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NOTES ON THE CRAYFISHES

IN THE

UNITED STATES NATIONAL MUSEUM

AND THE

MUSEUM OF COMPARATIVE ZOÖLOGY

WITH DESCRIPTIONS OF NEW SPECIES AND SUBSPECIES

TO WHICH IS APPENDED

A CATALOGUE OF THE KNOWN SPECIES AND SUBSPECIES.

BY

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WITH THIRTEEN PLATES.

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#### PREFATORY NOTE.

THE following notes on Crayfishes were made during an examination of all the Crayfishes that have been received at the United States National Museum and the Museum of Comparative Zoölogy since my last paper on these animals was published in the Proceedings of the United States National Museum, Feb. 7, 1898, 20, p. 643-694, pl. 62-70. I am deeply indebted to the authorities of the National Museum for sending to me the vast amount of material that has come to Washington since my last review of the subject. I am also indebted to Mr. W. P. Hay of Washington, Prof. S. E. Meek of the Field Museum of Natural History, Chicago, Ill., and Dr. A. E. Ortmann of the Carnegie Museum, Pittsburgh, Pa., for the loan of specimens.

## NOTES ON THE CRAYFISHES.

### ASTACOPSIS AUSTRALASIENSIS (Milne Edwards).

*Astacus australasiensis* M. Edw., Hist. Nat. Crustacés, 1837, 2, p. 332, pl. 24, f. 1-5.

There are two cotypes of this species in the Museum of Natural History in Paris. One of these, a female, has been kindly loaned to me by Prof. E. L. Bouvier. The rostrum of this specimen is long-triangular, excavated, the acumen provided with an upturned, blunt, apical denticle and a similar denticle on each side; behind the lateral denticles the margins of the rostrum are obscurely crenate. The post-orbital ridges terminate anteriorly in a blunt tubercle; they are channelled throughout their length and are followed by two obsolescent tubercles at a little lower level on the gastric region; the hepatic area also is tuberculated and a few less prominent tubercles are visible on the posterior margin of the cervical groove on each side of the carapace. The areola is broad, narrowing from before backward, punctate. Branchial regions obsolete squamose. Abdomen rather smooth, with a submarginal row of small tubercles on the pleura of the second somite; pleura rounded. Spine on dorsal face of inner branch of posterior abdominal appendages *submarginal*. Antennal scale of moderate width, flanked with a sharp denticle on the outer side at the base. Anterior process of the epistome triangular, with convex sides, ending anteriorly in an attenuated angle. Chelipeds nearly symmetrical, meros armed below with spines biserially disposed, upper margin thereof also furnished with a few (three or four) spinules; upper margin of carpus armed with two prominent spines, the distal the larger; outer face furrowed longitudinally, slightly tuberculate along the upper edge of the furrow; inner face of the carpus somewhat tuberculate and armed with one spine in the middle of the distal border. Propodite distinctly carinate on the upper border, less distinctly so on its lower border; the superior crest is cut into five teeth, the lower margin is denticulate; the outer face of the propodite is thickly covered with depressed tubercles. Dactylus furnished with one denticle near the proximal end of the upper border. Length, 63 mm.; length of carapace, 30.5 mm.; breadth of carapace, 13 mm.; length of areola, 9 mm.; breadth of areola at anterior end, 6 mm., at posterior end, 4.5 mm.; length of chela, 20 mm.; breadth of chela, 10 mm.; length of dactylus, 11.5 mm.

Bay of Sydney, Verreaux, No. 944, 1837.

I doubt if this is the specimen figured by Milne Edwards: he gives as the length of the body, two inches; the figure, which is said to be life size, is 56 mm. long.

Dr. Giuseppe Nobili<sup>1</sup> also has examined the same cotype belonging to the Paris Museum and is convinced that it belongs to the same species as a male specimen, 66 mm. long, in the Museum of Natural History of Genoa, said to have been collected by D'Albertis in 1872 on the little island of Sorong in the Strait of Galevo, northwestern coast of New Guinea. Perhaps a misplacement of labels has occurred in this case; the extraordinary distribution of this species implied by the nominal locality label accompanying the Genoa specimen, as well as the nature of the islet of Sorong, make it probable that the specimen was in reality secured at Sydney, Australia, where D'Albertis collected in 1873.

*Astacopsis australasiensis* may turn out to be nothing but an immature stage of *A. spinifera*.

