42 : 44 : 51 : 53 : 51.

Head longer than wide (47 : 45): cordate.

Antennae very short. Articles short and very short decreasing distad as usual. Ultimate article a little longer than the two preceding together.

Ocelli as in species: 1 + 4; 1 + 1,4; 1 + 1,3. All ocelli con-

tiguous, the first ocellus of series proper distinctly largest, the single ocellus of same size as more anterior ones.

Prosternum (Plate 1, fig. 10) near 1.43 times wider than long. Distance between chitinous spots 2.3 times width at level of bottom of mesal incision; 3.7 times dental line. Spine as usual. Teeth small and pale, rather obtuse; line of apices distinctly recurved. Sinus v-shaped, narrowly rounded at bottom.

Posterior angles of thirteenth plate slightly extended but well rounded; posterior angles of ninth strongly obliquely excised. First dorsal plate nearly as wide at middle as at anterior end; 1.65 times wider than long.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 1, 1, 1}{0, 0, 0, 2, 1}$; of the second, $\frac{0, 0, 1, 2, 2}{0, 0, 0, 2, 1}$; of the fourth to tenth, $\frac{0, 0, 0, 2, 2}{0, 0, 0, 2, 1}$; of the eleventh, $\frac{0, 0, 0, 2, 2}{0, 0, 1, 3, 1}$; of the twelfth, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 1, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$ (in one regenerated leg $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$); of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$, claw one. Anal coxae laterally armed.

Claw of female gonopods nearly as in typical form of species. Basal spines (Plate 2, fig. 6).

Length 7 to 8 mm.

TYPE.—M. C. Z., No. 397, California: Pacific Grove. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 325, 326, California: Pacific Grove; M. C. Z., No. 396, Capitola. R. V. Chamberlin.

The types represent a form averaging larger and considerably more robust than typical *O. patonius*. Among the differences presented by the variety, the presence of two ventral spines on the fourth joint of the first four pairs of legs, with the dorsal spines of the twelfth legs reduced to 0, 0, 2, 1, 1 or even 0, 0, 1, 1, 1 while its ventral ones stand as 0, 0, 2, 3, 2, should be especially noted.

OABIUS ULEORUS, sp. nov.

Plate 2, fig. 9.

DIAGNOSIS.—Stout; the head distinctly wider than long; first dorsal plate narrower than third. Light brown or testaceous, head obscure orange. Ocelli nine to eleven in three series; single ocellus not enlarged. Prosternum 1.5 + times wider than long; distance between chitinous spots four times dental line; sinus v-shaped. Lobes

of genital forceps acute, lateral smaller; basal spines stout, moderate in length, inner considerably the shorter. Coxal pores 3, 4, 4, 4. Claw of anal leg single. Third joint of all legs armed dorsally and ventrally. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 3, 2; of twelfth, dorsal, 1, 0, 3, 1, 1; of first, ventral, 0, 0, 1, 2, 1. Length 8 to 10 mm.

DESCRIPTION.—Light brown or testaceous, the first plate and the caudal margins of several succeeding ones darker; the caudal plates more reddish. Head obscure orange, darker caudad of suture. Antennae testaceous, brighter at tips. Prosternum and prehensorial feet testaceous. Venter very pale excepting the fourteenth and fifteenth plates which are testaceous. Last two pairs of legs bright yellow, of duller hue proximally. Other legs very pale.

Body proportionately wide, in type 7.5 times longer than width of tenth plate. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 58 : 54 : 56 : 67 : 69 : 66, the body being thus distinctly narrowed cephalad with first plate narrower than third and than head.

Head wider than long in ratio 58 : 56 or 55. Widest near lateral interruptions, nearly uniform in width from there to eyes.

Antennae short. Articles toward distal end becoming very short and closely compacted. Ultimate article considerably longer than the two preceding together, ordinarily exceeding them by about one half the length of the third preceding one.

Ocelli mostly nine to eleven in number, arranged in three series: *e. g.*, 1 + 5, 3, 1; 1 + 3, 4, 2; 1 + 3, 4, 3; 1 + 4, 3, 1; 1 + 4, 3, 2. Single ocellus not large. Sclerite ocelli compactly arranged, deeply pigmented.

Prosternum 1.55 + times wider than long. Distance between chitinous spots 2.3 times width at sinus; 4 times length of dental line. Teeth acute, equal; interval between those of each pair somewhat angular; line of apices nearly straight. Sinus v-shaped, with sides slightly concave. Spines of usual form.

First dorsal plate widest a little back of the anterior end, moderately narrowed caudad; caudal margin incurved mesally; plate as a whole about 1.75 times wider than long. Ninth and eleventh plates with corners oblique; those of the thirteenth straight.

Coxal pores small, decreasing proximad; 3, 4, 4, 4.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the third to seventh inclusive, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of the eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the

ninth and tenth, $\begin{smallmatrix} 0, 0, 2, 2, 2; \\ 0, 0, 2, 3, 2; \end{smallmatrix}$; of the eleventh, $\begin{smallmatrix} 1, 0, 2, 2, 2; \\ 0, 0, 2, 3, 2; \end{smallmatrix}$; of the twelfth, $\begin{smallmatrix} 1, 0, 3, 1, 1; \\ 0, 0, 3, 3, 2; \end{smallmatrix}$; of the thirteenth, $\begin{smallmatrix} 1, 0, 3, 1, 1; \\ 0, 1, 3, 3, 2; \end{smallmatrix}$; of the penult, $\begin{smallmatrix} 1, 0, 3, 1, 1; \\ 0, 1, 3, 3, 2; \end{smallmatrix}$; of the anal, $\begin{smallmatrix} 1, 0, 3, 1, 0; \\ 0, 1, 3, 2, 0; \end{smallmatrix}$; claw one. Last two pairs of coxae laterally armed.

Claw of female gonopods short and well curved; rather narrow; tripartite, with teeth acute and the lateral ones smaller and a little proximad of the median. Basal spines of moderate length, stout, in ventral view parallel sided from base to the short but angularly acuminate distal division (Plate 2, fig. 9).

Length 8 to 10 mm. The female type in 9.6 mm. long and has antennae 3.3 mm. long, with tenth dorsal plate 1.27 mm. wide.

TYPE.—M. C. Z., No. 337, Alaska: Forrester Island, May-June, 1913. Harold and R. W. Heath.

PARATYPES.—M. C. Z., No. 403, 404, Alaska: Forrester Island, May-June, 1913. Harold and R. W. Heath.

In general appearance and structure this species much suggests *O. tiganus*. It is a proportionately wider species. The females differ in the form of the claw of the gonopods and conspicuously in the form and proportion of the basal spines. (Cf. Plate 2, fig. 5, 9).

OABIUS DISSIMULANS, sp. nov.

Plate 3, fig. 1-3.

DIAGNOSIS.—Slender; first plate clearly narrower than third and head than tenth. Testaceous to dark brown, head pale orange to ferruginous. Ocelli ten to thirteen in three series. Prosternum 1.45 to 1.48 times wider than long; distance between chitinous spots 4 \neq times dental line; sinus narrowly v-shaped. Lobes of genital forceps small, median but slightly longest; basal spines short and broad. Coxal pores 3, 3, 3, 3 to 3, 4, 4 (5), 3. Claw of anal leg single. Third joint of all legs armed dorsally and ventrally. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 3, 1; of twelfth, dorsal, 1 (0), 0, 3, 1, 1 or 1, 0, 2, 1, 1; of first, ventral, 0, 0, 1, 3, 1. Length 8 to 10.5 mm.

DESCRIPTION.—Dorsum from testaceous to rather dark brown, the first plate often and sometimes the first several plates darker than the others; some of the major plates commonly darkened along caudal borders. The head varies from pale orange in lighter individuals, to ferruginous and dark brown in the darker ones, the region caudad of suture dusky. Antennae brown, often of deep cast, at tips commonly

abruptly light. Prosternum pale orange to dilute ferruginous and brown, the prehensors paler. Venter yellowish to brown, usually dilute, with the caudal plates from light orange in paler specimens to a burnt brown in the darker ones. Legs bright yellow to light orange.

The body is in the typical form mostly from 7.75 to 8.5 times longer than width of tenth plate, but in some individuals may be even as much as 9 or 9.5 times longer. It is distinctly narrowed from tenth plate cephalad, with first plate a very little narrower than the third and than the head. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other nearly as 31 : 30.5 : 31 : 35 : 36 : 34.5.

Head equal in length and breadth, or slightly longer than wide (*e. g.*, 47 : 46) as usual, occasionally even slightly wider than long. Bristles rather long, sparse. Not punctate or furrowed. Of usual form.

Antennae short, reaching to the fifth segment; strongly attenuated distad. Articles short and very short, decreasing distad as usual. Hairs long, not dense.

Each eye consisting mostly of from ten to thirteen ocelli arranged in three or in two series: *e. g.*, 1 + 5, 4, 3; 1 + 5, 3, 2; 1 + 4, 3, 2; 1 + 5, 3, 3; 1 + 3, 4, 3; 1 + 4, 3; 1 + 5, 3; 1 + 4, 2. Single ocellus distinctly largest, subelliptic. Seriate ocelli, excepting caudal one or more of uppermost series, mostly small.

Prosternum mostly from 1.45 + to 1.48 times wider than long. Distance between chitinous spots 2.5 times the width at level of bottom of sinus; $3\frac{1}{3}$ times width at level of bottom of interval between teeth of each pair (which is nearly as deep as bottom of sinus in most related species); and 3.8 to 4 + times the dental line, mostly near the latter ratio. Lateral edge of anterior portion of prosternum straight, and almost in line with outer side of ectal tooth. Sinus very narrowly v-shaped and considerably deeper than usual, the sides straight and at bottom meeting in a narrowly acute angle.

First dorsal plate mostly 1.7 to 1.8 times wider than long; sides evenly convex, diverging moderately cephalad, widest a little caudad of anterior end. Posterior minor plates typically with the caudal corners obliquely excised, with the line of truncature rather long. Posterior plates sometimes obscurely finely roughened. Hairs short and sparse, less sparse caudad. Sternites clothed with short hairs which become more numerous on the caudal ones; the last or pre-genital sternite subdensely clothed with hairs which are mostly longer.

Coxal pores circular, small; on each coxa decreasing rather regularly proximad. Examples of number and arrangement are: 3, 4, 4, 3, the most common; 3, 4, 5, 3; 3, 3, 3, 3; 3, 3, 4, 3.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$; of the second to seventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$ or the second rarely $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 2}$; of the eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the ninth and tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the eleventh, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$ and $\frac{1, 0, 2, 1, 1}{0, 0, 3, 3, 2}$ or $\frac{0, 0, 3, 1, 1}{0, 0, 2, 3, 2}$ or $\frac{1, 0, 3, 1, 1}{0, 0, 2, 3, 2}$, with trochanter sometimes armed on one side, making ventral spines 0, 1, 3, 3, 2; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$ or $\frac{1, 0, 2, 1, 1}{0, 1, 3, 3, 2}$ or $\frac{1, 0, 3, 1, 1}{0, 1, 2, 3, 2}$; of the fourteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 2, 0}$; claw one. Last two pairs of coxae laterally armed.

Posterior legs in both male and female short and uniformly and but little thickened, being comparatively slender.

Gonopods of male small and pale; distally somewhat rounded to obliquely truncate; bearing two, or occasionally three, bristles.

Claw of female gonopods moderate in size and curvature; tripartite, the teeth rather small and nearly equal, the median one being but little largest. Spines comparatively short and broad, with the sides subparallel or even a little diverging from base to apical portion which is rather obtuse, with mostly one or more denticles at base on each side (Plate 3, fig. 1-3). Median process of sternite short, distally very obtusely angular.

Length from 8 to 10 mm. A female 16 mm. long has antennae 3 mm. and anal legs 3.75 mm. long with tenth plate 1.3 mm. wide.

Pseudomaturus.—Coloration mostly as in the paler individuals of *maturus*.

Proportion of body as in *maturus*.

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

Prosternum as in adult; sinus of same characteristic form; teeth a little paler.

Coxal pores as in adult excepting for mostly smaller size: in number, *c. g.*, 3, 3, 3, 3 and 3, 4, 4, 3.

Gonopods of female with claw relatively smaller and paler. Inner basal spine relatively somewhat shorter than in adult and also more slender.

Spines of legs as in *maturus*.

Length 7 to 8 mm.

Immaturus.—Color very dilute, somewhat whitish yellow, the pigment denser toward ends, with violaceous tinge in life. Head yellow of a dilute orange tinge, darker caudad of suture. Antennae yellowish, paler proximally and at very tip than in intermediate portion. Prosternum dilute orange, like the head. Venter whitish, a yellowish tinge evident on caudal plates. Legs very pale, greyish white, with the caudal pairs brighter.

Antennae very short; articles nineteen or twenty, those of distal half especially very short and closely crowded, being proportionately much shorter than in the adult.

Ocelli 1 + 3, 2; small and separated; single ocellus largest.

Prosternum 1.45 + times wider than long; distance between chitinous spots 2.5 times width at sinus, $3\frac{1}{3}$ times dental line. Sinus rather more widely open than in older stages.

First dorsal plate only 1.7 times wider than long. Widths of head and usual series of plates to each other as 33 : 29 : 30.5 : 34 : 33 : 32, the head thus proportionately larger than in *maturus*.

Coxal pores very small; 2, 2, 2, 2.

Spines of first legs, $\frac{0, 0, 0, 0, 1}{0, 0, 0, 1, 1}$; of the second and third, $\frac{0, 0, 0, 1, 1}{0, 0, 0, 1, 1}$; of the fourth to sixth, $\frac{0, 0, 0, 2, 1}{0, 0, 0, 1, 1}$; of the seventh, $\frac{0, 0, 0, 2, 2}{0, 0, 0, 1, 1}$; of the eighth, $\frac{0, 0, 1, 2, 2}{0, 0, 0, 1, 1}$; of the ninth and tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 1, 1}$; of the eleventh, $\frac{0, 0, 2, 1, 2}{0, 0, 1, 1, 1}$; of the twelfth, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 2, 1}$ or $\frac{0, 0, 2, 1, 1}{0, 0, 2, 1, 1}$; of the thirteenth, $\frac{0, 0, 2, 1, 1}{0, 1, 2, 3, 1}$ (the trochanter spine very small); of the penult, $\frac{1, 0, 2, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$. Last pair of coxae laterally armed.

In the specimen described the gonopods of the female are short and pale with the three articles developed. The distal article is glabrous, while the first and second each bear a single bristle. Preceding sternite with one pair of longer bristles. Claw indicated merely as a minute pale point. Basal spines 1 + 1, minute, pale, and acute.

Length of specimen described, 5.7 mm.

TYPE.—M. C. Z., No. 380, California: Pacific Grove. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 322, 375, California: Brookdale; M. C. Z., No. 323, 373, Sausalito; M. C. Z., No. 369, Santa Cruz Island; M. C. Z., No. 370, 376, Pacific Grove; M. C. Z., No. 371, Felton Big Trees; M. C. Z., No. 372, Mill Valley; M. C. Z., No. 379, Berkeley. R. V. Chamberlin.

Also taken in California at Capitola and Santa Barbara.

This species is subject to considerable variation in slenderness. The typical specimens from Pacific Grove vary from 7.5 to 8 times longer than the width of the tenth plate; while those from Sausalito and Mill Valley seem on the average to be considerably more slender, from 9 to 9.5 times longer than width of that plate. The head, too, varies more than usual in its relative length and breadth. The spining, *e. g.* of the twelfth legs, likewise varies, as indicated above. It does not seem possible, however, clearly to establish any well-defined local varieties as intergrades are everywhere to be found. As

a species it is very distinct and easily separated from the others of the genus. The rather limited extent of variation in the form of the characteristic basal spines of the female gonopods may be judged from Plate 3, fig. 1-3, drawn from specimens from Brookdale, Santa Barbara, and Sausalito respectively.

OABIUS SASTIANUS (Chamberlin).

Lithobius sastianus Chamberlin, Proc. Acad. nat. sci. Phil., 1903, 55, p. 157.
Pomona college journ. ent., 1910, 2, p. 371, 374.

DIAGNOSIS.—Moderate; first plate decidedly narrower than third, and the head than the tenth. Brown of somewhat reddish tinge, the posterior legs also brown. Ocelli near ten in three series. Prosternum $1\frac{2}{3}$ times wider than long; distance between chitinous spots $3.5 +$ times the dental line; sinus v-shaped. Median lobe of genital forceps longest; basal spines long and slender, outer longer. Coxal pores very small, 2, 2, 3, 3 to 3, 4, 4, 4. Claw of anal leg single. Third joint of all legs armed dorsally and ventrally. Spines of anal legs, ventral, 0, 1, 3, 3, 1 or 0, 1, 3, 2, 1, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 3, 2; of twelfth, dorsal, 0, 0, 3, 2, 2; of first ventral, 0, 0, 1, 2, 1 to 0, 0, 1, 3, 2. Length 8 to 10 mm.

DESCRIPTION.—Dorsum and head with antennae brown of somewhat reddish tinge; antennae pale distad as usual. Venter paler brown. Most legs yellowish, the posterior pairs brown.

Body moderate, in the types being from 7 (♀) to 8.5 (♂) times longer than width of the tenth plate. Moderately narrowed cephalad, with first plate of same width as tenth and narrower than head. Ratio of widths of head and of first, third, eighth, tenth, and twelfth plates near 49 : 45 : 45 : 53 : 53 : 52.

Head equal in length and breadth or very nearly so. Widest near marginal breaks, between which and the eyes the sides are nearly straight. Bristles few, long.

Antennae short, reaching the fifth segment. Composed of the usual twenty short and very short articles which decrease in length from the third distad.

Each eye composed of about ten ocelli which are arranged in three series: *e. g.*, 1 + 4, 3, 2. Ocelli decreasing in size from the dorsal row ventrad.

Prosternum $1\frac{2}{3}$ times wider than long. Distance between chitinous spots 2 times the width at level of bottom of sinus; $3.55 +$

times the dental line. Teeth small, the interval between those of each pair relatively wide, semicircular. Mesal incision v-shaped. Spine distally bristle-like as usual.