#### ASTACONEPHROPS ALBERTISII Nobili.

*Astaconephrops albertisii* NOBILI, Annali Mus. Civ. Storia Nat. Genova, 1899, 40, p. 244; Bolletino dei Musei di Zoologia ed Anatomia Comparata di Torino, June 9, 1903, 18, p. 1.

The genus *Astaconephrops*, with its one species *albertisii*, based on a single female specimen in the Museum of Genoa which is said to have come from Katau on the southern coast of New Guinea, needs further elucidation. According to Nobili the margins of the rostrum (which in a general way resembles the rostrum of *Paranephrops*) are continued back, in the shape of two keels, over the carapace to the cervical groove; the abdominal segments are produced into points laterally; the inner branch of the last pair of abdominal appendages is furnished with a rib or keel on the dorsal face, terminating in a spine near the centre of the branch; the chelae are long and slender and on account of the elevation of the middle of the two faces appear subprismatical; the carpus is cylindrical, or rather depressed, and armed on the inner side with a sharp spine concealed in a large tuft of hairs; the inner margin of the palm is furnished with minute teeth, all the rest of the palm being smooth; the fingers are unarmed, but provided with hairs along their cutting edges.

From the description of this animal given by Nobili one would infer a combination of the characters of *Nephrops*, *Paranephrops* and *Cheraps*. The

<sup>1</sup> Contribuzioni alla Conoscenza della Fauna Carcinologica della Papuasias, delle Molluche e dell'Australia. Annali del Mus. Civ. Storia Nat. Genova, 1899, 40, p. 246.

branchial formula is the same as in the genus *Cheraps*, and essentially the same as in *Paranephrops*; but according to Nobili the podobranchiae of the eighth and ninth somites are not furnished with an ala or lamina in the genus *Astacone-phrops*, whereas in the genus *Cheraps* these podobranchiae are alate.

PARASTACUS ARAUCANIUS, sp. nov.

Plate 4.

*Male*:—Cephalothorax shorter than the abdomen, strongly compressed laterally, mostly smooth, minutely granulated on the sides; areola broad (about two thirds as broad as long), minutely punctated; rostrum short, not reaching the distal end of the second antennular segment, margins elevated, slightly convergent from base to near the tip, where they abruptly converge to form the abbreviated acumen; the infero-lateral edges of the rostrum are visible from above, forming the superior border of the orbit separated from the supero-lateral edge of the rostrum by a groove; distal half of the rostrum concave above; antero-lateral margins of the carapace produced into a prominent, rounded angle below the small eye which lies in a deep and uncommonly complete orbit. Post-orbital ridges, obsolete. The pleural angles of the abdomen are rounded, the telson long with a pair of lateral spines and a longitudinal median furrow on its upper face along its distal half; the median rib on the upper side of the inner branch of the last pair of abdominal appendages ends in a small spine situate a little distance from the margin. Antennal scale short and broad. The chelipeds are asymmetrical, the right one being the larger; the meros is tuberculated on its lower face, granulate on the superior margin, but destitute of spines; the surface of the carpus is lightly squamoso-granulate, the granulations becoming more pronounced on the supero-interior edge where they take the form of blunt tubercles; the chela, too, is lightly squamoso-granulate, without any prominent spine or tubercle, except one blunt tubercle or tooth near the base of the immovable finger; the superior and inferior borders are rounded.

Dimensions. Length, 42 mm.; length of cephalothorax, 19 mm.; length of areola, 6 mm., breadth of areola, 4 mm.; length of larger claw, 15.5 mm., breadth of do., 7 mm., length of dactylus, 8.5 mm.

Corral, Chile, Dec. 18, 1908, in a cascade stream. Thomas Barbour coll., M. C. Z., No. 7,355.

This species is related to *P. nicoleti* (Phil.) and *P. hassleri* Fax. Like these it has a strongly compressed cephalothorax, indicating a burrow-dwelling species.

It differs from both of these species in its short and broad areola. Compared with *P. nicoleti*, it differs in the lack of sculpture of the chela and carpus. Compared with *P. hassleri*, the rostrum is shorter, broader, and more abruptly truncate, the chela is rounded above and below and unprovided with the crest-like series of low, squamous tubercles.

Six species of *Parastacus* have been previously described from Chile, viz.:—*P. chilensis* (M. Edw.) in 1837, *P. spinifrons* (Philippi) in 1882, *P. nicoleti* (Philippi) in 1882, *P. bimaculatus* (Philippi) in 1894, *P. agassizii* Fax. in 1898, and *P. hassleri* Fax. in 1898. The type of *P. chilensis*, a single dry specimen, is in the Muséum d'Histoire Naturelle in Paris, and should be more fully described, since Milne Edwards's diagnosis (Hist. Nat. Crust., 1837, 2, p. 333) is entirely insufficient. In 1849 (Gay's Hist. Chile, Zool., 3, p. 211, Atlas, 2, Crust. pl. 1, f. 4) Nicolet described and figured as *Astacus chilensis* M. Edw. a crayfish certainly different from Milne Edwards's species, and R. A. Philippi therefore gave Nicolet's species a new name, *Astacus nicoleti*, in a paper published in the Anales de la Universidad de Chile, 1882, 61. In a paper published in 1898 when I was ignorant of Philippi's paper, I also gave a name to Nicolet's crayfish, fortunately the same name that had been already given it by Philippi. In the same paper Philippi describes and figures a new species, *Astacus spinifrons*; the diagnosis is as follows:—A. rostro elongato-triangulari ad basin utrinque spinula acuta; carpo extus profunde sulcato, margine superiore grosse tuberculato; mano crassa subtus rotundata; digitis haud lineato-sulcatis, intus basi longe barbato-ciliatis.

In 1894 Philippi<sup>1</sup> published a description of another new species of *Parastacus* from Chile under the name of *Astacus bimaculatus*. This is probably the species which I described later by the name of *Parastacus agassizii* (Proc. U. S. Nat. Mus., 1898, 20, p. 690).

#### PARASTACUS SPINIFRONS (Philippi).

Plate 9, Fig. 1.

*Astacus spinifrons* PHILIPPI, Anales Univers. Chile, 1882, 61.

A male *Parastacus* in the Museum of Natural History, Paris, sent to me for identification by Prof. E. L. Bouvier, I think belongs to this species. It differs,

<sup>1</sup> Dos Palabras sobre la Sinonimia de los Crustáceos, Decápodos, Braquiuros o Jaivas de Chile. Anales Universidad Chile, 1894, 87, p. 369–379. I have been unable to consult either of Philippi's memoirs directly. Miss Rathbun, however, has kindly furnished me with a transcript of the earlier one, copied from the volume of the Anales in the Library of Congress, Washington, and Dr. A. E. Ortmann has courteously lent me a MS. copy of the later paper, given to him by F. Philippi, son of the author, about 1900.

it is true, from Philippi's figures of *P. spinifrons*, at least from the copy of those figures in Dr. Ortmann's possession, in some respects, for instance the rostrum is shorter and broader and the immobile finger of the large claw is much longer. These discrepancies may be due to the inaccuracy of the original figures or of the copy of these figures which is all that I have before me. Philippi's diagnosis, moreover, takes no account of the pronounced asymmetry of the chelipeds, a marked feature of the specimen from the Paris Museum. I append a description of the latter; future explorations in Chile will determine whether it is the same species as Philippi's.

Cephalothorax subcylindrical, smooth, shorter than the abdomen; areola broad, considerably less than one half the length of the anterior section of the carapace; rostrum triangular, reaching to the distal end of the second antennular segment, upper surface plane, with slightly elevated margins; post-orbital ridges obscurely marked except anteriorly where they form an elongate, low, tubercle without an acute spine; the antero-lateral angle of the carapace is produced to a prominent blunt angle below the orbit; there is no lateral or branchiostegian spine. The abdominal pleura are broad, with rounded angles. The antennal scales are broad, broadest in the middle; lower surface of the peduncle of the antenna hairy; epistoma triangular, anterior angle acute; third pair of maxillipeds clothed with dense hair below. Chelipeds unsymmetrical, the right one being much the larger, meros pretty smooth, except on its lower face which is provided with a row of small marginal tubercles and clothed with a heavy coat of hair; the superior margin of the meros is destitute of a spine; the carpus has a deep longitudinal groove along its external face; below this groove the surface is smooth, above it there are small squamous tubercles which on the superior border of the carpus assume the form of prominent tubercles, or blunt teeth, four or five in number; the infero-interior face of the carpus of the larger cheliped is likewise furnished with similar tubercles; the right (larger) claw is very thick, with rounded superior and inferior borders; the body of the claw is beset with flattened low tubercles which are most pronounced anteriorly, near the socket of the dactylopodite; the fingers gape, are pitted in place of being tuberculated, and there are about three blunt teeth on the cutting edge of each finger, one of which is especially prominent; both fingers are heavily bearded at the base, especially on the inner side; the left (smaller) claw is nearly smooth, with long and slender fingers that meet throughout their length, destitute of teeth but furnished with a beard at the base, like the larger claw. Inner branch of the last pair of abdominal appendages armed with a submarginal spinule at