First dorsal plate nearly 1.8 times wider than long; conspicuously narrowing from anterior end caudad. Posterior angles of the ninth, eleventh, and thirteenth dorsal plates straight or with a tendency to very slight extension, not at all excised.

Coxal pores very small: 2, 2, 3, 3; 2, 3, 3, 3; 3, 4, 4, 4.

Spines of first legs, $\begin{smallmatrix} 0, 0, 1, 2, 1 \\ 0, 0, 1, 2, 1 \end{smallmatrix}$ to $\begin{smallmatrix} 0, 0, 2, 2, 1 \\ 0, 0, 1, 3, 2 \end{smallmatrix}$; of second, $\begin{smallmatrix} 0, 0, 1, 2, 2 \\ 0, 0, 1, 3, 1 \end{smallmatrix}$ to $\begin{smallmatrix} 0, 0, 2, 2, 2 \\ 0, 0, 1, 3, 2 \end{smallmatrix}$; of third to fifth, $\begin{smallmatrix} 0, 0, 2, 2, 2 \\ 0, 0, 2, 3, 1 \end{smallmatrix}$ to $\begin{smallmatrix} 0, 0, 3, 2, 2 \\ 0, 0, 2, 3, 2 \end{smallmatrix}$; of sixth to ninth, $\begin{smallmatrix} 0, 0, 2, 2, 2 \\ 0, 0, 2, 3, 2 \end{smallmatrix}$ or $\begin{smallmatrix} 0, 0, 3, 2, 2 \\ 0, 0, 2, 3, 2 \end{smallmatrix}$; of the tenth and eleventh, $\begin{smallmatrix} 0, 0, 3, 2, 2 \\ 0, 0, 2, 3, 2 \end{smallmatrix}$; of the twelfth, $\begin{smallmatrix} 0, 0, 3, 2, 2 \\ 0, 0, 2, 3, 2 \end{smallmatrix}$ or $\begin{smallmatrix} 0, 0, 3, 2, 2 \\ 0, 0, 3, 3, 2 \end{smallmatrix}$; of the thirteenth, $\begin{smallmatrix} 1, 0, 3, 1, 1 \\ 0, 1, 3, 3, 2 \end{smallmatrix}$; of the penult, $\begin{smallmatrix} 1, 0, 3, 1, 1 \\ 0, 1, 3, 3, 2 \end{smallmatrix}$; of the anal, $\begin{smallmatrix} 1, 0, 3, 1, 0 \\ 0, 1, 3, 3, 1 \end{smallmatrix}$, with one claw. Last two pairs of coxae laterally armed.

Anal and penult legs in both sexes moderately uniformly inflated.

Claw of female gonopods of moderate length, well curved; distinctly tripartite with the middle lobe somewhat longest as usual. Basal spines moderately long and slender; acuminate from base to apex, with the outer longer than the inner.

Length of types from 8 to 8.5 mm. A male 8.5 mm. long has antennae 2.8 mm. and anal leg 2.8 mm. long with width of tenth plate 1 mm. A female 8 mm. long has tenth plate 1.13 mm. wide.

TYPE.—M. C. Z., No. 336, California: Shasta Springs. R. V. Chamberlin.

A divergent species known only from the types, a single pair.

OABIUS TABIPHILUS, sp. nov.

Plate 1, fig. 9; Plate 2, fig. 8.

DIAGNOSIS.—Body moderate, first plate much narrower than third and head a little narrower than tenth. Dorsum dilute orange-yellow, head the same or a little deeper. Ocelli seven to eleven in two or three series. Prosternum 1.5 to 1.6 times wider than long; distance between chitinous spots 3.5 to 3.8 times the dental line; sinus narrowly v-shaped. Lobes of female genital forceps short and blunt, median but little longest; basal spines small. Coxal pores 3, 3, 3, 3-3, 4, 4, 3. Claw of anal leg single. Third joint of all legs armed dorsally and ventrally. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 0, 0; of penult, ventral, 0, 1, 3, 3, 1; of twelfth, dorsal,

1, 0, 3, 1, 2 or 1, 0, 3, 1, 1; of first legs, ventral, 0, 0, 1, 3, 1. Length 7-10 mm.

DESCRIPTION.—Dorsum dilute orange-yellow to light brownish yellow. Head like dorsum or with orange a little deeper; the frontal region pale. Antennae dilute orange-yellow, paler distad. Prothorax like head but more dilute. Venter pale yellowish, excepting the posterior plates which are light orange. Legs very pale or whitish yellow excepting the posterior pairs which are more densely pigmented, commonly bright lemon-yellow.

Body proportionately wide the length being from 7.25 to 8 times greater than width of the tenth dorsal plate. Body only moderately narrowed cephalad, the widths of head and of first, third, eighth, tenth, and twelfth dorsal plates being to each other about as 28 : 26 : 27.5 : 32 : 32 : 31.

Head usually slightly longer than wide (28 : 27). Of the usual form.

Antennae very short, reaching the fifth segment; moderately attenuated distad but tip not very slender. The twenty articles mostly very short and closely compacted, decreasing distad from the second or third.

Ocelli of each eye (Plate 1, fig. 9) from seven to eleven in number, arranged in two or three series: *e. g.*, 1 + 3, 3; 1 + 4, 4; 1 + 4, 3; 1 + 2, 3, 2; 1 + 4, 3, 2; 1 + 4, 4, 2. Single ocellus of about same size as most caudal one of upper series, or sometimes smaller and at others somewhat larger. Ocelli decreasing in size cephalad and ventrad, those of third series, when present, commonly very small.

Prothorax 1.5 to 1.6 times wider than long. Distance between chitinous spots 2.5 to 2.8 times width at bottom of sinus, 3.5 to 3.6 times as great as length of dental line. Teeth small, dark tipped. Sinus narrowly v-shaped, but sides a little concave. Spine nearly as in related species, stout at base and bristle-like distally; straight or nearly so.

First dorsal plate 1.73 to 1.75 times wider than long; caudal corners well rounded; sides moderately diverging cephalad. Eleventh and thirteenth plates with caudal margins straight or corners showing even a slight tendency toward extension, not at all excised.

Coxal pores small, circular, the most proximal often much smallest: 3, 4, 4, 3; 3, 3, 3, 3.

Spines of first legs, $\begin{smallmatrix} 0, 0, 2, 2, 1 \\ 0, 0, 1, 3, 1 \end{smallmatrix}$; of the second to seventh, $\begin{smallmatrix} 0, 0, 2, 2, 2 \\ 0, 0, 1, 3, 2 \end{smallmatrix}$; of the eighth to tenth, $\begin{smallmatrix} 0, 0, 2, 2, 2 \\ 0, 0, 2, 3, 2 \end{smallmatrix}$; of the eleventh, $\begin{smallmatrix} 0, 0, 3, 2, 2 \\ 0, 0, 2, 3, 2 \end{smallmatrix}$; of the

twelfth, $\frac{1, 0, 3, 1, 2}{0, 0, 3, 3, 2}$ or $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 0, 0}{0, 1, 3, 2, 0}$; claw one. Last two pairs of coxae laterally armed.

Anal and penult pairs of legs in both sexes short and rather slender, being but moderately uniformly thickened as in *O. tiganus*, etc., scarcely if at all more so in male than in female.

Gonopods of male considerably extended; pale; slender. In ventral view commonly appearing rounded apically but sometimes subtruncate. Bearing mostly two bristles.

Claw of female gonopods moderately bent and concave; tripartite with the teeth blunt and short, the median one being a little longest. Spines (Plate 2, fig. 8) small; broadest at base, the sides incurving and moderately converging to the acuminate distal division; apex rounded. Process of sternite distally truncate or slightly convex.

Length from 7 to 10 mm. A male 8.5 mm. long has antennae and anal legs both 3 mm. long, and the tenth plate 1.17 mm. wide.

Pseudomaturus.—Coloration as in *maturus*.

Antennae very short. Articles distad of second very short and closely compacted. Ultimate article in specimen described longer than the two preceding together and nearly equalling the three preceding.

Ocelli 1 + 4, 4. The first ocellus of dorsal series largest, the single one small. Ocelli somewhat irregular in form, size, and position.

Prosternum 1.4 times wider than long. Distance between chitinous spots 2.4 times width at level of bottom of sinus; 3.8 times the length of dental line. Line of apices of teeth a little recurved.

Coxal pores 3, 3, 3, 2 - 3, 3, 4, 2.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$; of the eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of others as given for *maturus*.

Length of specimen described (a ♂) 6.5 + mm.

Praematurus (Late).—Color as in *maturus* or somewhat paler throughout.

Antennae as in *pseudomaturus*.

Ocelli 1 + 3, 2; 1 + 4, 3. First ocellus of dorsal series the largest.

Prosternum nearly as in *maturus*; teeth smaller and more acute. 1.47 times wider than long. Distance between chitinous spots $2\frac{1}{3}$ times width at level of bottom of sinus; 3.5 times dental line.

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

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 0, 2, 1}$; of the second, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$ (left) or $\frac{0, 0, 1, 2, 1}{0, 0, 0, 2, 1}$ (right); of the third, $\frac{0, 0, 2, 2, 2}{0, 0, 0, 2, 1}$ (left) or $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$ (right); of the fourth

to eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 0, 2, 1}$; of the ninth and tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of the eleventh, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 0, 0}{0, 1, 3, 2, 0}$. Last two pairs of coxae laterally armed.

Claw of female gonopods short and pale; the lateral teeth considerably the smaller. Inner spine about two thirds as long as the outer; both acuminate from base.

Length (♀) about 6.5 mm.

Immaturus.—Of a pale, slightly yellowish, tinge, the head and most caudal segments being of a denser yellow. Anal legs nearly white, darker proximad. Antennae pale yellow.

Antennae with articles rather more loosely joined than in the later stages, submoniliform.

Ocelli 1 + 3, 2. The single ocellus and the first two of the dorsal series largest and about equal in size; the others distinctly smaller; pale and well separated.

Prosternal teeth pale, in relative size and form as in *praematurus* or nearly so, 1.5 times wider than long. Distance between chitinous spots only 2.1 times width at bottom of sinus; 3 times length of dental line.

Coxal pores very small and pale margined; 2, 3, 3, 2.

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 0, 2, 1}$; of the second and third, $\frac{0, 0, 0, 2, 1}{0, 0, 0, 2, 1}$; of the fourth to seventh, $\frac{0, 0, 0, 2, 2}{0, 0, 0, 2, 1}$; of the eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 0, 2, 1}$; of the ninth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$; of the tenth and eleventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$; of the twelfth, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 1, 1}$; of the thirteenth, $\frac{0, 0, 3, 1, 1}{0, 1, 2, 3, 1}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 0, 0}{0, 1, 3, 2, 0}$. Last two pairs of coxae laterally armed.

Female gonopods short and pale but distinctly triarticulate. Ultimate article with claw represented by a slight pale and acute spinule or tooth; without hairs. Second article apparently with a single short ventral bristle. First article with two ventral bristles. Spines 1 + 1, small and pale, acutely conical.

Length ad 6 mm.

Agentialis II.—Pale, the yellowish tinge very dilute, clearer in head and prosternum and on caudal segments. Anal legs white with a tinge of yellow.

Articles of antennae distad of the second very short; the ultimate article proportionately longer than in older stages, being equal in length to the four preceding taken together, or very nearly so.

Ocelli 1 + 3. The two caudal ocelli of the series proper the largest,

irregular; the single one a little smaller and the most anterior one much smaller; middle ocellus of series a little lower than the other two. Organ of Tömösvary in outline larger than anyone of the ocelli.

Prosternum essentially as in later stages (specimen measured had prosternum 1.55 times wider than long; distance between chitinous spots 2.4 times width at sinus and 3.7 times the dental line).

Coxal pores, 1, 2, 2, 2.

Spines of first legs, $\frac{0,0,0,1,1}{0,0,0,0,1}$; of the second to sixth, $\frac{0,0,0,1,1}{0,0,0,1,1}$; of the seventh to ninth, $\frac{0,0,0,2,1}{0,0,0,1,1}$; of the tenth, $\frac{0,0,0,2,1}{0,0,1,1,1}$; of the eleventh, $\frac{0,0,0,2,2}{0,0,1,1,1}$; of the twelfth, $\frac{0,0,2,1,1}{0,0,1,2,1}$; of the thirteenth, $\frac{0,0,2,1,1}{0,1,1,1,1}$; of the penult, $\frac{0,0,2,1,0}{0,1,3,2,1}$; of the anal, $\frac{0,0,2,0,0}{0,1,3,2,0}$. None of coxae armed.

Gonopods of male appearing as slight, rounded, and wholly glabrous protuberances.

Gonopods of female appearing as much longer processes which are slender and conically pointed; biarticulate; glabrous; with no trace of claw or of basal spines.

In the male studied there is no longer any trace of anal glands; but in a female, the glands are traceable in an apparently degenerate condition.

Length of a female 5.3 mm.; of a male, 5.7 mm.

TYPES.—M. C. Z., No. 411, California: Santa Barbara. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 328-333, 407-410, California: Santa Barbara. R. V. Chamberlin.

Many specimens of this divergent and very distinct species were collected by the author in June, 1909, and in March, 1913. It is most easily detected through the uniform absence of any dorsal spine on the fourth joint of the anal legs.

OABIUS (NYCTOBIUS) DECIPIENS, sp. nov.

Plate 3, fig. 5.

DIAGNOSIS.—Slender; first plate decidedly narrower than third; head wider than long, narrower than tenth plate. Testaceous to light chestnut; head brown to chestnut. Ocelli eight to ten in three series, the single ocellus distinctly largest. Prosternum less than 1.5 times wider than long; distance between chitinous spots 3.4— times dental line; sinus wide and shallow. Lobes of genital forceps short, median little longest; basal spines short and broad. Coxal pores

1, 2, 2, 2 to 3, 4, 4, 3, small. Anal leg with two claws. Third joint of all legs armed dorsally and ventrally. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 3, 1; of thirteenth, ventral, 0, 1, 2, 3, 2 or, rarely 0, 1, 3, 3, 2; of twelfth, dorsal, 1, 0, 3, 1, 1; of first, ventral, 0, 0, 1, 2, 1. Length 8.5 to 10 mm.

DESCRIPTION.—Dorsum testaceous to light chestnut, with the first and the last plates darker than the median. Head brown to chestnut. Antennae nearly same color as head; paler at tips. Prosternum similar to head but somewhat paler. Venter pale testaceous to dilute brown, the caudal plates darker. Legs nearly same in color as the contiguous plates of venter, the posterior pairs being thus darker, but these paler along mesal and ventral surfaces, especially distad.

Body in types from 8.5 to 9 times longer than width of the tenth plate. Rather conspicuously narrowed cephalad, with the first plate much narrower than the third. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other about as 27 : 25 : 28 : 32 : 33 : 30.

Head wider than long (27 : 26). Subrotund; the sides well rounded posteriorly; caudal margin mesally straight. On the caudal portion are two rather distinctly impressed furrows which diverge forwards.

Antennae short, reaching the fifth segment. Articles short, decreasing in size distad, the last ones being decidedly shorter than the proximal ones. Hairs moderately long.

Each eye consisting of from eight to ten ocelli arranged in two or three series: *e. g.*, 1 + 4, 4; 1 + 4, 3; 1 + 1, 4, 3; 1 + 3, 3, 1; 1 + 2, 4, 1. All ocelli rather large; the single one distinctly largest.

Prosternum 1.47 times wider than long. Distance between chitinous spots 2.2 times the width at level of bottom of sinus; 3.36 times the dental line. Teeth small and acute with sides more or less incurved; line of apices recurved. Sinus wide and rather shallow; sides and bottom rounded.

First dorsal plate $1\frac{2}{3}$ times wider than long; sides widely rounded behind, diverging moderately cephalad. Dorsum smooth and shining or but finely and obscurely roughened caudad.

Coxal pores small, decreasing proximad as usual. In number and arrangement, *e. g.*, 1, 2, 2, 2; 2, 2, 2, 2; 2, 3, 3, 2; 3, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 1, 1(2), 1}{0, 0, 1, 2, 1}$; of the second to seventh, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$; of the eighth and ninth, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 2}$; of the tenth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$; of the eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 1}{0, 0, 2, 3, 2}$ or $\frac{1, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 2, 3, 2}$ or occasionally $\frac{1, 0, 3, 1, 1}{0, 1, 2, 3, 2}$; of the penult,

$\begin{matrix} 1, 0, 3, 1, 1 \\ 0, 1, 3, 3, 1 \end{matrix}$; of the anal, $\begin{matrix} 1, 0, 3, 1, 0 \\ 0, 1, 3, 2, 0 \end{matrix}$; claws two. Last two pairs of coxae laterally armed.

Anal and penult legs very short; slender; fourth and fifth articles weakly longitudinally furrowed dorsally.

Claw of female gonopods short and relatively wide; tripartite, with the lobes short, the median being not much longest. Spines wide and short, the sides parallel from base to the short acuminate distal portion; the latter subacute but with apex narrowly rounded (Plate 3, fig. 5). Inner side of first article convex.

Length of types from 8.5 to 10 mm. A female 8.5 mm. long has antennae 2.8 mm. long and tenth dorsal plate 1 mm. wide.

TYPE.—M. C. Z., No. 405, California: Pacific Grove. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 334, California: Pacific Grove. R. V. Chamberlin.

OABIUS (NYCTOBIUS) INEPTUS, sp. nov.

Plate 2, fig. 3, 4; Plate 3, fig. 4.

DIAGNOSIS.—Moderate; first plate narrower than third and head a little narrower than tenth. Dark brown, chestnut at ends, head and first tergite deeper chestnut. Ocelli six or seven in two series, the single ocellus clearly largest. Prosternum near 1.65 times wider than long; distance between chitinous spots 3.25+ times the dental line. Lobes of genital forceps short and rounded; basal spines short and broad, close together, outer spine but little longer than inner, not more robust. Coxal pores small, 1, 2, 2, 2-2, 2, 2, 2. Anal leg with two claws. Third joint of all legs armed dorsally and ventrally. Spines of anal legs, ventral, 0, 1, 3, 2, 0, dorsal, 1, 0, 3, 1, 0; of penult, ventral, 0, 1, 3, 3, 1; of thirteenth, ventral, 0, 1, 2, 3, 2; of twelfth, dorsal, 0, 0, 3, 1, 1; of first, ventral, 0, 0, 1, 2, 1. Length 7-7.3 mm.