the distal end of the median rib. Length, 90 mm., length of carapace, 41 mm., width of carapace, 20 mm., width of base of rostrum, 6.5 mm., length of rostrum, 9 mm., length of areola, 11.5 mm., breadth of areola, 7 mm., length of antennal scale, 7 mm., greatest breadth of do., 4 mm., length of larger claw, 31 mm., breadth of do., 17.5 mm., length of superior margin of hand, 10 mm., length of dactylus, 19 mm., length of smaller chela, 23 mm., breadth of do., 9 mm., length of dactylus, 16 mm.

There are four specimens of this species in the U. S. National Museum from the rivulets of MM. Bock and Jones, Lake Nahuel Huapi, on the eastern slope of the Cordilleras in Argentina. The chelipeds are preserved in three of these specimens; in two the larger claw is on the left side, in one it is the right, as in the Paris specimen.

The tip of the rostrum is setose in this species, and in most cases there are a pair of minute, horny, bead-like lateral teeth just back of the point of the rostrum. The rostrum is therefore essentially like that of *P. bimaculatus*. From the latter the present species differs in having much stouter, shorter-fingered, more heavily tuberculated claws, and a somewhat longer metathorax and narrower areola.

*Parastacus agassizii* (= *bimaculatus*) has been recorded from Lake Nahuel Huapi by Ortmann (Proc. Amer. Philos. Soc., 41, p. 293). The specimens should be examined anew with reference to the possibility of their belonging to the present species, *P. spinifrons*?

Specimens from Puerto Montt, Lake Llanquihué, on the opposite slope of the Cordilleras, in Chile, are said by Doflein (Sitzungsber. Akad. Wissensch. München, 1900, 30, p. 133) to agree wholly with my description of *P. agassizii*<sup>1</sup> (= *bimaculatus*).

#### PARASTACUS BIMACULATUS (Philippi).

*Astacus bimaculatus* R. A. PHILIPPI, Anales Universidad Chile, 1894, 87, p. 378 (Chile).

*Parastacus agassizii* FAXON, Proc. U. S. Nat. Mus., Feb. 17, 1898, 20, p. 690, pl. 70, figs. 4, 5 (Talcahuano, Chile). DOFLEIN, Sitzungsber. Akad. Wissensch. München, 1900, 30, p. 132 (Puerto Montt, Lago Llanquihué, Chile). LENZ, Zool. Jahrb., Supp., May 2, 1902, 5, p. 736 (Tumbes, Chile). PORTER, Revista Chilena de Hist. Nat., Dec. 31, 1904, 8, p. 258, Pl. 9 (Contulmo and Chillán, Chile).

<sup>1</sup> The error in the branchial formula of *P. agassizii* as it appears in my paper in the Proc. U. S. Nat. Mus., 1898, 20, p. 692, has been pointed out by Doflein. This error was due to an unfortunate dislocation of the table in printing, as is evident on comparing the table of the branchial arrangement in the genus *Parastacus* on p. 683.



A single specimen of this species has been lately received at the Museum of Comparative Zoölogy from Valparaiso, Chile.

As noted above, *P. agassizii* has been recorded from Lake Nahuel Huapi in Argentina by Ortmann (Proc. Amer. Philos. Soc., 41, p. 293). Specimens from this locality in the U. S. National Museum belong to a different although similar species, *P. spinifrons* (Phil.)? and Dr. Ortmann's determination should therefore be verified.

I think that my *P. agassizii* is the same species as the one previously described by R. A. Philippi in 1894 under the name of *Astacus bimaculatus*. Philippi's description is as follows:—

"*Astacus bimaculatus* Ph.

"A. cephalothorace utrinque macula magna triangulari, albida notato; rostro elongato, peracuto, utrinque ante apicem denticulo armato, unde lineae elevatae sensim divergentes nascuntur; chelis valde inaequalibus, sinistra majore; carpo ejus extus inflato, velut bullato, margine superiore unispinoso; digitis gracilibus, denticulatis. Longit. corporis 72 mm., chelae majoris 37 mm.

"El color del cuerpo es oscuro siendo una mezcla de negro verdoso i de pardo rojizo, como en las demas especies, i en cada lado se ve una gran mancha triangular blanquizca; su superficie es lisa, pero las patas anteriores están cubiertas de granulaciones bastante gruesas, que faltan solo en la parte inflada del carpo. El pico es casi tan largo como la escama situada en la base de las antenas exteriores; se adelgaza paulatinamente en una punta mui aguda e inclinada. De cada lado i mui cerca de la punta se notan dos dientecitos puntiagudos, de donde parten listones bastante elevados i agudos, qui diverjen paulatinamente. Un dientecito mui puntiagudo se observa tambien ante el borde de la órbita. Las patas anteriores son mui desiguales, la izquierda es mucho mas larga i sobre todo mas gruesa; por lo demas su hechura es la misma. En el borde superior del artículo tercero se nota una espina, i dos o tres en el borde inferior. El carpo muestra tambien una o dos espinas en su borde superior, i en su lado exterior una hinchazon casi semi-globosa, mui notable en el carpo izquierdo, menor pero bien aparente en el derecho. La mano es mucho mas angosta i estirada que en las otras tres especies chilenas, sobre todo los dedos, cuyo borde interior es finamente dentado. Las otras partes del cuerpo no ofrecen nada de particular."

This description agrees pretty well with the species which I described as *P. agassizii*, but I do not know what Philippi means by asserting that the figure of *Astacus fluviatilis* in the *Régne Animal* of Cuvier (Disciples' Ed., pl. 49, fig. 2) is an exact representation of his new Chilean species. The colour of the specimens from Talcahuano had long since vanished when I described them. Porter, however, has more recently described the living colours of *P. agassizii*, and they seem to conform in the main to the colour scheme of *P. bimaculatus* as described by Philippi:

"El color es en el dorso i flancos del cuerpo bruno-oliváceo, notándose en cada costado del cefalotórax, por detras del surco cervical, una gran mancha triangular de color amarillo limon cuyo vértice redondeado alcanza hasta la aréola, confundándose en esta rejion con la del lado opuesto en muchos ejemplares. A veces se vé ademas una mancha redondeada del mismo color a pocos milímetros del borde anterior del carapacho. Los tuberculillos escamiformes de las quelas lo mismo que las espinitas del rostro

son anaranjados, color que se observa en la parte inferior del cuerpo e inferior e interna de las patas. Estas últimas son de color bruno-oliváceo o bien oliváceo, especialmente en las quelas.”<sup>1</sup>

With reference to the large triangular colour-patch on each side of the carapace of *P. bimaculatus* as described by Philippi and of *P. agassizii* as described by Porter, it should be observed that spots of the same shape and in the same place are often seen in crayfishes of divers kinds shortly after they are immersed in alcohol. These spots or blotches are the result of the quick action of the alcohol on the thinnest part of the branchiostegites, which are bathed in the fluid on both sides, within and without. At first red, these spots afterwards fade into yellowish white,—the colour which ultimately pervades the whole of the body in specimens preserved in spirits. One is almost inclined to suspect that the colour-pattern noted by Philippi and Porter was due to recent immersion of the specimens in alcohol.

#### ASTACUS LENIUSCULUS Dana.

A large number of specimens of this species were collected for the U. S. National Museum in Johnson Creek, Portland, Multnomah Co., Oregon, by Messrs. Lyon and Benedict in May, 1905. The largest of these are upwards of five and one half inches long and demonstrate the fact that this species has as full, obese a form as *A. trowbridgii*. There is considerable variation in relative width of the areola in these specimens. Of twenty-six specimens, eighteen (7 ♂, 11 ♀) have the right and left claws symmetrical, while in eight (5 ♂, 3 ♀) the claws are asymmetrical. In many of the asymmetrical individuals I think the smaller, slenderer claw, which may be either on the right or left side, is a new claw grown after the loss of the original one.