DESCRIPTION.—Dark brown or chestnut, deeper chestnut anteriorly and posteriorly. Head and first dorsal plate deeper in color, appearing almost black caudad of the suture in front of which it is rather pale. Antennae chestnut, paler distally. Prosternum dark chestnut. Venter brown, the anterior and posterior plates darker and the latter especially more reddish. Legs brown.

Body 7.5 to 8 times longer than width of tenth plate; conspicuously narrowed cephalad to the first plate, with the head rather large. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other nearly as 25 : 23 : 25 : 27 : 27 : 27.

Head subrotund as in *O. decipiens*, the sides being conspicuously convex. Clearly wider than long, the ratio being near 25 : 23.

Antennae short as usual. Articles nineteen or twenty; decreasing in size distad as in other species.

In types, the ocelli are six or seven in number and are arranged in two series: *e. g.*, 1 + 3, 2; 1 + 3, 3. Single ocellus clearly largest though proportionately smaller than in *O. decipiens*. Other ocelli of moderate size.

Teeth of prosternum moderate; acute, with sides straight and intervals angular; inner tooth larger than the outer and the line of apices straight or nearly so. Prosternum 1.65 times wider than long. Distance between chitinous spots 2.1 times width at level of bottom of sinus; 3.26 times the dental line.

First dorsal plate with the sides between the rounded anterior and posterior portions nearly straight, moderately diverging cephalad; 1.9 times wider than long. Plates strongly arched, smooth and shining.

Coxal pores 1, 2, 2, 2 - 2, 2, 2, small.

Spines of first legs, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$; of the second to seventh or thereabout, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$; of the eighth and ninth, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$; of the tenth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$; of the eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 2, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 2, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$; claws 2. Last two pairs of coxae laterally armed. Spining thus as in *O. decipiens*.

Anal and penult legs short; a little and uniformly thickened.

Claw of female gonopods (Plate 2, fig. 3) relatively wide and short, moderately curved; tripartite with the lobes small and distally obtusely rounded, the median longest though not greatly so. Basal spines (Plate 2, fig. 4; Plate 3, fig. 4) of each side close together on a distinct low lobe or tubercle; broad, with the sides parallel or a little diverging from base to the acuminate apical portion which is subacute. Sternal process distally subacutely rounded.

Length of types 7 to 7.3 mm. A female 7.3 mm. long has antennae 2.6 mm. long and anal leg 2.8 mm. long, and the tenth dorsal plate .98 mm. wide.

TYPE.—M. C. Z., No. 335, Oregon; Portland, August, 1902. R. V. Chamberlin.

PARATYPE.—M. C. Z., No. 406, Oregon: Portland, August, 1902. R. V. Chamberlin.

The types consist of two specimens.

This species is very close in general structure to *O. decipiens*. These two species, aside from differing in size, in ocelli, in proportions of prosternum, and of first dorsal plate, etc., are at once to be separated by the differences in the basal spines of the female gonopods (Plate 3, fig. 4, 5).

KIBERBIUS, gen. nov.

Head with the usual marginal interruptions.

Antennae short; composed normally of twenty articles.

Eyes composed of from one to three series of ocelli. Single ocellus but little enlarged.

Prosternal teeth 2 + 2; small; the dental line short with line of apices straight or a little recurved. Median sinus wide v-shaped.

Posterior angles of none of the dorsal plates produced.

Coxal pores small and circular, uniseriate.

Claw of female gonopods tripartite with the median not greatly exceeding the lateral. Basal spines long and slender; 2 + 2. Gonopods of male uniaarticulate.

Tarsi of anterior legs with division typically indicated by difference in diameter, clear transverse line and partial suture (Plate 4, fig. 6), but indication of division may be lacking (in *K. nannus* only).

Anal legs in both sexes conspicuously longitudinally furrowed along the mesal surface, the furrow broad and deep and the leg having a consequent thin or flattened appearance (Plate 5, fig. 1). None of the coxae laterally armed. None of the legs cephalad of the twelfth having the third joint with three dorsal spines. Legs between the first or second and the twelfth pairs all with the fifth joint bearing two dorsal spines. Dorsal spines of anal legs 1, 0, 3, 1, 0; ventral 0, 1, 3, 2, 0 or 0, 1, 3, 1, 0 (in *K. nannus* only); claw single. Dorsal spines of penult legs, 1, 0, 3, 1, 1 or 1, 0, 2, 1, 1; ventral 0, 1, 3, 3, 1 to 0, 1, 2, 3, 0 (*K. nannus*); claws 3, the anterior one distinct, long, straight and spine-like. Dorsal spines of thirteenth legs, 1, 0, 3, 1, 1 or 1, 0, 2, 1, 1; ventral, 0, 0, 2, 3, 2 or 0, 0, 2, 3, 1. Dorsal spines of twelfth legs, 0, 0, 2, 1, 1; ventral, 0, 0, 2, 3, 2 or 0, 0, 1, 3, 2. Dorsal spines of eleventh, 0, 0, 2, 2, 2 or 0, 0, 0, 2, 2; ventral, 0, 0, 2, 3, 2 to 0, 0, 0, 3, 2. Dorsal spines of first legs, 0, 0, 1, 1, 1 or 0, 0, 1, 2, 1; ventral, 0, 0, 1, 1, 1 or 0, 0, 1, 2, 1.

Length under 9 mm.

TYPE.—*K. ogmopus*, sp. nov.

This genus, at present represented by three Californian species, is most readily distinguished by the presence in males and females alike of the conspicuous wide and deep longitudinal furrow along mesal surface of anal legs or by a pronounced corresponding flattening of the same. The genus is also separable through the absence of lateral spines from the posterior coxae.

Key to Species of Kiberbius.

- a.* Ventral spines of anal leg, 0, 1, 3, 1, 0; third joint of all or most legs between second and twelfth unarmed dorsally; length under 7 mm. *K. nannus*, sp. nov.
- aa.* Ventral spines of anal legs, 0, 1, 3, 2, 0; third joint of all legs dorsally armed; length 8 mm. or more.
- b.* Head longer than wide, of nearly same width as tenth plate; first and third plates of same width or very nearly so.
K. remex (Chamberlin)
- bb.* Head equal in length and breadth; head distinctly narrower than the tenth plate and the first plate than the third.
K. ogmopus, sp. nov.

KIBERBIUS OGMOPUS, sp. nov.

Plate 4, fig. 5, 6; Plate 5, fig. 1-3.

DIAGNOSIS.—Body moderately stout; first dorsal plate 1.6 times wider than long, narrower than the third; head equal in length and breadth, narrower than tenth plate. Pale brown, first and last plates darker; head dark brown. Ocelli about ten in three series. Prosternum 1.5 + times wider than long; distance between chitinous spots 4.25 — times dental line. Lobes of genital forceps acute; basal spines long and slender, narrowing toward middle. Coxal pores 2, 2, 2, 2. Third joint of all legs dorsally armed. Spines of anal legs, ventral, 0, 1, 3, 2, 0; of penult legs, ventral, 0, 1, 3, 3, 1, dorsal, 1, 0, 3, 1, 1; of twelfth, ventral, 0, 0, 2, 3, 2; of first, ventral, 0, 0, 1, 2, 1, dorsal, 0, 0, 1, 1, 1. Length 8 to 9 mm.

DESCRIPTION.—Dorsum pale brown; the anterior plates darker and suffused with purplish; the posterior plates also darker. Antennae light purplish brown, paler at tips. Prosternum pale brownish. Venter very pale mesally, the anterior portion strongly suffused with



FIG. 2.— Distribution of *Kiberbius*.

purplish, the caudal ones distinctly darker. Anal and penult legs more or less suffused with purplish proximad of the tarsi.

Body typically from 7.5 to 8 times longer than width of tenth plate; conspicuously narrowed cephalad, the widths of head and of first, third, eighth, tenth, and twelfth plates in female type to each other as 47 : 42 : 49 : 55 : 55 : 52, the first plate thus conspicuously narrower than the third.

Head subcordate; caudal margin straight. Equal in length and breadth or a very little wider than long (Plate 4, fig. 5).

Antennae moderately short. Articles of medium length; sub-cylindric; not closely compacted; those immediately preceding the ultimate short. Ultimate longer than the two preceding together.

Each eye consisting mostly of about ten ocelli arranged in three series: *e. g.*, 1 + 4, 3, 2. Ocelli of purplish cast. Single ocellus paler and a little largest. Those of most ventral row considerably smaller than the others. Organ of Tömösvary in outline about size of the smaller ocelli.

Prosternum (Plate 4, fig. 6) 1.53 times wider than long. Distance between chitinous spots 2.57 times width at level of bottom of sinus; 4.23 times the dental line. Teeth acute with sides straight; line of apices only slightly recurved. Sides sloping directly from ectal tooth. Spine of usual type.

First dorsal plate only moderately narrowed caudad; caudal margin slightly mesally incurved; 1.6 times wider than long. Posterior corners of thirteenth dorsal plate straight; of the ninth and eleventh rounded or shortly obliquely truncate.

Coxal pores 2, 2, 2, 2.

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

Anal leg short. The tibia and the tarsal joints characteristically very deeply longitudinally furrowed or channelled along ventral surface, the femur less deeply so (Plate 5, fig. 1). The penult leg has the tibia and tarsi similarly but much less conspicuously furrowed.

Claw of female gonopods short and proportionately wide; tripartite, the teeth and the incisions between them acute. Basal

spines relatively long and slender, the outer one in ventral aspect appearing narrowest near middle of length, the distal division short and acute; inner spine presenting edge ventrad and appearing in outline acutely acuminate from the very base (Plate 5, fig. 3).

Length mostly 8 to 9 mm.

TYPE.—M. C. Z., No. 339, California: Eaton's Canyon, near Altadena. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 419, California: Eaton's Canyon, near Altadena. R. V. Chamberlin.

The specific name of this species refers to the characteristic channelling of the anal legs.

KIBERBIUS NANNUS, sp. nov.

Plate 4, fig. 7; Plate 5, fig. 4.

DIAGNOSIS.—Slender; first plate 1.6— times wider than long, much narrower than third; head longer than wide, narrower than tenth plate. Yellow, the head brightest. Ocelli four or five in one or two series. Prosternum 1.5— times wider than long; distance between chitinous spots four times the dental line; sinus v-shaped. Median lobe of genital forceps considerably longest; basal spines long and slender, inner nearly as long as outer. Coxal pores 1, 1, 1, 1. Third joint of all or most legs between second and twelfth unarmed dorsally or ventrally. Spines of anal legs, ventral, 0, 1, 3, 1, 0; of penult, ventral, 0, 1, 2, 3, 0, dorsal, 1, 0, 2, 1, 1; of twelfth, ventral, 0, 0, 1, 3, 2; of first, ventral, 0, 0, 1, 1, 1, dorsal, 0, 0, 1, 1, 1 or 0, 0, 1, 2, 1. Length 6 + mm.

DESCRIPTION.—Yellow. The head and posterior segments a brighter yellow. Antennae and posterior legs yellow.

Body between 8.5 and 9 times longer than width of tenth plate. Conspicuously narrowed cephalad. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 35 : 33 : 37 : 43 : 44 : 42, the first plate thus being considerably narrower than the third.

Head (Plate 4, fig. 7) strongly narrowed cephalad of the eyes. Caudal margin straight. Considerably longer than wide (39 : 35).

Antennae short. Articles short and decreasing cephalad in the usual way. Ultimate article distinctly longer than the two preceding together.

Ocelli in type three or four in one or two series: *e. g.*, 1 + 3; 1 + 3.1. Single ocellus not specially enlarged.

Prosternum 1.48 times wider than long. Distance between chitinous spots 2.9 times width at level of bottom of median sinus; 4-times the dental line. Prosternal teeth small, the mesal one of each pair in the type somewhat larger than the outer and the line of apices thus straight or very slightly procurved. Sinus v-shaped with the sides a little convex.

First dorsal plate gradually narrowed caudad of the middle with posterior corners well rounded; caudal margin slightly incurved mesally. Plate as a whole 1.57 times wider than long.

Coxal pores 1, 1, 1, 1.

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

Last three joints of the anal legs conspicuously longitudinally channelled along mesal side as in *K. ogmopus* but not quite so strongly so.

Claw of female gonopods scarcely curved, being nearly flat; tripartite, with the median lobe decidedly longest, the lateral ones at same level considerably proximad of distal one. Basal spines especially long and slender, the inner as long as or nearly as long as the outer; in ventral view the spines are narrowed gradually from base but the sides incurve midway between base and apical portion (Plate 5, fig. 4).

Length of female type, 6.2 mm.; width of tenth plate .7 mm.

TYPE.—M. C. Z., No. 340, California: Eaton's Canyon near Altadena, April, 1913. R. V. Chamberlin.

At first, it seemed likely that this form was to be identified with an immature stage of the preceding species because of certain apparently immature features, such as, to some extent, the spining of the legs. However, the gonopods are large and fully developed with no suggestion whatsoever of immaturity. Upon clearing and mounting the specimen showed well-developed eggs within the body.

KIBERBIUS REMEX (Chamberlin).

Lithobius remex Chamberlin, Proc. Acad. nat. sci. Phil., 1903, 55, p. 156;
Pomona college journ. ent., 1910, 2, p. 370, 374.

DIAGNOSIS.—Body moderate; head longer than wide of nearly same width as tenth plate; first dorsal plate 1.8 times wider than long. Brown. Ocelli about six in two series. Prosternum 1.6 times wider than long. Coxal pores 3, 4, 4, 3. Third joint of all legs dorsally armed. Spines of anal legs, ventral, 0, 1, 3, 2, 0; of the first, ventral, 0, 0, 1, 2, 1. Length 8 mm.

DESCRIPTION.—Head and dorsum brown. Legs pale brown.

Body slightly less than 8 times longer than width of tenth plate. Body nearly parallel sided, the head and the tenth plate of same width. Widths of head and of first, third, eighth, and tenth plates to each other as 28 : 26 : 26 : 27 : 28, the third and first plates being of same width and the head much wider than the first.

Head cordate, considerably more strongly narrowed cephalad of eyes than usual. Widest near marginal interruptions. Longer than wide in ratio 15 : 14, very nearly. Hairs long, few.

Antennae short. Consisting of the usual twenty articles which, excepting the first two and the ultimate, are short. Ultimate nearly equalling the three preceding taken together.

Eye consisting of six ocelli arranged in two longitudinal series: *e. g.*, 1 + 3, 2; 1 + 2, 3. Deeply pigmented. Single ocellus but little enlarged. Those of upper series larger than those of lower.

Prosternum 1.6 times wider than long. Teeth of moderate size with sides somewhat concave and apices narrowly rounded. Spine as usual.

First dorsal plate with sides convex toward ends but between these nearly straight, considerably diverging cephalad. Posterior minor plates with their corners obliquely truncate, the line of truncation making only a slight angle with the posterior margin. Hairs short and very sparse.

Coxal pores of moderate size: 3, 4, 4, 3.

Ventral spines of first legs, 0, 0, 1, 2, 1; of the sixth and seventh, 0, 0, 1, 3, 2; of the ninth, 0, 0, 2, 3, 2; of the anal, 0, 1, 3, 2, 0.

Anal legs distally conspicuously flattened with tarsus somewhat clavately widening distad. Proximal joints laterally longitudinally sulcate and at some time complanate.

Length 8 mm.; width of tenth plate 1 + mm.; length of antenna and of anal leg, 2.9 mm.

TYPE LOCALITY.—California: Shasta Springs, 1902. R. V. Chamberlin.

Known only from the type specimens.

PAOBIUS, gen. nov.

Lateral margins of head continuous, without any abrupt interruptions (Plate 4, fig. 3).

Antennae short, consisting normally of twenty articles.

Eyes composed of ocelli arranged in two or three series. Single ocellus differentiated, equal to or larger than largest of others.

Prosternal teeth 2 + 2, with line of apices straight or nearly so, and the dental line one fourth or less the distance between the chitinous spots. Sinus proportionately large, v-shaped. Spine stout at base but distally attenuated and bristle-like (Plate 3, fig. 3).

Posterior angles of none of the dorsal plates produced.

Coxal pores small and circular, uniseriate.

Claw of female gonopods tripartite; the lateral lobes equal and at same level, smaller than the median though not much so; or bipartite and with lobes equal. Basal spines 2 + 2, long and narrowest near middle (Plate 4, figs. 2, 4).

Tarsi of anterior legs with division indicated by a pale transverse line.

Anal and penult legs without special lobes or other modifications in either sex. Last one or two pairs of coxae laterally armed or rarely, none laterally armed (*P. vagrans*). Third joint of all but the first pair of legs with three dorsal spines or rarely that of first 12 or 13 pairs with but 2 (*P. vagrans*). First seven to eleven pairs of legs with but a single dorsal spine on the fifth joint. Dorsal spines of anal legs 1, 0, 3, 0, 0 or 1, 0, 3, 1, 0; ventral, 0, 1, 3, 2, 0; claw single. Dorsal spines of penult legs 1, 0, 3, 1, 0; ventral, 0, 1, 3, 3, 1; claws 3, the anterior accessory being long, straight and spine-like. Dorsal spines of thirteenth legs 1, 0, 3, 1, 0 or 1, 0, 3, 1, 1; ventral, 0, 1, 3, 3, 2 to 0, 1, 2, 3, 2 or 0, 0, 2, 3, 2 and 0, 1, 3, 3, 1. Dorsal spines of twelfth legs 1, 0, 3, 1, 0 to 0, 0, 3, 1, 1 and 1, 0, 2, 1, 1; ventral, 0, 0, 2, 3, 2. Dorsal spines of eleventh legs 0, 0, 3, 1, 1 to 0, 0, 2, 1, 2 and 0, 0, 3, 2, 2; ventral, 0, 0, 2, 3, 1 or 0, 0, 2, 3, 2. Dorsal spines of first legs 0, 0, 1, 1, 1 to 0, 0, 2, 1, 1 and 2, 2, 1; ventral, 0, 0, 1, 1, 1 to 0, 0, 1, 3, 1 and 2, 1, 1.