In a male specimen collected by Mr. S. E. Meek, in Ten-Mile Lake, Florence, Lane Co., Oregon, Oct. 17, 1896 (U. S. N. M. No. 23,121), the chelae have the form characteristic of *A. leniusculus*, and both pairs of post-orbital spines are developed as in that species, but in the shape of the rostrum and the proportions of the areola it agrees with *A. trowbridgii*. Another specimen in the U. S. National Museum from Astoria, Clatsop Co., Oregon, resembles *A. trowbridgii* in the breadth and inflation of the claws and the length of the posterior section of the carapace. Still another specimen in the same Museum (collected by Mr. Wm. Palmer) from the base of Mt. Tamalpais, Marin Co., Cal., taken altogether would be classed with *A. trowbridgii*; yet in the proportions of the posterior sec-

<sup>1</sup> Porter, op. cit., p. 258.

tion of the carapace and the areola it agrees rather with *A. leniusculus*. As these two species inhabit the same region it is possible that they interbreed and produce hybrids.

ASTACUS TROWBRIDGII Stimpson.

*Astacus trowbridgii* stands midway between *A. leniusculus* and *A. klamathensis*. As it varies in one direction towards the former species, as has just been shown, so, on the other hand it passes through intermediate forms into the latter species. Such intermediate forms I have seen from Wilson Creek, Willapa, Pacific Co., and Littlerock, Thurston Co., Washington; and Sinslow River, Mapleton, Lane Co., and Wallowa Lake, Oregon. In dealing with small, immature individuals it is often difficult if not impossible to decide whether they should be assigned to *A. klamathensis* or to *A. trowbridgii*.

ASTACUS KLAMATHENSIS Stimpson.

Plate 11, 12.

*Astacus klamathensis* has a wide distribution in British Columbia, and in the states of Idaho, Washington, Oregon, and northern California, in the vast area drained by the Columbia River and its tributaries as well as in the smaller streams that empty into the Pacific Ocean on the west side of the Cascade Range of mountains.

*New localities*:—IDAHO: Indian Creek, Washington Co. WASHINGTON: Goldendale, Klickitat Co.; Granite Lake, Spokane Co.; Naches River, North Yakima, Yakima Co.; Crab Creek, [Douglas Co.?]; Creek near Hemp P. O.; Salmon River; Prairie Creek; North River; Willapa River, Holcomb, Nasel River, Nasel, Pacific Co. OREGON: Wallowa Lake, Wallowa Co.; Silver Creek, Harney Co.; Bear River, Medford, Jackson Co., Johnson Creek, Portland, Multnomah Co.; Nehalem River, Tillamvok Co. CALIFORNIA: Shasta River, near Montague, Siskiyou Co.; Cottonwood Creek, near Hornbrook, Siskiyou Co.; Priceland and Garberville, Humboldt Co.

In a lot of two dozen or more specimens of this species from Portland, Oregon, in the U. S. National Museum, a slight variation from the typical form is apparent in the lengthening of the rostrum and antennal scale and the more pronounced granulation of the chelae. In these regards they show a slight approach towards *A. trowbridgii*. Many of these individuals have lost their

claws and grown them anew (see Plate 11, 12). It is interesting to note the restored claws never assume the normal form but are elongated and flattened. When both chelipeds have been lost and re-grown simultaneously, the result is an individual with perfectly symmetrical claws on the right and left sides, so different in shape from the normal claws that one might easily be led to believe that it is a distinct species. Such a specimen is shown in Plate 12, fig. 2. The restored claws in these cases assume an ancestral, less highly specialized form.

*ASTACUS NIGRESCENS FORTIS*, subsp. nov.

Plate 7, Fig. 5, 9; Plate 9, Fig. 2.

Similar to *Astacus nigrescens*, from which it is distinguished by the following characters:— the sides of the rostrum converge more from the base to the tip; the areola of the carapace is narrower in proportion to its length; the chelae are shorter, broader, and more inflated.

Dimensions of a male:—length, 94 mm.; length of carapace, 49 mm.; width of carapace, 26 mm.; length of abdomen, 45 mm.; width of abdomen, 24 mm.; length of posterior section of carapace, 19 mm.; width of areola, 6 mm.; length of chela, 42 mm.; width of chela, 19 mm.; length of dactylus, 22 mm.

*Types*:— Fall River, Fall City Mills, Shasta Co., Cal., Aug. 29, 1898, Rutter and Chamberlain coll., U. S. N. M., No. 44,404, 2 ♂, 3 ♀, 1 juv.

*Paratypes*:— Hat Creek, Cassel, Shasta Co., Cal., Aug. 30, 1898, Rutter and Chamberlain coll., U. S. N. M., 3 ♀.

*ASTACUS GAMBELII CONNECTENS*, subsp. nov.

Plate 7, Fig. 6, 10; Plate 10, Fig. 1.