FIG. 3.— Distribution of Paobius.

Length 9 mm. and less.

TYPE.— *P. boreus*, sp. nov.

The five species at present known are small forms from 7 to 9 mm. in length, these being known at present as occurring in British Columbia, on Forrester Island off the southern Alaskan Coast, and in the mountains of Vermont. It is evidently a boreal genus and will probably be found at various points in Canada. In general appearance the species resemble the more typical members of *Oabius*. They are at once distinguished from species of other genera by the characteristic structure of the lateral margin of the head which, as in *Bothropolys*, is not interrupted or broken between the caudal corners and the eyes or only very vaguely so. The partial division of the anterior tarsi indicated by pale transverse line or by partial suture on ventral side is a correlated character of importance. The three distinct claws of the penult legs, of which the anterior one is long, is an important characteristic in comparing with *Oabius*. The presence of only a single dorsal spine on the fifth joint of the first nine to eleven pairs of legs and the absence of any spine at all from this joint in the penult legs, are unusual characters also differentiating these species. The presence of three dorsal spines on the third joint of all but the first pair of legs in all but the Vermont species (*P. vagrans*) may also be noted. The form of the basal spines of the female gonopods is generally characteristic, though in this regard the Vermont species is again divergent.

Key to the Species of Paobius.

- a. Dorsal spines of anal legs 1, 0, 3, 0, 0 or 1, 0, 2, 0, 0.
 - b. None of the posterior coxae laterally armed; ventral spines of thirteenth legs 0, 1, 3, 3, 1; third joint of first ten or more pairs of legs with but two dorsal spines.

P. vagrans, sp. nov.
 - bb. Last two pairs of coxae laterally armed. Ventral spines of thirteenth legs 0, 1, 2, 3, 2 or 0, 0, 2, 3, 2; third joint of all legs with three dorsal spines. *P. boreus*, sp. nov.
- aa. Dorsal spines of anal legs 1, 0, 3, 1, 0.
 - b. Fifth joint of sixth to ninth pairs of legs with but one ventral spine; head equal in length and breadth.

P. columbiensis, sp. nov.
 - bb. Fifth joint of sixth to thirteenth pairs of legs with two ventral spines; head wider than long. *P. orophilus*, sp. nov.

PAOBIUS BOREUS, sp. nov.

Plate 3, fig. 7-9; Plate 4, fig. 1-3.

DIAGNOSIS.—Slender; first dorsal plate 1.6 times wider than long; head much wider than long. Brown to chestnut, head lighter. Ocelli twelve to fourteen in three series. Prosternum with distance between chitinous spots 4.25 times dental line; sinus wide, u-shaped. Lobes of genital forceps acute; basal spines narrowed near middle, clavate distad. Coxal pores 2, 3, 3, 2. Last two pairs of coxae laterally armed. Third joint of all legs with three dorsal spines. Spines of anal legs, dorsal, 1, 0, 3, 0, 0; of penult, dorsal, 1, 0, 3, 1, 0; of thirteenth, ventral, 0, 1, 2, 3, 2 or 0, 0, 2, 3, 2, dorsal, 1, 0, 3, 1, 0; of twelfth, dorsal, 1, 0, 3, 1, 0; of first, ventral, 0, 0, 1, 3, 1, dorsal, 0, 0, 2, 1, 1. Length 8 to 9 mm.

DESCRIPTION.—Dorsum brown to chestnut. Head lighter, of ferruginous tinge; commonly with a dark spot in front of the caudal border. Antennae dark, paler, rufous or yellowish, at tips or in same over distal half or more of length. Posterior legs usually but slightly, if at all, more brightly colored than others. Venter much paler than the dorsum, clear brownish grey; most of the caudal plates chestnut. Prosternum and prehensors dilute chestnut.

Body rather slender, being from 8.5 to 9 times longer than wide. Conspicuously narrowed cephalad, with first plate narrower than third and much narrower than head. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other about as 58 : 51 : 54 : 65 : 67 : 65.

Head (Plate 4, fig. 3) wider than long in about ratio 58 : 53.

Antennae short. Articles distad of the second decreasing regularly, short and very short, compact. Ultimate article distinctly longer than the two preceding taken together.

Eyes each consisting of mostly twelve to fourteen ocelli (Plate 3, fig. 7) arranged in three series: *c. g.*, 1 + 5, 4, 2, which is the commonest number and arrangement; 1 + 6, 4, 3; 1 + 5, 4, 3; 1 + 3, 4, 4. Single ocellus distinctly largest. Other ocelli dark, regular. Ocelli of most ventral row reduced, those of others decreasing cephalad. Organ of Tömösvary small, ordinarily not detectable in lateral view of head.

Prosternum in type 1.57 times wider than long. Distance between chitinous spots $1\frac{2}{3}$ times width at level of bottom of median sinus;

4.25 times length of dental line. Teeth acute, the inner one of each pair a little larger than the outer so that the line of apices is straight or very nearly so. Median sinus wide, somewhat u-shaped but subacute at bottom (Plate 3, fig. 8).

First dorsal plate widest cephalad, moderately narrowing caudad; 1.6 times wider than long. Posterior corners of ninth, eleventh, and thirteenth dorsal plates more or less oblique.

Coxal pores, 2, 3, 3, 2.

Spines of first legs, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 3, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 3, 2, 1}{0, 0, 1, 3, 1}$; of the third to seventh, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 3, 1}$; of the eighth, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 1}$, the dorsal spine of fifth joint on anterior side of joint; of the ninth to eleventh, $\frac{0, 0, 3, 1, 1}{0, 0, 2, 3, 1}$, with dorsal spine of fifth joint also on anterior side; of the twelfth, $\frac{1, 0, 3, 1, 0}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 0}{0, 1, 2, 3, 2}$ or $\frac{1, 0, 3, 1, 0}{0, 0, 2, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$, of the anal, $\frac{1, 0, 3, 0, 0}{0, 1, 3, 2, 0}$. Last two pairs of coxae laterally armed.

Anal legs a little and uniformly thickened to the tarsi which are slender; but slightly if at all more thickened in male than in female; dorsally somewhat complanate and weakly longitudinally furrowed.

Gonopods of male small, wart-like, each bearing two moderately long bristles.

Claw of female gonopods (Plate 4, fig. 1) short, of uniform width from base to teeth; tripartite, teeth acute, the median longer than the lateral which are subequal. Basal spines with the inner one of each pair shorter than the outer; constricted near middle of length and then, especially in the outer one, widening clavately rather conspicuously and characteristically to the short acuminate portion (Plate 4, fig. 2).

Length 8 to 9 mm.

Immaturus.—Light brown. Head and prehensors somewhat orange. Anal legs brighter at distal ends.

Antennae with twenty articles present. First three or four articles conspicuously longest; the others very short; ultimate article proportionately longer than in adult.

Ocelli 1 + 3, 2. The single ocellus and adjacent seriate one of same size or nearly so. Ocelli pale and distinct, anterior ones smallest as usual.

Prosternum nearly as in adult. Line of apices of teeth nearly straight. Sinus v-shaped.

Coxal pores very small: 2, 2, 2, 2.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 0, 1, 1}$; of the second to sixth, $\frac{0, 0, 2, 1, 1}{0, 0, 0, 1, 1}$; of the seventh to ninth, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 2, 1}$, the dorsal spine of fifth joint anterior in position; of the tenth, $\frac{0, 0, 3, 1, 1}{0, 0, 2, 3, 1}$, dorsal spine of tibia anterior in position; of the eleventh, $\frac{0, 0, 3, 1, 0}{0, 0, 2, 3, 1}$; of the twelfth, $\frac{1, 0, 3, 1, 0}{0, 0, 2, 3, 1}$; of the thirteenth, $\frac{1, 0, 3, 1, 0}{0, 1, 2, 3, 1}$ or $\frac{1, 0, 3, 1, 0}{0, 0, 2, 3, 1}$; of the penult, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 0, 0}{0, 1, 3, 2, 0}$.

Gonopods of female with the three articles distinct, the ultimate bearing a claw which is small, slender and acute and spine-like. Third article without bristles; the second one with a single ventral bristle; and the first one with two.

Length 5.5 to 6.5 mm.

Agenitalis II.—Dilute brown. Head orange. Antennae pale brown, orange at tips. All legs with tarsi somewhat orange.

Articles of antennae nineteen. Articles distad of the third, excepting the ultimate, very short; the twelfth and thirteenth in specimen described shorter than the adjacent ones, having been apparently formed by recent subdivision of one article. Ultimate article about as long as the three preceding ones taken together.

Ocelli 1 + 3, 2. First ocellus of upper series largest, the anterior one of this series very small. Ocelli all pale.

Prosternum as in older stages.

Coxal pores very small: 2, 2, 2, 2.

Spines of first legs, $\frac{0, 0, 0, 0, 1}{0, 0, 0, 0, 1}$; of the second, $\frac{0, 0, 0, 0, 1}{0, 0, 0, 1, 1}$; of the third to ninth, $\frac{0, 0, 1, 1, 1}{0, 0, 0, 1, 1}$; of the tenth, $\frac{0, 0, 2, 1, 0, (1)}{0, 0, 1, 1, 1}$; of the eleventh, $\frac{0, 0, 2, 1, 0}{0, 0, 1, 1, 1}$; of the twelfth, $\frac{0, 0, 2, 1, 0}{0, 0, 1, 2, 1}$; of the thirteenth, $\frac{0, 0, 2, 0, 0}{0, 0, 1, 1, 1}$; of the penult, $\frac{0, 0, 2, 0, 0}{0, 1, 3, 1, 1}$; of the anal, $\frac{0, 0, 2, 0, 0}{0, 1, 3, 2, 0}$. None of the posterior coxae as yet laterally armed.

Gonopods of female biarticulate. No claw indicated but one ready to have appeared with the next moult showing through integument in cleared specimen. No bristles present but a spine is indicated on proximal article as a small acute chitinous point.

Length 5 mm.

Pullus IV (*Larva quarta*).—Pale, for the most part unpigmented or nearly so. Head and antennae yellowish, also the caudal end of the body and slightly so the tarsi of some of the legs.

Antennae composed of seventeen articles of which those between the third and the ultimate are very short and closely compacted.

Ocelli 1 + 1; the anterior one the larger; both somewhat angular.

Prosternum nearly as in older stages. Sinus v-shaped with sides a little excurved.

One coxal pore present on coxa of each twelfth leg.

Twelve pairs of developed legs present, with the remaining three pairs appearing as slender buds.

Spines of first to third pair of legs, $\frac{0, 0, 0, 0, 1}{0, 0, 0, 0, 1}$; of fourth to ninth, $\frac{0, 0, 0, 0, 1}{0, 0, 0, 1, 1}$; of tenth to twelfth, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$.

Anal glands distinct and well developed.

Length 2.8 mm.

Pullus III (Larva tertia).—Very pale and almost without pigment excepting the head, prehensors, and antennae which are of yellow or orange cast.

Antennae composed of fourteen articles.

Ocelli 1 + 1 of which the anterior is the larger.

Prosternal teeth small, acute; line of apices slightly recurved. Sinus strictly v-shaped.

Pairs of developed legs ten, behind which are two pairs of slender buds which distad of the coxa are unsegmented. Spines of first legs, $\frac{0, 0, 0, 0, 1}{0, 0, 0, 0, 0}$; of the second to seventh, $\frac{0, 0, 0, 0, 1}{0, 0, 0, 1, 1}$; of the eighth and ninth, $\frac{0, 0, 0, 0, 0}{0, 0, 0, 1, 1}$; of the tenth, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 0}$.

Anal glands well developed.

Length 2.5 mm.

TYPE.—M. C. Z., No. 345, Alaska: Forrester Island. Harold and R. W. Heath.

PARATYPES.—M. C. Z., No. 346-349, 418, Alaska: Forrester Island. Harold and R. W. Heath.

This species is readily recognized through the absence of a dorsal spine on the fourth joint of the anal legs. The only other known western lithobiid having this characteristic spining in the anal legs is *Oobius tabiphilus*, from Santa Barbara.

PAOBIUS COLUMBIENSIS, sp. nov.

Plate 4, fig. 4.

DIAGNOSIS.—First dorsal plate 1.5 times wider than long; head equal in length and breadth. Body and head above light yellowish brown. Ocelli ten to twelve in two or three series. Prosternum with distance between chitinous spots four times the dental line; sinus widely v-shaped. Two lateral lobes of genital forceps equal, a little smaller than the median; basal spines long and slender, nar-

rowest near middle. Coxal pores 2, 3, 3, 3. Last pair of coxae laterally armed. Fifth joint of sixth to ninth pairs of legs with but one ventral spine. Spines of anal legs, dorsal, 1, 0, 3, 1, 0; of penult, dorsal, 1, 0, 3, 1, 0, ventral, 0, 1, 3, 3, 1; of thirteenth, ventral, 0, 1, 3, 3, 2, or 0, 0, 2, 3, 2, dorsal, 1, 0, 3, 1, 1; of twelfth, dorsal, 0, 0, 3, 1, 1; of first, ventral, 0, 0, 1, 1, 1 or 0, 0, 1, 2, 1, dorsal, 0, 0, 1, 1, 1. Length 7-8 mm.

DESCRIPTION.—Dorsum light yellowish brown or orange-brown, with head not darker in types. Antennae yellowish brown. Posterior legs bright yellow.

Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 52 : 44 : 46 : 59 : 61 : 58. Head precisely equal in length and breadth.

Antennae of moderate shortness. Articles short, decreasing regularly distad in the usual way. Ultimate article considerably longer than the two preceding taken together but shorter than the three preceding.

Ocelli ten to twelve in two or three series: *c. g.*, 1 + 4, 4, 3; 1 + 5, 4, 1; 1 + 5, 5. Single ocellus but a little larger than the most caudal ones of series. Other seriate ocelli mostly very small. Deeply pigmented.

Prosternum 1.6 times wider than long. Distance between chitinous spots 2.5 times width at sinus and 4 times length of dental line. Teeth small and rather close, the interval between those of each pair semicircular. Line of apices very nearly straight. Spine close to base of outer tooth, bending mesocephalad over it, of usual character. Sinus widely v-shaped, the interval between the two mesal teeth being greater than that between teeth of each pair.

First dorsal plate moderately narrowed caudad of middle in front of which the sides are subparallel. 1.5 times wider than long. Posterior angles of ninth, eleventh, and thirteenth dorsal plates straight.

Coxal pores 2, 3, 3, 3.

Spines of first legs, $\frac{0, 0, 1, 1, 1}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 1, 1, 1}{0, 0, 1, 1, 1}$; of the second to eighth, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 2, 1}$; of the ninth, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 3, 1}$; of the tenth and eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$ or $\frac{1, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$. Last pair of coxae laterally armed.

Claw of female gonopods tripartite, the two lateral lobes equal and at same level, a little smaller than the median, all rather blunt. Spines 2 + 2 or 2 + 3; long and slender, broadest at base and nar-

rowing to near middle above which again widening to beginning of the acuminate tip which is of moderate length; inner spine curving somewhat mesad (Plate 4, fig. 4).

Length 7 to 8 mm.

TYPE.—M. C. Z., No. 350, British Columbia: Kaslo.

PARATYPES.—M. C. Z., No. 417, British Columbia: Kaslo.

PAOBIUS OROPHILUS, sp. nov.

DIAGNOSIS.—First dorsal plate 1.7— times wider than long; head wider than long. Brown; head much darker, nearly black. Ocelli about thirteen in three series. Prosternum with distance between chitinous spots four times the dental line; sinus v-shaped. Genital forceps bipartite or tripartite with outer tooth small; basal spines long, inner as long as or a little longer than outer. Coxal pores 2, 3, 3, 3. Last pair of coxae laterally armed. Fifth joint of sixth to thirteenth pairs of legs with two ventral spines. Spines of anal legs, dorsal, 1, 0, 3, 1, 0; of penult, dorsal, 1, 0, 3, 1, 0; of thirteenth, ventral, 0, 0, 3, 3, 2, dorsal, 1, 0, 3, 1, 1; of twelfth, dorsal, 0, 0, 3, 1, 1; of first, ventral, 0, 0, 1, 2, 1, dorsal, 0, 0, 3, 2, 1. Length 9 mm.

DESCRIPTION.—The dorsum in type is uniform brown. Head much darker, blackish with no tinge of red, uniform. Antennae like head excepting the tips which are light, yellowish. Venter, prosternum, and prehensors light brown or testaceous. Legs like venter, the caudal pairs a little darker, uniform.

Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 52 : 42 : 47 : 56 : 57 : 55. Head wider than long in ratio 52 : 50 or 52 : 49.

Antennae short, rather stout and only moderately attenuated distad. Articles short, each a little clavate. Ultimate article a little longer than the two preceding taken together, as usual.

Ocelli in type thirteen in three series: thus, 1 + 5, 4, 3. Single ocellus distinctly largest, circular. Other ocelli large, distinct, and regular. Ocelli deeply pigmented excepting the single ocellus and the most caudal one of the uppermost series.

Prosternum in type 1.53 times wider than long. Each side of anterior portion conspicuously indented between spine and caudal or end or that adjacent to prehensor. Distance between chitinous spots 2.85 times width at level of bottom of sinus; 4 times the dental line.

Teeth small, acute, the inner of each pair the larger and the line of apices thus very nearly straight. Sinus strictly v-shaped. Spine as usual.

First dorsal plate moderately narrowed caudad; 1.68 times wider than long. Caudal margins of ninth, eleventh, and thirteenth dorsal plates rounding forward at lateral ends, but not truly obliquely truncate.

Coxal pores very small, 2, 3, 3, 3.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 2, 1}$; of the third, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 3, 1}$; of the fourth and fifth, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 3, 1}$; of the sixth to eighth, $\frac{0, 0, 3, 2, 1}{0, 0, 1, 3, 2}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$, the dorsal spine of tibia being on the anterior side instead of on the posterior as more usual; of the twelfth, $\frac{0, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 0}$ claws three, all distinct; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$. Only anal coxae laterally armed.

Claw of female gonopods long and strongly curved, not excavated, thin and rather slender; bipartite, with the lobes equal, acute or tripartite, a smaller outer claw being thus present. Spines long and slender, equal in length or the inner a little the longer; in ventral view the inner spine is acuminate from base and is distally acute, but the outer is narrowed about one third the distance from the distal end toward which it is a little expanded and which is truncate or at middle a little incised.

Length of type 9 mm.

TYPE.—M. C. Z., No. 351, British Columbia: Kaslo.

PARATYPES.—M. C. Z., No. 416, British Columbia: Kaslo.

This species differs from *P. columbiensis*, occurring in the same locality, in larger size, coloration, spining of part of legs, different proportions of head, form of prosternum and especially in having the claw of the female gonopods more slender and curved and only bipartite, with the basal spines of a distinctly different form.

PAOBIUS VAGRANS, sp. nov.

DIAGNOSIS.—First dorsal plate 1.65+ times wider than long; head wider than long. Dorsum yellowish brown with head chestnut or cherry-red. Ocelli six to nine in two or three series. Prosternum with distance between chitinous spots 4— times the dental line;

sinus large, v-shaped. Claw of gonopods tripartite; outer basal spine broad, much larger than the inner. Coxal pores 2, 3, 3, 2 to 3, 4, 4, 3. None of the coxae laterally armed. Third joint of first ten or more pairs of legs with but two dorsal spines. First seven pairs of legs with but a single dorsal tibial spine. Spines of anal legs, dorsal, 1, 0, 3, 0, 0 or 1, 0, 2, 0, 0; of penult, dorsal, 1, 0, 3, 1, 0 or 1, 0, 2, 1, 0; of thirteenth legs, ventral, 0, 1, 3, 3, 1, dorsal, 1, 0, 2, 1, 1; of twelfth, dorsal, 0, 0, 3, 2, 2 or 0, 0, 3, 1, 2; of first, ventral, 0, 0, 1, 1, 1 or 0, 0, 2, 1, 1; dorsal, 0, 0, 2, 2, 1. Length, 7.5–9 mm.

DESCRIPTION.—Dorsum yellowish brown, with some of the plates occasionally showing a greenish tinge. Head from somewhat ferruginous to chestnut and cherry-red in individuals in full color, the first dorsal plate also more or less darkened like the head. Antennae colored like the head proximally, yellowish or orange distally. Venter a little paler than dorsum, sometimes in part showing a greenish tinge. Prosternum and prehensors a little paler than the head. Legs pale brown or brownish yellow, the caudal pairs more densely pigmented, bright orange-yellow.

Body considerably narrowed cephalad from the tenth plate, with the first plate much narrower than the head but only slightly or not at all narrower than the third. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 48 : 43 : 43+ : 52 : 55 : 54.

Head wider than long in about ratio 48 : 45. Caudal margin widely incurved. Lateral breaks may be more or less vaguely indicated.

Antennae very short, the articles decreasing regularly from second to the penult, short and very short. Ultimate article distally acuminate, longer than the two preceding taken together.

Ocelli six to nine in two or three series: *c. g.*, 1 + 3, 2; 1 + 3, 3; 1 + 3, 2, 1; 1 + 4, 3, 1. Single ocellus distinctly largest.

Prosternum with teeth equal, the line of apices a little recurved. Incision of good size, of the usual v-shape. Spine stouter at base than the bristle, slenderly acuminate and bristle-like distad, inserted in usual position. In type 1.54 times wider than long. Distance between chitinous spots 2.6 times width at level of bottom of incision; 3.9 times length of the dental line.

First dorsal plate with sides convex anteriorly and caudally, sub-straight between, considerably converging caudad; 1.65 times wider than long. Caudal margin of ninth, eleventh, and thirteenth dorsal plates straight, the corners not excised or but indistinctly so.

Coxal pores small: 2, 3, 3, 2; 2, 3, 3, 3; 3, 3, 3, 3; 2, 4, 4, 2; 3, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 1, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 2, 1, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 0, 3, 1}$; of the third, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$, $\frac{0, 0, 2, 2, 1}{0, 0, 0, 2, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 0, 3, 1}$; of the fourth, $\frac{0, 0, 2, 2, 1}{0, 0, 0, 2, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 0, 3, 1}$; of the fifth, $\frac{0, 0, 2, 2, 1}{0, 0, 0, 3, 1}$; of the sixth, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 0, 3, 1}$; of the seventh, $\frac{0, 0, 2, 2, 1}{0, 0, 0, 3, 1}$; of the eighth, $\frac{0, 0, 2, 2, 1}{0, 0, 0, 3, 2}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 0, 3, 2}$; of the ninth, $\frac{0, 0, 2, 2, 2}{0, 0, 0, 3, 2}$; of the tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the eleventh, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 2, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 2, 1, 1}{0, 1, 3, 3, 1}$; of the penult, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$ or $\frac{1, 0, 2, 1, 0}{0, 1, 3, 3, 1}$, claws three; of the anal, $\frac{1, 0, 3, 0, 0}{0, 1, 3, 2, 0}$ or $\frac{1, 0, 2, 0, 0}{0, 1, 3, 2, 0}$, the coxal spine sometimes doubled, claw one. None of the coxae laterally armed.

Claw of female gonopods short and relatively wide, well curved, tripartite, the median lobe longest, all acute. Outer basal spine of each pair longer and much wider than the inner with its sides proximal of the apical portion straight and parallel; apical portion moderate in length and acuteness, weakly denticulate on outer edge or also on mesal. Inner spine in ventral view acuminate from near base, denticulate along ectal edge.

Length from 7.5 to 9 mm.

TYPE.—M. C. Z., No. 352, Vermont: St. Johnsbury. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 412, Vermont: St. Johnsbury; M. C. Z., No. 414, Lake Carmi. R. V. Chamberlin.

This species is aberrant, especially in the character of basal spines of the female gonopods and in lacking lateral coxal spines.

AREBIUS, gen. nov.

Head with the usual marginal interruptions.

Antennae short; composed of twenty articles.

Eyes composed of moderate or large ocelli arranged in two or three or occasionally in four longitudinal series. Single ocellus clearly differentiated and conspicuously larger than the others.

Prosternal teeth 2 + 2; line of apices recurved; sinus v-shaped; spines slender and distally bristle-like.

Posterior angles of ninth, dorsal plate straight or obliquely somewhat excised; of the eleventh and thirteenth from somewhat obliquely truncate to straight or very weakly extended caudad.

Coxal pores small and circular; uniseriate.

Claw of female gonopods either large and strictly entire (*Hesperobius sens. str.*); or smaller and bipartite or tripartite with the main lobe or lobes greatly exceeding the lateral one or ones (*Pagobius*). Basal spines 2 + 2, long and mostly moderately slender.

Tarsi of anterior legs slender with division indicated by an abrupt narrowing evident especially on the ventral side and by a paler, less chitinous transverse line or narrow band, and sometimes in addition by a mostly partial suture.

Posterior legs comparatively slender in both sexes; without special modification in the male. Last one or two pairs of coxae laterally armed. From six to eleven last pairs of legs with the third joint bearing three dorsal spines. Either all legs from the first to the eleventh, twelfth, or thirteenth, or all excepting the first one, two, three, or four pairs bearing two dorsal spines on the fifth joint. Usually the first five to eight pairs of legs, but rarely only the first two pairs, with but a single ventral spine on the third joint. Dorsal spines of anal legs, 1, 0, 3, 1, 0; ventral 0, 1, 3, 2, 0 (normal in *Pagobius*) to 0, 1, 3, 2, 1 or 0, 1, 3, 3, 1 (*Arebius sens. str.*); claws either one or two. Dorsal spines of penult legs 1, 0, 3, 1, 1; ventral, 0, 1, 3, 3, 2; claws three, the anterior commonly short but rather stout and somewhat truly claw-like. Dorsal spines of thirteenth legs 1, 0, 3, 1, 1 to 1, 0, 3, 2, 2; ventral, 0, 1, 3, 3, 2 or 0, 0, 3, 3, 2. Dorsal spines of twelfth legs from 0, 0, 3, 1, 1 and 1, 0, 3, 1, 1 to 0, 0, 3, 1, 2 and 1, 0, 3, 2, 2; ventral, 0, 0, 3, 3, 2 or rarely 0, 0, 2, 3, 2. Dorsal spines of eleventh legs 0, 0, 3, 2, 2; ventral, 0, 0, 2, 3, 2. Dorsal spines of first legs 0, 0, 2, 1, 1 or less commonly, 0, 0, 2, 2, 1; ventral, 0, 0, 1, 2, 1 or 0, 0, 1, 3, 1.

Length 12 mm. and less.

TYPE.—*A. medius*, sp. nov.

The species of this genus at present known occur in California with the exception of *A. oregonensis*, the types of which were taken at Portland, Oregon. They are forms of small or medium size, from brown to chestnut in color, in which the body is rather conspicuously narrowed cephalad from the tenth plate, with the head proportionately rather small.

The species fall into two natural groups or subgenera; *Arebius sens. str.*, embracing species in which the claw of the female gonopods is large and strictly entire and the ventral spines of the anal legs normally 0, 1, 3, 2, 1 or occasionally 0, 1, 3, 3, 1; and *Pagobius*, subgen. nov., with *P. diplonyx*, sp. nov. as the type, embracing species in which the claw of the female gonopods is smaller and either bipartite

or tripartite, one or two small teeth appearing on sides of the main claw, and the ventral spines of the anal legs normally 0, 1, 3, 2, 0. Sometimes immature specimens of species of *Arebius sens. str.* (e. g. *A. obesus*) have minute lateral teeth near the base, but these invariably disappear by the time the *maturus* stage is reached. The smallness of the lateral tooth or teeth in the claw of the gonopod of species of *Pagobius* and the proximal position of the same clearly indicate a transition to the condition of integrity normal in *Arebius* proper.

Key to Subgenera and Species of Arebius.

- a. Claw of ♀ gonopods strictly entire; ventral spines of anal legs normally 0, 1, 3, 2, 1 or 0, 1, 3, 3, 1. *Arebius sens. str.*
 b. Only the last pair of coxae laterally armed.
A. oregonensis, sp. nov.
- bb. Last two pairs of coxae laterally armed.
 c. Anal leg with the claw single. *A. obesus* (Stuxberg)
 cc. Anal legs with two claws.
 d. Ventral spines of anal legs 1, 3, 3, 1; only the first two pairs of legs with third joint bearing but a single ventral spine, the others with 2 or 3. *A. elysianus*, sp. nov.
 dd. Ventral spines of anal legs 1, 3, 2, 1; first 7 pairs of legs with the third joint bearing a single ventral spine.
A. medius, sp. nov.
- aa. Claw of ♀ gonopods bipartite or tripartite; ventral spines of anal legs normally 1, 3, 2, 0. *Pagobius*, subgen. nov.
 b. Claw of anal leg single. *A. dolius*, sp. nov.
 bb. Anal leg with two claws.
 c. Claw of ♀ gonopods bipartite; basal spines slender, narrowed from base distad; head wider than long; first dorsal plate cir. 1.8 times wider than long. *A. kochii* (Stuxberg)
 cc. Claw of ♀ gonopods tripartite; basal spines stout, only slightly or not at all narrowed from base to the acuminate apical portion; head equal in length and breadth; first dorsal plate cir. 1.6 times wider than long.
A. diplonyx, sp. nov.

FIG. 4.— Distribution of *Arebius*.

AREBIUS OBESUS (Stuxberg).

Plate 7, fig. 3, 4; Plate 8, fig. 1.

Lithobius obesus, Stuxberg, Öfvers. K. vet.-akad. Förhandl., 1875, **32**, no. 2, p. 67; Ann. mag. nat. hist., 1875, ser. 4, **15**, p. 189. Chamberlin (in part), Pomona college journ. ent., 1910, **2**, p. 371, 373. Can. ent., 1911, **43**, p. 380.

Lithobius (*Archilithobius*) *obesus* Stuxberg, Öfvers. K. vet.-akad. Förhandl., 1875, **32**, no. 3, p. 18, 31; Proc. Cal. acad. sci., 1877, **7**, p. 138.

NON *Lithobius obesus* Bollman, Proc. U. S. N. M., 1889, **11**, p. 347.

DIAGNOSIS.—Slender; first dorsal plate 1.5 + times wider than long; head as long as wide. Brown; head, and sometimes posterior plates, reddish. Ocelli eight to fourteen in three series. Prosternum 1.6 + times wider than long; distance between chitinous spots four times the dental line; sinus v-shaped. Claw of gonopods large, entire; basal spines moderate, acuminate from base. Coxal pores 2, 3, 3, 2 to 4, 4, 4, 4. Claw of anal leg single. Last two pairs of coxae laterally armed. First eight pairs of legs with third joint bearing but a single ventral spine. Spines of anal legs, ventral, 0, 1, 3, 2, 1; of thirteenth, dorsal, 1, 0, 3, 1, 1, ventral, 0, 1, 3, 3, 2; of twelfth, dorsal, 1, 0, 3, 1, 1, ventral, 0, 0, 2, 3, 2; of first, dorsal, 0, 0, 2, 2, 1. Length, 9 to 12 mm.

DESCRIPTION.—Dorsum brown, the caudal plates sometimes with tendency toward reddish. Head of a similar brown color or in some more reddish, the frontal region paler. Antennae brown, but little paler at tips. Prosternum somewhat paler than head with the prehensors a little lighter. Venter testaceous or yellowish with the caudal plates darker. Legs pale excepting the posterior pairs which are darker in correspondence with the ventral plates.

Body rather slender, usually from 8.5 to 9.25 times longer than width of tenth plate. Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 30 : 28 : 29 : 33 : 34 : 33.

Head as long as wide or slightly longer; caudal margin mesally slightly incurved. Obscurely punctate.

Antennae short, reaching the fifth body-segment. Articles short, sides nearly straight, each article a little clavately widening distad.

Each eye consisting of from eight to fourteen ocelli arranged in three series: *e. g.*, 1 + 3, 3, 1; 1 + 4, 3, 1; 1 + 4, 3, 2; 1 + 4, 4, 2; 1 + 5, 4, 3; 1 + 5, 5, 3. Single ocellus much larger than any of the

seriate ocelli, the most caudal ocellus of each of the two upper rows also commonly large, others decreasing in size cephalad and ventrad.

Prosternum about 1.62 times wider than long. Distance between chitinous spots near 2.36 times width at level of bottom of sinus; 4 times the length of the dental line. Teeth small, acute, dark; line of apices a little recurved. Sinus v-shaped. Spines slender and distally bristle-like.

First dorsal plate 1.55+ times wider than long. Sides caudad more than usually strongly rounded and converging about caudal corners, cephalad only gently convex and diverging. Caudal corners of minor plates and of the seventh obliquely excised. Plates smooth and shining.

Coxal pores very small, circular: 2, 3, 3, 2; 3, 3, 3, 3; 3, 4, 4, 3; 4, 4, 4, 4.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$; of the third and fourth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$; of the fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 2}$; of the sixth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 2}$ to $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$; of the seventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$; of the eighth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; 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; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$, claw one. Last two pairs of coxae laterally armed.

Claw of female gonopods (Plate 7, fig. 4) moderately large and rather strongly curved; entire, with no trace of lateral teeth, acute. Basal spines (Plate 7, fig. 3) 2 + 2 or 2 + 3; of moderate length, slender, acuminate from near base; the plane of dorsal excision long. Mesal side of first joint (Plate 8, fig. 1) diverging considerably from its fellow cephalad. Process of sternite truncate.

Length mostly 9 to 12 mm. A male 11 mm. long has antennae 3.5 mm. in length and the tenth dorsal plate 1.24 mm. wide.

Immaturus (♂).—Head slightly longer than wide as in *maturus*.

Antennae with the full number of articles present but those of distal half, especially, relatively shorter than in adult.

Ocelli of same form and arrangement as in *maturus*, the number being also nearly the same.

Prosternum essentially as in adult but distance between chitinous spots may be as much as 3 times width at level of bottom of sinus.

Coxal pores, 2, 2, 2, 2.

Spines of first legs, $\frac{0, 0, 1, 2, 1}{0, 0, 0, 2, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 0, 2, 1}$; of the third and fourth, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the fifth to eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$; of the ninth,

$\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 1}$; of the tenth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 2}$; of the eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$. Last two pairs of coxae laterally armed.

Specimen described from Stanford.

Pullus IV (Larva quarta).—Very pale, yellowish brown, apparently violaceous in life. Head yellow of a dilute orange or ferruginous tinge, paler in front of suture. Antennae pale brown, lighter at tips. Prosternum nearly like head. Venter pale. Legs white or nearly so proximally, the tarsi with some yellow pigment.

Head longer than wide (29 : 28).

Antennae composed of seventeen articles, of which those between the third and the ultimate are very short, and more or less moniliform.

Ocelli 1 + 2, 1 single ocellus already largest.

Prosternal teeth small and pale. Prosternum 1.53 times wider than long. Distance between chitinous spots 2.56 times width at level of bottom of sinus; 4.1 times length of dental line.

Widths of head and of first, third, eighth, tenth, and twelfth dorsal plates to each other as 28 : 23 : 25 : 27 : 25 : 22.

First dorsal plate conspicuously narrowed caudad; 1.6 times wider than long.

Coxal pore one on each twelfth coxa.

Spines of first legs, $\frac{0, 0, 0, 0, 0}{0, 0, 0, 0, 1}$; of the second to ninth, $\frac{0, 0, 0, 0, 0}{0, 0, 0, 1, 1}$; of the tenth, $\frac{0, 0, 0, 0, 0}{0, 0, 0, 1, 1}$ to $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$; of the eleventh and twelfth, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$.

The spine on femur decreases in length cephalad.

Length of specimen described 4 mm., with antennae 1.5 mm. long.

TYPE LOCALITY.—California: Sausalito.

Also taken in California at Stanford, (M. C. Z., No. 354, 445, 447); Santa Barbara, (M. C. Z., No. 449); Fresno, (M. C. Z., No. 448). R. V. Chamberlin.

AREBIUS MEDIUS, sp. nov.

Plate 7, fig. 1.