Similar to *A. gambelii* (Girard), but different in these regards:— the rostrum is narrower and longer, with a longer acumen, and in correlation with this the antennal scales are much longer, their internal margin sloping gradually to the lengthened apical spine. The post-orbital ridges, though rudimentary, as in *A. gambelii*, develop a pair of prominent posterior spines as in *A. nigrescens*, while the anterior pair — the only post-orbital spines found in *A. gambelii* — are much more prominent than in that form. The chelae are longer and slenderer than in *A. gambelii*.

*Types*:— U. S. N. M. No. 23,096, Snake River at Upper Salmon Falls, Idaho, Oct. 3, 1894, Evermann and Scovill coll., 3 ♂, 1 ♀.

*Paratype*:—Silvies River, Burns, Harney Co., Oregon, July 27, 1904, J. O. Snyder coll., 1 ♀. U. S. N. M.

This form bears the same relation to *A. gambelii* as *A. leniusculus* does to *A. trowbridgii*. In the development of the posterior pair of post-orbital spines it shows an affinity to *A. nigrescens*. It appears to be connected with *A. gambelii* by intermediate forms. A large male upwards of  $3\frac{1}{4}$  in. long in the U. S. National Museum, collected at the mouth of St. Joe River, Coeur d'Alene Lake, Idaho, has the long narrow rostrum and the elongated hand and fingers of *A. g. connectens*, but the posterior pair of post-orbital spines are wanting, and specimens (also in the U. S. National Museum) from Warm Springs, Harney Co., Oregon, in most respects like typical *A. gambelii*, show traces of the posterior post-orbital spines.

Dimensions of a male:—Length, 65 mm.; length of carapace, 34 mm.; length of abdomen, 31 mm.; length of posterior section of carapace, 11 mm.; width of areola, 5 mm.; length of chela, 31 mm.; breadth of chela, 7.5 mm.; length of dactylus, 18 mm.

#### ASTACUS LEPTODACTYLUS Eschscholtz.

*New locality*:—Myslowitz, Germany, 1893, Coll. Hofer, (U. S. N. M., No. 43,317) 1 ♂.

#### ASTACUS PALLIPES ITALICUS, subsp. nov.

Plate 8, Fig. 2.

In the Italian Crayfish as compared with the typical form of *A. pallipes* from France, the margins of the rostrum are less convergent from the base to the lateral pair of spines, so that the breadth of the rostrum between the lateral spines is greater; the rostral acumen, too, is longer. The sides of the abdominal segments end in a distinctly more acute angle. The chelae are more coarsely granulated, the granulations or small tubercles separated by wider intervals. The anterior process of the epistoma is more broadly triangular. The antennal scale is larger, longer, and terminates in a more prominent spine. The tip of the inner part of the gonopods of the male is produced beyond the tip of the external part, whereas in *A. pallipes* the tips of the two parts are subequal. The telson is relatively broader.

*Types*:—U. S. N. M., No. 28,638, River Sarno, Pompeii, Italy, June 10, 1900, Dana Coolidge coll. 11 ♂, 9 ♀.

Two specimens, 1 ♂, 1 ♀, in the U. S. N. M., No. 20,073, from Piobesi, near Turin, Italy, received from the Turin Zoölogical Museum agree in the essential characters with the Pompeiian specimens.

From these specimens I infer that the Cisalpine crayfishes constitute a marked geographical race, which in some respects (viz. the form of the rostrum, antennal scale, epistoma, and gonopods) shows an approach to *Astacus astacus*. It is not, however, liable to be confounded with that species, since the median carina of the rostrum is not denticulated, and the post-orbital ridges are entire, not broken up into an anterior and a posterior section as is the case with *Astacus astacus*. In the important matter of the branchial apparatus, moreover, *Astacus pallipes italicus* differs from *A. astacus* and agrees with *A. pallipes* in having but two rudimentary pleurobranchiae on each side of the body, upon the eleventh and twelfth body-segments.<sup>1</sup>

The crayfish found in the neighbourhood of Madrid, Spain, is in almost every respect like the typical French *Astacus pallipes*. It does, however, show an approach to the Italian examples in one regard, viz. an enlargement of the anterior process of the epistoma, and with this in a few specimens goes a tendency toward a broadening of the rostrum. It would nevertheless be an over-refinement to separate the Spanish crayfishes from *Astacus pallipes*.