DIAGNOSIS.—First dorsal plate 1.45 times wider than long; head as long as wide. Dark brown to chestnut with head blackish. Ocelli eight or ten in two or three series. Prosternum 1.5 times wider than long; distance between chitinous spots $3\frac{2}{3}$ times the dental line; sinus v-shaped. Claw of female gonopods large, acute, entire; basal spines long and stout (Plate 7, fig. 1). Coxal pores 2, 2, 2, 2 to 3, 4, 4, 3. Anal

leg with two claws. Last two pairs of coxae laterally armed. First seven pairs of legs with third joint bearing but a single spine. Spines of anal legs, ventral, 0, 1, 3, 2, 1; of thirteenth, ventral, 0, 1, 3, 3, 2, dorsal, 1, 0, 3, 1, 1; of twelfth legs, ventral, 0, 0, 2, 3, 2, dorsal, 0, 0, 3, 1, 2; of first legs, dorsal, 0, 0, 2, 1, 1. Length 8-11 mm.

DESCRIPTION.—Dark brown to chestnut, shining. Head darker, blackish. Antennae chestnut to blackish, light distad. Prosternum and prehensors dusky brown, the prehensors lighter, especially distad. Venter lighter, brown to light chestnut, the caudal plates sometimes darker. Legs brown, the caudal pairs darkest, sometimes irregularly dusky; tarsi of all legs paler, testaceous.

Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 60 : 55 : 60 : 69 : 69 : 68.

Head subrotund, broadly rounded anteriorly; caudal margin mesally a little incurved. Widest between eyes and marginal breaks. Equal in length and breadth or slightly wider.

Antennae and its articles of intermediate length. Articles cylindrical, those of distal portion becoming slender. Ultimate article a little clavately widening distad.

Ocelli in specimens examined mostly eight to ten in two or three series: *e. g.*, 1 + 4, 3; 1 + 4, 3, 2, which is the much commonest number and arrangement. Single ocellus much the largest. Most caudal one the largest of seriate ocelli. Organ of Tömösvary in outline a little smaller than the ocelli of lowermost series, situated ventrad of anterior end of eye patch.

Teeth of prosternum of moderate size, acute, uniform; the line of apices a little recurved. Sinus v-shaped, sides a little concave, of intermediate size; distance between two mesal teeth less than that between teeth of each pair. Spine slenderly acuminate, curving mesocephalad over ectal tooth. 1.5 times wider than long. Distance between chitinous spots 2.2 times width at level of bottom of sinus; $3\frac{2}{3}$ times length of dental line.

First dorsal plate 1.45 times wider than long; sides convex, considerably converging caudad. Posterior corners of ninth and eleventh dorsal plates obliquely excised or truncate, the line of truncation short, especially on thirteenth plate.

Coxal pores: 2, 2, 2, 2; 2, 3, 3, 2; 3, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$; of the third to seventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of the eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 2}{0, 0, 2, 3, 2}$; of the thirteenth and

penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$, claws two. Last two pairs of coxae laterally armed.

Claw of female gonopods large and strongly curved, entire; acutely pointed. Mesal side of first article straight, well chitinized and keel-like. Basal spines long and stout, the outer a little longer than the inner; both gradually acuminate from base distad, the tip very narrowly rounded (Plate 7, fig. 1).

Length 8 to 11 mm.

TYPE.—M. C. Z., No. 356, California: Brookdale, March, 1913. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 438, California: Brookdale, March, 1913. R. V. Chamberlin.

AREBIUS ELYSIANUS, sp. nov.

Plate 7, fig. 2.

DIAGNOSIS.—First dorsal plate $1\frac{2}{3}$ times wider than long; head slightly wider than long. Testaceous, with head darker reddish brown. Ocelli eight to twelve in three series. Prosternum 1.5 + times wider than long; distance between chitinous spots 3.6— times dental line. Claw of gonopods long, entire; spines moderate in length. Coxal pores 2, 2, 2, 2 to 3, 3, 3, 3. Anal leg with two claws. Last two pairs of coxae laterally armed. Third joint of all legs excepting the first two pairs bearing two or three spines. Spines of anal legs, ventral, 0, 1, 3, 3, 1; of thirteenth legs, ventral, 0, 1, 3, 3, 2, dorsal, 1, 0, 3, 2, 2; of twelfth legs, dorsal, 1, 0, 3, 2, 2, ventral, 0, 0, 3, 2, 2; of first legs, dorsal, 0, 0, 2, 2, 1. Length 8–12 mm.

DESCRIPTION.—Dorsum light yellowish or testaceous brown. Head dark brown of reddish cast, always distinctly and considerably darker than the dorsum; frontal region paler. Antennae like head, reddish brown, with tips in some degree paler. Prosternum somewhat lighter than head. Venter yellow or pale testaceous, caudal plates a little darker, usually somewhat reddish. Legs pale, the posterior pairs more deeply pigmented, mostly yellow or of a somewhat orange tinge.

Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 32 : 30 : 31 : 37 : 37 : 35.

Head slightly wider than long (32 : 31). Caudal margin straight,

otherwise head is suborbicular or sides somewhat flattened caudad of eyes.

Antennae short; composed of the usual twenty articles which are short; articles subcylindric or a little widening distad.

Ocelli eight to twelve in three series: *e. g.*, 1 + 3, 3, 2; 1 + 4, 3, 2; 1 + 4, 4, 3. Single ocellus largest. Of the seriate ocelli the caudal one of first row and of the second are largest, those of lowermost row smallest.

Prosternum in type 1.5+ times wider than long. Distance between chitinous spots 2.27 times width at level of bottom of sinus; 3.57 times the dental line. Teeth moderately small and acute with sides a little concave. Sinus rather shallow in proportion to its width; v-shaped but with sides a little concave. Spine moderately stout at base, becoming bristle-like distally.

First dorsal plate $1\frac{2}{3}$ times as wide as long; widest anteriorly, the sides rather conspicuously converging caudad. Minor plates mostly with the caudal margin straight entirely across width or with the caudal corners a little rounded or occasionally one corner excised.

Coxal pores small and circular, mostly well separated, few in number: *e. g.*, 2, 2, 2, 2; 2, 3, 3, 2; 2, 2, 3, 2; 2, 3, 3, 3; 3, 3, 3, 3.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the third, to fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the sixth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the 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, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 3, 1}$, claws two. Last two pairs of coxae laterally armed.

Gonopods of male slender; well exposed; somewhat obliquely subconically rounded distally and bearing apparently but a single bristle.

Claw of female gonopods rather long and narrowly acutely pointed, moderately curved and entire with no indication of lateral teeth. Basal spines moderate in stoutness and length, acuminate regularly from base to apex; inner spine somewhat smaller than the outer (Plate 7, fig. 2). Inner side of first article weakly convex, only a little diverging cephalad from margin of its fellow.

Length 8 to 12 mm. A male 10 mm. long has antennae 3 mm. long and anal leg of same length or very nearly so.

TYPE.—M. C. Z., No. 444, California: Los Angeles, Elysian Park, June, 1909. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 355, 442, California: Pasadena; M. C. Z., No. 441, San Ysidro. W. M. Wheeler; M. C. Z., No. 443, Claremont. R. V. Chamberlin.

AREBIUS OREGONENSIS, sp. nov.

Plate 7, fig. 6.

DIAGNOSIS.—First dorsal plate 1.7 times wider than long; head as long as wide. Brown, head dark brown to chestnut. Ocelli ten to fourteen in four series. Prosternum with distance between chitinous spots only $3\frac{1}{3}$ times the dental line. Claw of female gonopods entire; basal spines long and slender, of uniform width, the outer but little longer. Coxal pores 4, 4, 4, 4. Only last pair of coxae laterally armed. Third joint of first five pairs of legs with a single ventral spine. Spines of thirteenth legs, ventral, 0, 1, 3, 3, 2, dorsal, 0, 0, 3, 1, 1; of twelfth ventral, 0, 0, 2, 3, 2 or 0, 0, 2, 3, 3, dorsal, 0, 0, 3, 1, 2. Length 10–12 mm.

DESCRIPTION.—Brown. Head darker, dark brown or chestnut. Antennae like head, uniform or paler distad. Prosternum and prehensors paler than the head. Venter brown with the caudal plates a little darker.

Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 75 : 69 : 72 : 88 : 90 : 84.

Head as wide as long or slightly longer (75 : 77). Rather strongly narrowed caudad of marginal breaks; caudal margin mesally a little incurved.

Antennae of moderate shortness. The articles of corresponding moderate length; usually not decreasing distad in usual way or only but few preceding the ultimate thus shortened, but sometimes those distad of third or fourth decrease in the ordinary way.

Ocelli ten to fourteen in four series: *e. g.*, 1 + 2, 4, 3, 1; 1 + 4, 4, 3, 1; 1 + 4, 4, 4, 1. Single ocellus much exceeding the others in size. Seriate ocelli comparatively rather large, regular. Organ of Tömösvary smaller in outline than the smaller ocelli, below the anterior end of which it is placed.

Teeth of prosternum very small and acute, equal; line of apices recurved. Sinus large, v-shaped, with sides a little concave. Spine not close to outer tooth, not much stouter at base than the bristles, long and slenderly acuminate, nearly straight. Sides of anterior portion rounding out a considerable distance from the outer tooth in a direction but little caudad of directly ectad before extending caudad at the usual angle (Plate 7, fig. 6). Distance between chitinous spots only twice or slightly less times width at level of bottom of sinus; $3\frac{1}{3}$ times the dental line.

First dorsal plate 1.7 times wider than long; caudal corners widely rounded; sides but little diverging cephalad. Caudal margins of ninth and eleventh plates bent forwards at ends, that of the ninth the more strongly so. Thirteenth plate with the caudal margin curving caudad at ends, the corners being slightly extended.

Coxal pores in type 4, 4, 4, 4.

Ventral spines of first and second legs 0, 0, 1, 3, 1. Spines of second to fourth legs, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of the fifth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 3, 2}$; of the sixth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 2}{0, 0, 2, 3, 2}$ or on one side, $\frac{0, 0, 3, 1, 2}{0, 0, 2, 3, 3}$; of the thirteenth, $\frac{0, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; others lost in types. Only last pair of coxae in types laterally armed.

Claw of female gonopods large, well curved, concave, entire. Inner side of first article straight. Basal spines long and slender, with the outer but little the longer; outer spine of nearly uniform width from base to the short acutely pointed apical portion. Process of sternite acutely pointed.

Length 10 to 12 mm.

TYPE.—M. C. Z., No. 353, Oregon: Portland, 3 August, 1902. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 439, Oregon: Portland, 3 August, 1902. R. V. Chamberlin.

AREBIUS (PAGOBIUS) KOCHII (Stuxberg).

Plate 5, fig. 6; Plate 6, fig. 1-3.

Lithobius kochii Stuxberg, Öfvers. K. vet.-akad. Förhandl., 1875, **32**, no. 2, p. 68; Ann. mag. nat. hist., 1875, ser. 4, **15**, p. 190. Chamberlin (in part), Ann. Ent. soc. Amer., 1909, **2**, p. 187; Pomona college journ. ent., 1910, **2**, p. 371, 374; Can. ent., 1911, **43**, p. 380.

Lithobius (Archilithobius) kochii Stuxberg, Öfvers. K. vet.-akad. Forhandl., 1875, **32**, no. 3, p. 18, 30; Proc. Cal. acad. sci., 1877, **7**, p. 138.

NON *Lithobius kochii* Bollman, Proc. U. S. N. M., 1887, **10**, p. 254, 255; 1889, **11**, p. 348. *

DIAGNOSIS.—First dorsal plate 1.8 times wider than long; head a little wider than long. Testaceous to chestnut, frontal region of head paler. Ocelli about ten in three series. Prosternum 1.6 + times wider than long; distance between chitinous spots 3.8 times dental line. Claw of female gonopods long, bipartite; basal spines attenuated from base, outer a little longer. Coxal pores 2, 2, 2, 2 to 3, 3, 3, 3,

small. Anal leg with two claws. Last two pairs of coxae laterally armed. Third joint of first seven pairs of leg with a single ventral spine. Spines of anal legs, ventral, 0, 1, 3, 2, 0 or 0, 1, 3, 2, 1; of thirteenth, ventral, 0, 1, 3, 3, 2; of twelfth, dorsal, 0, 0, 3, 1, 2. Length 7.5 to 11 mm.

DESCRIPTION.—Dorsum testaceous to dark brown, often varying toward chestnut; caudal margin of plates sometimes darkened. Head dilute to dark chestnut with the frontal region paler. Venter pale testaceous or very dilute brown, commonly showing anteriorly a somewhat violaceous tinge, while the caudal plates are darker as usual, burnt brown. Legs nearly like corresponding plates of venter; last pair brown above, paler distally and ventrally.

Body strongly narrowed cephalad with head rather small and first plate narrower than third, the widths of head and of first, third, eighth, tenth, and twelfth plates being to each other nearly as 28 : 26 : 28 : 34 : 34 : 33. Body typically about eight times wider than long.

Head suborbicular, the sides being considerably convex; caudal margin mesally nearly straight. A little wider than long (29 : 28).

Antennae very short, reaching only to the fifth segment of body. The twenty articles short and cylindrical, rather uniform in proportions.

Ocelli most frequently about ten in three series: *e. g.*, 1 + 4, 3, 2. Decreasing in size cephalad and ventrad. Single ocellus typically much larger than any other, well differentiated (Plate 6, fig. 1).

Prosternum (Plate 5, fig. 6) 1.63 times wider than long. Distance between chitinous spots $2\frac{1}{3}$ times the width at level of bottom of sinus; 3.8 times the dental line. Median sinus v-shaped with the sides straight; shallow, scarcely or not at all extending below level of chitinous dental plate. Teeth small with sides nearly straight, the inner a little larger than the outer and the line of apices but slightly recurved. Spine stout at base, narrowing to bristle-like form distally as usual.

First dorsal plate 1.8 times wider than long; sides moderately convex and converging caudad, widest a little back of the anterior end. Minor plates mostly simply rounded at caudal corners, not obliquely truncate or excised.

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

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$; of the third, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 2, 1}$, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the fourth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the fifth to seventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$ or

$\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 2}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$, with two claws. Coxae of last two pairs of legs laterally armed but the spines, especially of the penult pair, easily lost off and coxae so appearing unarmed.

Posterior legs short and moderately slender in female, being a little, uniformly, thickened. In male as in female without special lobes or furrows.

Gonopods of male short and rather wide; distal edge straight, bearing two bristles.

Claw of gonopods of female (Plate 6, fig. 3) rather long and strongly curved; bipartite, the inner or dorsal lateral lobe being wholly obliterated, the ventral lateral lobe much smaller than the main one, both acute (Plate 6, fig. 2). Basal spines attenuated more or less uniformly from base to apex, the outer a little the larger.

Length from 7.5 to 11 mm. A male 10 mm. long has antennae 3.6 mm. and anal leg 3.25 mm. long, with the tenth dorsal plate 1.24 mm. wide.

TYPE LOCALITY.—California: Sausalito.

TOPOTYPES.—M. C. Z., No. 344, 437, California: Sausalito. R. V. Chamberlin.

Also taken in California at Monterey and Pacific Grove, R. V. Chamberlin, and at Ukiah, Oregon.

AREBIUS (PAGOBIUS) DIPLONYX, sp. nov.

Plate 5, fig. 5; Plate 6, fig. 7, 8.

DIAGNOSIS.—Dorsal plate 1.54 to 1.58 times wider than long; head equal in length and breadth. Brown, first one and last several plates darker, head chestnut. Ocelli eight to ten in three series. Prosternum 1.5 to 1.58 times wider than long; distance between chitinous spots 3.53 to 3.8 times the dental line; sinus v-shaped, opening wide. Claw of female gonopods tripartite with median lobe much the longest; spines subcylindric. Coxal pores 2, 2, 2, 2 to 2, 3, 3, 3. Anal leg with two claws. Last two pairs of coxae laterally armed. Third joint of first seven pairs of legs with single ventral spine. Spines of anal legs, ventral, 0, 1, 3, 2, 0 or 0, 1, 3, 2, 1; of thirteenth, ventral, 0, 1, 3, 3, 2 or 0, 1, 2, 3, 2; of twelfth, dorsal, 0, 0, 3, 2, 2 or 0, 0, 3, 1, 2. Length 8.5 to 10 mm.

DESCRIPTION.—Dorsum brown, with the first one and the last several plates commonly darker, more or less chestnut. Head chestnut, nearly uniform or but slightly paler in front of the suture. Antennae usually dark brown or chestnut like the head in individuals in full color, with the ultimate article alone or sometimes with more of the distal portion paler; in some the antennae are lighter throughout. Venter pale brown to almost colorless, sometimes suffused with purplish and at others having a greenish tinge, the posterior plates a denser, clearer brown. Prosternum testaceous and brown to chestnut, the prehensors paler, especially distally. Legs pale, with the tarsi more pigmented; the posterior pairs brownish, brighter testaceous or yellowish distally.

Body mostly from 7.5 to 8.5 times longer than width of tenth plate; but one female 9 mm. long is but 6.4 times longer than the width of this plate. Body conspicuously narrowed cephalad with first plate clearly narrower than the third. Widths of head and of first, third, eighth, tenth, and twelfth plates in a female measured are to each other as 60 : 54 : 60 : 70 : 72 : 68, and in a male as 55 : 50 : 54 : 65 : 64 : 60.

Head precisely equal in length and breadth. Widest just back of eyes; sides considerably converging from the marginal breaks caudad.

Antennae short. Composed of from twenty to twenty-three articles which are of moderate length or short and subcylindric in form, not closely compacted. When the number of articles is above the usual twenty, this is due to subdivision of some of those immediately preceding the ultimate which are, as a result, very short. Ultimate article normally but slightly longer than the two preceding taken together.

Each eye consisting usually of from eight to ten ocelli arranged in three series: *e. g.*, 1 + 4, 3, 2, the most frequent arrangement and number; 1 + 4, 3, 1; 1 + 3, 3, 1. Single ocellus distinctly largest, it and the first one of the most dorsal series commonly of a distinct color cast.

Prosternum 1.5 to 1.58 times wider than long. Distance between chitinous spots 2.4 to 2.65 times width at level of bottom of sinus; 3.53 to 3.8 times the dental line. Sinus v-shaped with the opening wide. Teeth small, uniform, well separated with the interval widely semicircular; line of apices nearly straight. Spine long, stout at base and slender distally as usual.

First dorsal plate 1.54 to 1.58 times wider than long. Caudal margins of ninth, eleventh, and thirteenth dorsal plates straight, with

the corners rectangular or narrowly rounded, not at all obliquely truncate.

Coxal pores 2, 2, 2, 2 to 2, 3, 3, 3.

Spines of first legs, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 2, 1, 1}{0, 0, 1, 3, 1}$; of the second, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$; of the third, $\frac{0, 0, 2, 2, 1}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the fourth and fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the sixth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 2, 1}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 1, 3, 1}$; of the seventh, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the eighth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 1}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 2}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$ or $\frac{1, 0, 3, 1, 1}{0, 1, 2, 3, 2}$ the spines of the trochanter small or minute; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$ or $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$, claws two with the accessory one moderately large and distinct. Last two pairs of coxae laterally armed.

Gonopod of male very slightly protruding, bearing apparently but one bristle.

Claw of female gonopods strongly curved and concave mesally; tripartite, with the median lobe much largest and the outer tooth often inconspicuous (Plate 6, fig. 8). Spines subcylindric, but slightly narrowed from the base to the acuminate distal portion which is moderate (Plate 6, fig. 7).

Length from 8.5 to 10 mm.

TYPE.—M. C. Z., No. 342, California: Santa Barbara. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 341, 434-436, California: Santa Barbara. R. V. Chamberlin.

A considerable number of specimens of this species were collected by the author in March, 1913.

AREBIUS (PAGOBIUS) DOLIUS, sp. nov.

Plate 6, fig. 4-6.

DIAGNOSIS.—Body strongly narrowed cephalad. First dorsal plate 1.55 to 1.6 times wider than long; head longer than wide. Dorsum brown, darker at ends, head chestnut. Ocelli seven to nine, mostly in two series. Prosternum about 1.5 times wider than long; distance between chitinous spots 3.8 times dental line. Claw of female gonopods bipartite; basal spines narrowed from base, outer one considerably larger. Coxal pores 3, 3, 3, 3 to 3, 4, 4, 3. Anal leg with claw single. Last two pairs of coxae laterally armed. Third

joint of first eight pairs of legs with single ventral spine. Spines of anal legs, ventral, 0, 1, 3, 2, 1; of thirteenth legs, ventral, 0, 0, 3, 3, 2; of twelfth, dorsal, 1, 0, 3, 1, 1. Length 9–11 mm.

DESCRIPTION.—Brown, with the first and one or more of caudal plates sometimes darker, more or less of chestnut tinge. Head chestnut, often dusky, paler in front of suture. Antennae brown to chestnut, lighter at tips. Prosternum chestnut like the head, with the prehensors somewhat lighter. Venter much lighter than dorsum, dilute brown of frequently greyish cast; caudal plates darker as usual. Posterior legs darkest, brownish, lighter at tips but not clear yellow.

Body strongly narrowed cephalad with the head comparatively small, the widths of head and of first, third, eighth, tenth, and twelfth plates being to each other, in a male, as 54 : 52 : 57 : 65 : 68 : 68 : 65 and in a female as 52 : 51 : 57 : 67 : 69 : 69.

Head longer than wide, typically in about ratio 54 : 52.

Antennae short; the twenty articles short, decreasing gradually distad from the second. The ultimate article normally distinctly longer than the two preceding ones together.

Each eye commonly composed of from seven to nine ocelli in two series: *e. g.*, 1 + 4, 3; 1 + 5, 3; 1 + 4, 2. Single ocellus (Plate 6, fig. 5) always distinctly much larger than any other, the first of the dorsal series being next in size and the others decreasing cephalad.

Prosternum 1.5— times wider than long. Distance between chitinous spots 2.8 times width at bottom of median sinus and 3.8 times the dental line. Teeth rather small and acute; the line of apices distinctly recurved. Sinus strictly v-shaped. Spine much stouter than the bristles and acutely acuminate but ordinarily not strictly bristle-like at tip.

First dorsal plate with sides moderately converging caudad to the rounded corners; 1.55 or 1.6 times wider than long. Minor plates with caudal corners simply rounded, not obliquely truly truncate.

Coxal pores small: 3, 3, 3, 3; 3, 3, 4, 3; 3, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 2, 1}$; of the second to fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the sixth to eighth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 2}$; of the ninth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$ or $\frac{1, 0, 3, 1, 1}{0, 0, 2, 3, 2}$; of the thirteenth, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$, with the claw single. Last two pairs of coxae laterally armed.

Claw of female gonopods bipartite, with the inner or more dorsal lobe much smaller than and much below apex of the main one, the outer lobe being wholly obliterated (Plate 6, fig. 6). Basal spines

distinctly narrowing from the base distad, the apical portion more abruptly acute; sometimes the sides are somewhat incurved toward middle of length; outer spine stouter and considerably longer than the inner (Plate 6, fig. 4).

Length from 9 to 11 mm.

TYPE.—M. C. Z., No. 343, California; Friant, March, 1913. R. V. and S. C. Chamberlin.

PARATYPES.—M. C. Z., No. 431, California: Santa Barbara, R. V. Chamberlin; M. C. Z., No. 432, 433, 450, Friant, March, 1913, R. V. and S. C. Chamberlin.

NOTHEMBIUS, gen. nov.

Head with lateral marginal interruptions.

Antennae short; composed normally of twenty-two articles, or in some individuals of but twenty-one.

Eyes composed of ocelli in two or three series; single ocellus differentiated and enlarged.

Prosternal teeth 2 + 2 or 3 + 3; line of apices, more or less recurved; sinus v-shaped; spine slender, distally bristle-like.

Posterior corners of ninth dorsal plate rounded; of eleventh straight or slightly rounded; and of thirteenth produced.

Claw of female gonopods large; entire. Basal spines 2 + 2 or 2 + 3; stout, attenuated distad, with the outer of each pair considerably exceeding the inner.

Tarsi of the anterior legs with a division more or less clearly indicated, the suture being mostly complete or nearly so.

Anal and penult legs of male moderately thickened, the fifth joint of the former bearing on its ventral surface at distal end a more or less conspicuous pilose lobe. Last one or two pairs of coxae laterally armed. Either all legs or all excepting the first one to first five pairs with the third joint bearing three dorsal spines and either two or three ventral ones; fifth joint of legs from first to twelfth, or all of these excepting the first one or two pairs with two dorsal spines. Dorsal spines of anal legs 1, 0, 3, 1, 0; ventral in female, 1, 3, 2, 1 and in a male either 1, 3, 2, 0 or 1, 3, 2, 1; claw one. Dorsal spines of penult legs 1, 0, 3, 1, 1; ventral, 0, 1, 3, 3, 2 or in individual exceptions 0, 1, 3, 3, 1; claws three. Dorsal spines of thirteenth legs 1, 0, 3, 1, 1 or 1, 0, 3, 1, 2; ventral, 0, 1, 3, 3, 2 or in exceptional individuals, 0, 0, 3, 3, 2. Dorsal spines of twelfth legs 1, 0, 3, 1, 2 or 0, 0, 3, 1, 2 to



FIG. 5.— Distribution of *Nothembius*.

0, 0, 3, 1, 2 or 0, 0, 3, 2, 2; ventral, 0, 0, 3, 3, 2. Dorsal spines of eleventh legs 0, 0, 3, 2, 2; ventral, 0, 0, 3, 3, 2 or 0, 0, 2, 3, 2. Dorsal spines of first legs mostly 3, 2, 1 or 2, 2, 1, in individual exceptions sometimes only 2, 1, 1; ventral nearly always 0, 0, 2, 3, 2, occasionally 0, 0, 2, 3, 1 or 0, 0, 2, 2, 1.

Length between 8.5 and 13.5 mm.

TYPE.—*N. insulæ*, sp. nov.

Three species of this interesting genus occur in California. They may be separated as follows.

Key to Species of Nothembius.

- a. Prosternal teeth 3 + 3; ventral spines of anal legs in both ♂ and in ♀, 0, 1, 3, 2, 1. *N. aberrans*, sp. nov.
- aa. Prosternal teeth 2 + 2; ventral spines of anal legs in ♂, 0, 1, 3, 2, 0, and ♀ 0, 1, 3, 2, 1.
- b. Dorsal spines of third joint of first four to six pairs of legs only two in number; body typically 8.5 or more times longer than width of the tenth plate. . . . *N. insulæ*, sp. nov.
- bb. Dorsal spines of third joint of all legs three in number or of the first alone rarely only two; body mostly only between seven and eight times longer than width of tenth plate.
N. nampus, sp. nov.

NOTHEMBIUS INSULÆ, sp. nov.

Plate 8, fig. 6; Plate 9, fig. 1-3.

DIAGNOSIS.—Slender; first dorsal plate 1.7 times wider than long; head wider than long. Dorsum brown to chestnut, head and first dorsal plate darker. Ocelli six to eight in two or three series. Prosternum 1.6 times wider than long; distance between chitinous spots 3.6 times dental line; teeth, 2 + 2. Basal spines of gonopods acuminate from base. Coxal pores 3, 3, 3, 3 to 3, 4, 4, 3. Third joint of first four or five pairs of legs with but two dorsal spines. Last one or two pairs of coxae laterally armed. Spines of anal legs, ventral, in female 0, 1, 3, 2, 1, in male 0, 1, 3, 2, 0; of thirteenth, dorsal, 1, 0, 3, 1, 1; of twelfth, dorsal, 1, 0, 3, 1, 2 or 1, 0, 3, 1, 1. Lobe of anal leg of male as in Plate 9, fig. 1. Length 10 to 13.5 mm.

DESCRIPTION.—Dorsum brown to chestnut, typically the latter. Head and usually with it the first dorsal plate a little darker than the

dorsum of body with the region in front of suture usually paler and in some a black spot just back of the suture. Antennae chestnut, rufous distally. Prosternum dusky brown; prehensors testaceous. Venter brown, the caudal plates darker and more reddish as usual. Legs brown like the venter, the tarsi lighter, testaceous; posterior pairs more chestnut, the tarsi, or tibiae and tarsi, commonly lighter, testaceous.

Body usually 8.5 or more times longer than width of tenth plate; Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 67 : 63 : 71 : 82 : 84 : 78.

Head suborbicular; wider than long in about ratio 67 : 63.

Antennae short and strongly attenuated. Articles short, uniform, very regularly decreasing distad; twenty-two in number.

Ocelli six to eight in two or three series: *e. g.*, 1 + 3, 2; 1 + 4, 3; 1 + 3, 2, 1; 1 + 4, 2, 1. Single ocellus greatly exceeding in size the others, which are mostly small; first ocellus of uppermost row clearly the largest of the seriate ocelli, often paler than the others which decrease cephalad.

Prosternum (Plate 9, fig. 3) 1.6 times wider than long. Distance between chitinous spots 2.26 times width at level of bottom of sinus; 3.6 times length of dental line. Sides of anterior portion rounding out well from ectal teeth. Line of apices of teeth nearly straight. Sinus large, v-shaped; distance between mesal teeth somewhat greater than that between teeth of each pair.

First dorsal plate near 1.7 times wider than long.

Coxal pores 3, 3, 3, 3; 3, 3, 4, 3; 3, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 2}$; of the second to fourth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the fourth to fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the sixth to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{1, 0, 3, 1, 1}{0, 0, 3, 3, 2}$ or $\frac{1, 0, 3, 1, 2}{0, 0, 3, 3, 2}$, where the latter the anterior dorsal spine of tibia very small; of the thirteenth and penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$ (♀) or $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$ (♂); claw one. Either last pair or last two pairs of coxae laterally armed; when the last two the spine on penult coxa is very small.

Anal legs of male with the fifth joint thickened and at distal end ventromesally excised and on plane of excision bearing an oblong lobe, the longitudinal axis of which is a little oblique to that of joint; the lobe expands distally above base and is flat or somewhat concave topped (Plate 9, fig. 1).

Claw of female gonopods large, well curved, moderately excavated. Spines acuminate from base gradually to distal division and then more

abruptly acutely pointed. Outer spine always considerably longer than the inner (Plate 8, fig. 6). Mesal edge of first article diverging from the median line, proximally somewhat concave (Plate 9, fig. 2).

Length 10 to 13.5 mm.

Praematurus.—Color of dorsum decidedly green. Head and first plate light brown. Antennae light brownish, lighter distad. Prosternum like head. Venter green. Legs pale green, lighter, freer from green, distad; posterior pairs brighter, yellowish.

Articles of antennae already twenty-one or twenty-two.

Ocelli five in two series: 1 + 3, 2. Single ocellus largest, pale; first of upper series next in size, also pale.

General form and proportion of prosternum as in adult. Sinus between v- and u-shaped, large. Line of apices of teeth slightly recurved.

Coxal pores 2, 2, 2, 2.

Spines of first legs, $\frac{0,0,1,2,1}{0,0,1,2,1}$; of the second, $\frac{0,0,2,2,1}{0,0,2,3,1}$; of the third, $\frac{0,0,2,2,2}{0,0,2,3,1}$; of the fourth to sixth, $\frac{0,0,2,2,2}{0,0,2,3,2}$; of the seventh to eleventh, $\frac{0,0,3,2,2}{0,0,2,3,2}$; of the twelfth, $\frac{1,0,3,1,2}{0,0,3,3,2}$; of the thirteenth and penult, $\frac{1,0,3,1,1}{0,1,3,3,2}$; of the anal, $\frac{1,0,3,1,0}{0,1,3,2,1}$ (♀), or $\frac{1,0,3,1,0}{0,1,3,2,0}$ (♂). Last pair of coxae laterally armed.

Anal legs in male slender, the fifth joint not much thickened but showing at the distal end the lobe which may have nearly the characteristic form excepting for smaller size or which may appear in the form of merely a rounded, bulging eminence or knob not yet showing the characteristic shape.

Claw of female gonopods moderately curved, rather stout, strictly entire. Basal spines two *plus* two, but the inner spine of each pair very much smaller, both spines acutely conical. Second and third articles each with three ventral bristles, the first with three or four.

Length cir. 8.25–8.5 mm.

Immaturus.—Prevailing green. Head and first plate same as dorsum or brownish with frontal paler. Antennae paler distad of middle. In green individuals the legs are somewhat whitish distad.

Antennae with full number of articles, twenty-two.

Ocelli 1 + 2, 2. Well separated; slightly pigmented. Single ocellus and the caudal one of each series not much differing in size.

Prosternum with same form and proportions as in adult.

Coxal pores very small, 2, 2, 2, 2.

Spines of first legs, $\frac{0,0,1,1,1}{0,0,0,1,1}$; of the second, $\frac{0,0,2,2,1}{0,0,0,1,1}$; of the third to fifth, $\frac{0,0,2,2,2}{0,0,1,1,1}$; of the sixth and seventh, $\frac{0,0,2,2,2}{0,0,1,2,1}$; of the eighth

and ninth, $\frac{0, 0, 2, 2, 2}{0, 0, 1, 3, 1}$; of the tenth, $\frac{0, 0, 3, 2, 2}{0, 0, 1, 3, 1}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 1, 3, 2}$; of the eleventh, $\frac{0, 0, 3, 1, 2}{0, 0, 1, 2, 1}$; of the twelfth, $\frac{0, 0, 3, 1, 1}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{0, 0, 3, 1, 1}{0, 0, 2, 2, 2}$ to $\frac{0, 0, 3, 1, 1}{0, 0, 3, 3, 2}$; of the penult, $\frac{0, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$ (♀) or $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$ (♂).

No lateral spines detected on any of the coxae.

Length cir. 7.5 mm.

Agentalis I.—Color very dilute brown, with head and first dorsal plate a little darker. Legs pale, whitish.

Antennae composed of twenty articles which are short and closely compacted, the ultimate being longer than the three preceding ones taken together.

Ocelli 1 + 2, 1 or 1 + 2, 2. Single ocellus and caudal one of upper series equal or single one rather smaller.

Prosternum nearly as in older stages.

Coxal pores very small, 2, 1, 1, 1.

Spines of first legs, $\frac{0, 0, 0, 1, 1}{0, 0, 1, 1, 1}$ or $\frac{0, 0, 0, 1, 0}{0, 0, 1, 1, 1}$, the ventral spine of third joint being minute; of the second, $\frac{0, 0, 0, 2, 1}{0, 0, 1, 1, 1}$ or $\frac{0, 0, 1, 2, 1}{0, 0, 1, 1, 1}$; of the fourth, $\frac{0, 0, 1, 2, 1}{0, 0, 1, 2, 1}$; of the fifth to ninth, $\frac{0, 0, 1, 2, 2}{0, 0, 1, 2, 1}$; of the tenth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$ to $\frac{0, 0, 1, 2, 2}{0, 0, 1, 3, 2}$; of the eleventh, $\frac{0, 0, 2, 1, 1}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 2, 1, 1}{0, 0, 1, 3, 2}$; of the twelfth, $\frac{0, 0, 2, 1, 1}{0, 0, 1, 3, 2}$ or $\frac{0, 0, 2, 1, 1}{0, 0, 1, 2, 2}$; of the thirteenth and penult, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$; of the anal, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 0}$. Posterior coxae with neither bristles nor spines.

Female gonopods elongate; conical; biarticulate; with no trace of claw or spines.

Anal glands still present in fully developed form.

Length cir. 6.4 mm.

Pullus IV (Larva quarta).—Very pale, dilute yellowish. Head more pigmented, somewhat orange.

Antennae composed of seventeen articles.

Ocelli 1 + 2, 1. Caudal ocellus of upper series and that of the lower larger than the single ocellus; anterior one small. All distinct and well separated.

Prosternum with line of apices of teeth recurved. Sinus proportionately somewhat smaller than in the adult.

Each twelfth coxa with a single pore.

Twelve developed pairs of legs present, the other three pairs appearing as slender appressed buds.

Spines of first legs, $\frac{0, 0, 0, 0, 1}{0, 0, 0, 1, 1}$ or $\frac{0, 0, 0, 0, 1}{0, 0, 1, 1, 1}$; of the second, $\frac{0, 0, 0, 0, 1}{0, 0, 1, 1, 1}$; of the third, $\frac{0, 0, 0, 1, 1}{0, 0, 1, 1, 1}$; of the fourth to eighth, $\frac{0, 0, 0, 2, 1}{0, 0, 1, 1, 1}$; of the ninth, $\frac{0, 0, 0, 1, 1}{0, 0, 1, 1, 1}$; of the tenth to twelfth, $\frac{0, 0, 0, 0, 0}{0, 0, 1, 1, 1}$.

Anal glands well developed.

Length *circa* 6 mm.

TYPE.—M. C. Z., No. 429, California: Santa Cruz Island, La Playa Canyon. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 359-364, 427, 428, California: Santa Cruz Island, La Playa Canyon. R. V. Chamberlin.

This species is very close to *N. nampus* but the differences appear clearly and definitely upon close study. It is a more slender species with a proportionately smaller head, being 8.5 or more times longer than width of the tenth plate whereas the ratio in *N. nampus* is usually between seven and eight or but slightly more, to one. The prosternum is proportionately narrower. It is a distinctly more reddish species, being normally chestnut in the adult. The spines of the female gonopods are somewhat more slender and are more uniformly and acutely acuminate. Finally, the first four or five pairs of legs have the third joint with but two dorsal spines as against three in *N. nampus* on all or on all but the first pair. There appears to be a difference in habitat, *N. insulae* having been found only in the cooler, moister portions of La Playa Canyon on Santa Cruz Island, where *N. nampus* occurs on the hills and in the more open places as it does on the mainland.

NOTHEMBIUS NAMPUS, sp. nov.

Plate 8, fig. 4; Plate 9, fig. 6, 7.

DIAGNOSIS.—Less slender; first dorsal plate near 1.64 times wider than long; head wider than long. Testaceous to brown, head and first dorsal plate light chestnut. Ocelli seven to nine in two or three series. Prosternum 1.66 to 1.68 times wider than long; distance between chitinous spots 3.75 times dental line; sinus shallow and wide; teeth 2 + 2. Basal spines of gonopods less slender (Plate 8, fig. 4). Coxal pores 3, 4, 4, 3. Third joint of all legs, or of all but first pair, with three dorsal spines. Last one or two pairs of coxae laterally armed. Spines of anal legs, ventral, in female 9, 1, 3, 2, 1, in male 0, 1, 3, 2, 0; of thirteenth, dorsal, 1, 0, 3, 1, 1; of twelfth, dorsal, 0, 0, 3, 1, 2. Lobe of anal leg of male as in *N. insulae*. Length 7 to 12 mm.

DESCRIPTION.—Dorsum testaceous to brown, the plates caudad of the middle in most showing a distinct median longitudinal dark stripe which may also sometimes be present on the anterior ones.

Head and usually the first dorsal plate pale chestnut, frontal region paler and on caudal portion a darker median longitudinal stripe. Prosternum mostly light brown, the prehensors paler. Venter yellow to testaceous, with the caudal plates darker, burnt brown. Legs yellowish or testaceous, the posterior pairs more densely pigmented.

Body from 7 to $8\frac{1}{3}$ times longer than width of tenth plate. Widths of head and of first, third, eighth, tenth, and twelfth dorsal plates to each other as 29 : 28 : 29 : 31 : 32 : 30.

Head wider than long. Caudal margin mesally a little incurved. Sides between eyes and lateral breaks characteristically nearly straight and subparallel.

Antennae very short, reaching or not fully attaining the fifth body segment. Articles normally twenty-two, sometimes only twenty-one; short and mostly rather slender; distally shorter ones may occur at intervals between longer ones.

Ocelli seven to nine in two or three series: *e. g.*, 1 + 4, 3, a very common arrangement; 1 + 3, 3; 1 + 4, 2, 1; 1 + 4, 3, 1. Single ocellus largest, the others, excepting most caudal, of small or very small size.

Prosternal teeth 2 + 2; inner one of each pair larger than the outer so that line of apices is commonly almost straight. Sinus shallow and wide, with sides concave. Spine slender and straight. 1.66 to 1.68 times wider than long. Distance between chitinous spots 2.64 times width at level of bottom of sinus; 3.75 times the dental line. Distance between apices of mesal teeth equal to that between apices of teeth of each pair (Plate 9, fig. 6).

First dorsal plate about 1.64 times wider than long; sides back of about anterior third of length considerably converging and but little convex; caudal corners well rounded. Caudal margin of ninth plate straight; the eleventh and especially the thirteenth plate with the caudal corners obliquely excised, the line of excision straight and making but a slight angle with the median portion of margin.

Coxal pores small, decreasing in size proximad on each coxa in the usual way: 2, 3, 3, 2; 3, 4, 4, 3, the most usual number and arrangement.

Spines of first legs, $\frac{0, 0, 3, 2, 1}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the second to eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 1, 2}{0, 0, 3, 3, 2}$; of the thirteenth and penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$ (♀) or $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 0}$ (♂). Last two pairs of coxae, or rarely but the last pair, laterally armed.

Anal legs in male short, of uniform thickness. The tibia at its

distal end with mesoventral side obliquely excised and bearing at this place a characteristic oblong lobe set somewhat obliquely to the longitudinal axis of the joint, somewhat expanded above base and distally flattened as in *N. insulae*; bristles of lobe rather few, straight.

Gonopods of male pale; small, rounded and wart-like; bearing one or two bristles.

Claw of female gonopods short and unusually thick and stout; rather strongly curved; strictly entire; distally narrowly acutely rounded. Spines 2 + 2 or 2 + 3, the outer considerably larger than the inner; in ventral view the outer is attenuated from near base, the inner being proportionately broader with the sides parallel from base to an acuminate apical portion (Plate 8, fig. 4; Plate 9, fig. 7). Inner side of first article considerably diverging proximad from that of the opposite one, proximally concave.

Length 7 to 12 mm., the female types varying from 9 to 12 mm. and the male types from 7 to 10 mm. in length. A male 9.75 mm. long has antennae 3.5 mm. and anal legs 3.4 mm. long and the tenth plate 1.17 mm. wide.

TYPE.—M. C. Z., No. 426, California: Claremont. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 420, 424, California: Claremont; M. C. Z., No. 358, 425, Eaton's Canyon; M. C. Z., No. 421-423, Santa Cruz Island. R. V. Chamberlin.

NOTHEMBIUS ABERRANS, sp. nov.

Plate 8, fig. 5; Plate 9, fig. 4, 5.

DIAGNOSIS.—First dorsal plate near 1.86 times wider than long; head wider than long. Brown, head a little darker and of chestnut cast. Ocelli nine to eleven in three series. Prosternum 1.64 times wider than long; distance between chitinous spots 4 times dental line; teeth 3 + 3. Outer spine longer and stouter than inner. Coxal pores 3, 3, 3, 3 to 4, 4, 4, 3. Third joint of first four or five pairs of legs bearing only two dorsal spines and of first nine only two ventral ones. Last two pairs of coxae laterally armed. Spines of anal legs, ventral, in both sexes 0, 1, 3, 2, 1; of thirteenth legs, dorsal, 1, 0, 3, 1, 2 or, rarely, 1, 0, 3, 1, 1; of twelfth, dorsal, 0, 0, 3, 2, 2 or 0, 0, 3, 1, 2. Lobe of anal leg in male as in Plate 9, fig. 5. Length 8.5 to 10 mm.

DESCRIPTION.—Dorsum typically brown. Head a little darker

and of chestnut cast. Antennae dark brown, light at tips. Venter brown. Prosternum darker than venter, of chestnut tinge. Legs pale brown, posterior pairs darker, all legs lighter distally. In some specimens the body is paler throughout and of a greenish tinge, as is often the case in the related species.

Widths of head and of first, third, eighth, tenth, and twelfth plates to each other as 58 : 56 : 60 : 71 : 75 : 73.

Head wider than long in about ratio 58 : 53; widest at level of breaks, widely rounded and but moderately narrowed anteriorly.

Antennae short and well attenuated. Articles twenty-two, short and very short, decreasing distad in the usual way.

Ocelli nine to eleven in three series: *e. g.*, 1 + 4, 3, 2, the commonest arrangement, 1 + 4, 3, 1; 1 + 4, 3, 3. Single ocellus largest; the most caudal one of first and of second series also large, the others decreasing anteriorly.

Prosternum in type 1.64 times wider than long. Distance between chitinous spots 2.35 times width at level of bottom of sinus; four times the dental line. Teeth 3 + 3, all moderately acute and with sides straight, the most mesal on each side smaller than the other two which are subequal, and the interval separating it from the median one of the three shallower and much narrower than that between the outer two. Line of apices recurved. Sinus narrow, narrowly rounded at bottom. Spine as usual (Plate 9, fig. 4).

First dorsal plate in type about 1.86 times wider than long; widening moderately cephalad. Posterior angles of ninth plate rounded, of the eleventh straight, and of thirteenth distinctly, although but moderately, produced.

Coxal pores 3, 3, 3, 3; 3, 3, 4, 3; 3, 4, 4, 3; 4, 4, 4, 3.

Spines of first legs, $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 1}$ or $\frac{0, 0, 2, 2, 1}{0, 0, 2, 2, 1}$ (on one side) to $\frac{0, 0, 2, 2, 1}{0, 0, 2, 3, 2}$; of the second, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 1}$ or $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the third and fourth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$; of the fifth, $\frac{0, 0, 2, 2, 2}{0, 0, 2, 3, 2}$ or $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the sixth to ninth, $\frac{0, 0, 3, 2, 2}{0, 0, 2, 3, 2}$; of the tenth and eleventh, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$; of the twelfth, $\frac{0, 0, 3, 2, 2}{0, 0, 3, 3, 2}$ or $\frac{0, 0, 3, 1, 2}{0, 0, 3, 3, 2}$; of the thirteenth, $\frac{0, 0, 3, 1, 2}{0, 1, 3, 3, 2}$ or $\frac{0, 0, 3, 1, 2}{0, 0, 3, 3, 2}$ (on one side), or rarely $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$; of the penult, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 2}$ or occasionally, on one side, $\frac{1, 0, 3, 1, 1}{0, 1, 3, 3, 1}$; of the anal, $\frac{1, 0, 3, 1, 0}{0, 1, 3, 2, 1}$, alike in both sexes; claw one. Last two pairs of coxae laterally armed.

Anal and penult legs considerably thickened in both sexes, especially the third, fourth, and fifth joints, the tibiae and tarsi remaining in comparison abruptly more slender. In the male the fifth joint of the

anal leg is less markedly excised at distal end than in the other two species. The lobe borne is comparatively thin, is higher caudally than anteriorly and has the distal or free surface convex; it bears numerous long, distally curved, hairs; the lobe is set somewhat obliquely to the long axis of the joint and is proportionately lower and smaller than in the other species (Plate 9, fig. 5).

The claw of the female gonopods is long and rather slender, acutely pointed, strongly curved and moderately excavated. The outer spine is distinctly and considerably stouter and longer than the inner; spines narrowed from base to apical portion which in outer spine is acute and in inner is almost obtuse (Plate 8, fig. 5). Inner edge of first article straight but distinctly diverging from the median line cephalad.

Length 8.5 to 10 mm.

TYPE.—M. C. Z., No. 357, California: Eaton's Canyon, near Altadena. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 365, 430, California: Eaton's Canyon, near Altadena. R. V. Chamberlin.

This species is readily separated from the two other species in having the prosternal teeth 3 + 3 instead of 2 + 2. The male differs from those species not only distinctly in the character of the lobe borne on the anal leg but also in having the ventral spines of that leg 0, 1, 3, 2, 1 as in the female. In the spining of the legs the species is nearer to *N. insulae* than to *N. nampus*. Typically it differs from both species in having the dorsal spines of the thirteenth legs 1, 0, 3, 1, 2 instead of 1, 0, 3, 1, 1. The posterior legs are proportionately stouter. The single ocellus is less enlarged.

TIGOBIOUS, gen. nov.

Head with lateral marginal breaks.

Antennae very short; articles twenty.

Eyes composed of seriate ocelli; single ocellus not enlarged, smaller than one or more of the other ocelli.

Prosternal teeth 2 + 2, the line of apices recurved. Spine slender. Incision rather large, v-shaped.

Posterior angles of none of the dorsal plates produced.

Coxal pores small and circular, uniseriate.

Claw of female gonopods short, tripartite, with median tooth largest. Basal spines 2 + 2 acuminate from base.



FIG. 6.— Distribution of *Tigobius*.

Tarsi of anterior legs strictly entire, with no trace of division.

Anal and penult legs in male moderately and uniformly crassate. Anal leg with sixth joint bearing at distal end on dorsal side a small but conspicuous process or lobe. Anal coxae laterally armed. Third joint of none of the legs cephalad of the ninth or tenth pair dorsally armed. Fifth joint of legs from second to near eleventh with two dorsal spines. Dorsal spines of anal legs 1, 0, 3, 1, 0; ventral, 0, 1, 3, 2, 0, the claw single. Dorsal spines of penult legs 1, 0, 3, 1, 1; ventral, 0, 1, 3, 3, 1; claws two. Dorsal spines of thirteenth legs 0, 0, 2, 1, 1; ventral, 0, 0, 2, 3, 2 or 0, 1, 2, 3, 2. Dorsal spines of twelfth legs 0, 0, 2, 1, 1; ventral, 0, 0, 2, 3, 2. Dorsal spines of eleventh legs 0, 0, 0, 2, 2 or 0, 0, 1, 2, 2; ventral, 0, 0, 1, 3, 2. Dorsal spines of first legs 0, 0, 0, 1, 1 or 0, 0, 1, 1, 1; ventral, 0, 0, 1, 2, 1.

Length 7 mm. and under.

TYPE.—*T. paralus*, sp. nov.

The characteristic lobe on the sixth joint of the anal legs much resembles that found on the fifth joint of the penult legs in the males of *Nampabius*. The genus is at present known from a single species.

TIGOBIUS PARALUS, sp. nov.

Plate 10, fig. 1-4.

Dorsum brown, lightest at middle. Caudal portion of head similar to dorsum; but anteriorly it is lighter, yellowish or subferruginous. Antennae light yellowish brown. Legs dilute brown, posterior pairs lighter, bright yellow. Venter brown, with caudal plates darker, and anterior ones suffused with violaceous. Prosternum and prehensors somewhat testaceous.

Body attenuated considerably cephalad from tenth plate, the first plate being much narrower than the head and than the third plate. Width of head and of first, third, eighth, tenth and twelfth plates to each other as 37 : 34.5 : 37 : 42 : 43 : 41.

Head varying in proportions from nearly equal in length and breadth (♀ paratype) to considerably longer than wide (41:37 in ♂ paratype). Sides substraight and but slightly converging caudad between eyes and caudal corners. Lateral marginal breaks slight.

Antennae very short. Articles between third and ultimate very short. Ultimate article longer than the two preceding taken together.

Ocelli 1 + 4 and 1 + 1, 3. Single ocellus somewhat smaller than

the first of series (Plate 10, fig. 2). Ocelli pale. Organ of Tömösvary circular in outline, larger than the adjacent ocelli.

Prosternum (Plate 10, fig. 3) strongly narrowed anteriorly, with sides of anterior portion incurving. Teeth low, angularly pointed, with line of apices distinctly recurved. Incision proportionately rather large, v-shaped, with sides a little concave. Spine slenderly acuminate, bending a little mesad. In type 1.42+ times wider than long. Distance between chitinous spots 2.23 times width at level of bottom of incision; 3.625 times as great as length of dental line.

First dorsal plate widest at or a little in front of the middle, widely rounded caudad from a little back of middle to and about the caudal corners; 1.7 times wider than long. Sixth, seventh, and ninth plates with the caudal corners excised, the line of excision or truncation being long; eleventh plate with caudal corners only shortly excised; fourth and thirteenth with caudal margins straight.

Coxal pores very small: 2, 2, 2, 2.

Spines of first legs, $\frac{0,0,0,1,1}{0,0,1,2,1}$ or $\frac{0,0,1,1,1}{0,0,1,2,1}$; of the second, $\frac{0,0,0,2,2}{0,0,1,2,1}$ or $\frac{0,0,1,2,2}{0,0,1,2,1}$; of the third, $\frac{0,0,0,2,2}{0,0,1,2,1}$, of the fourth, $\frac{0,0,0,2,2}{0,0,1,2,1}$ or $\frac{0,0,0,2,2}{0,0,0,2,1}$, of the fifth to eighth, $\frac{0,0,0,2,2}{0,0,0,2,1}$; of the ninth, $\frac{0,0,0,2,2}{0,0,1,2,1}$; of the tenth, $\frac{0,0,0,2,2}{0,0,1,3,2}$ or $\frac{0,0,1,2,2}{0,0,1,3,2}$ or $\frac{0,0,0,2,2}{0,0,1,3,1}$; of the eleventh, $\frac{0,0,0,2,2}{0,0,1,3,2}$, $\frac{0,0,1,2,2}{0,0,1,3,2}$, or $\frac{0,0,2,2,2}{0,0,1,3,2}$; of the twelfth, $\frac{0,0,2,1,1}{0,0,2,3,2}$; of the thirteenth, $\frac{0,0,2,1,1}{0,0,2,3,2}$ or (on one side), $\frac{0,0,2,1,1}{0,0,2,3,2}$; of the penult, $\frac{1,0,3,1,1}{0,1,3,3,1}$, claws two; of the anal, $\frac{1,0,3,1,0}{0,1,3,2,0}$, claw single. Anal coxae alone laterally armed.

Anal and penult legs of male moderately and uniformly crassate. Penult not otherwise modified but sixth joint of anal leg bearing on dorsal surface at distal end a small but conspicuous subcylindric process very similar to that occurring on tibia of penult legs in species of *Nampabius* (Plate 10, fig. 1).

Gonopods of male well exposed, sides subparallel and distal edge substraight; each bearing a single bristle.

Claw of female gonopods moderately short, but little curved, tripartite, with median tooth considerably largest and the lateral ones subequal. Spines acutely acuminate from base to apex; the outer longer than the inner (Plate 10, fig. 4).

Length from 5 to 7 mm.

TYPE.—M. C. Z., No. 366, California: Pacific Grove. R. V. Chamberlin.

PARATYPES.—M. C. Z., No. 367, California: Pacific Grove; M. C. Z., No. 368, 452, Santa Barbara; M. C. Z., No. 451, 453, Santa Cruz Island. R. V. Chamberlin.