#### CAMBARUS DIGUETI Bouvier.

*Cambarus digueti* BOUV., Bull. Mus. d'Hist. Nat., Paris, 1897, 3, p. 225.

*Cambarus carinatus* FAXON, Proc. U. S. Nat. Mus., Feb. 17, 1898, 20, p. 648.

*New locality*:—Ocotlan, State of Jalisco, Mexico (Field Mus. Nat. Hist.).

#### CAMBARUS PILOSIMANUS Ortmann?

A young female crayfish, 35 mm. long (M. C. Z., No. 7,405) was collected by Mr. J. L. Peters at Camp Menzel, 36 miles from the mouth of the Hondo River, in the Territory of Quintana Roo, Mexico, March 27, 1912. It is closely affined to *C. pilosimanus* and *C. williamsoni* of Ortmann, if not identical with one of these. It presents certain features, however, that are not found in either of Ortmann's species; viz:—there are two well-marked spines, one above the

<sup>1</sup>This was determined by examination of the branchial apparatus of two examples from the type lot of *A. p. italicus* from the River Sarno. The rudimentary gills borne on the eleventh and twelfth somites have the form of reduced simple filaments representing the stem of the completely formed gill.

other, on each side of the latero-anterior margin of the carapace, above the well-developed branchiostegian spines. This is a feature that one would not suspect to be a juvenile mark, and it may denote specific diversity. There are, moreover, two sharp spines on the second segment of the antennae near the base of the antennal scales.

The chelae of the specimen collected by Mr. Peters are slender and nearly smooth, the fingers sparsely pilose, the spines of the carpus and merus well developed, as in young specimens of *C. pilosimanus* according to Ortmann. The anterior segment of the telson is three-spined on each side, the inner spine being very small; the median longitudinal rib on the dorsal face of the inner branch of the last abdominal appendages ends in a spine some distance from the posterior margin.

The type locality of *C. pilosimanus* is Coban, Guatemala. Dr. Ortmann also records one specimen, in the Museum of Natural History of Paris, from Belize, British Honduras, a locality not very remote from the place where Mr. Peters got his specimen. Mr. A. S. Pearse (13th Ann. Rep. Mich. Acad. Sci., 1911, p. 110) has more recently recorded it from Cuatotolapam, Canton of Acayucan, State of Vera Cruz, Mexico. The type locality of *C. williamsoni* is Los Amates, Province of Izabal, Guatemala.

#### CAMBARUS MEXICANUS Erichson.

*New localities*:—MEXICO: Tuxtla Gutierrez, State of Chiapas (U. S. N. M., No. 30,580); Jalapa, State of Vera Cruz (Field Mus. Nat. Hist.).

Mr. A. S. Pearse<sup>1</sup> has recently redescribed this species under the name *Cambarus ruthveni*, sp. nov., from the hacienda of Cuatotolapam, Canton of Acayucan, State of Vera Cruz, Mexico, altitude, 15 metres.

#### CAMBARUS CUBENSIS Erichson.

*New localities*:—CUBA: Almendares River, Calabazar, Province of Habana (U. S. N. M., No. 31,881); Unión de Reyes, Province of Matanzas (M. C. Z., No. 7,633); Ciego de Avila, Province of Camagüey (Coll. J. T. Nichols).

There is a small specimen, a male, only  $\frac{3}{4}$  in. long, in the U. S. National Museum (No. 28,625), from Nueva Gerona, Isla de Pinos. It was collected by

<sup>1</sup> Report on the Crustacea collected by the University of Michigan — Walker Expedition in the State of Vera Cruz, Mexico. Thirteenth Ann. Rep. Mich. Acad. Sci., 1911, p. 110.

Messrs. Palmer and Riley, July 8, 1900. It may be an immature specimen of one of the races of *C. cubensis*, or possibly a nearly allied species.

Since the above paragraph was written, and the specimen returned to the United States National Museum, Dr. A. E. Ortmann<sup>1</sup> has described as a new species, *Cambarus (Procambarus) atkinsoni*, a crayfish collected by Dr. A. Atkinson in the tributaries of Rio de los Indios, Los Indios, Isle of Pines, May 25, 1910. It is closely related to *C. cubensis*, from which it differs principally in the much less dilated inner face of the copulatory organs of the male.

#### CAMBARUS CUBENSIS CONSOBRINUS Saussure.

*Cambarus consobrinus* SAUSS., Rev. et Mag. Zool., 1857, sér. 2, 9, p. 101; Mém. Soc. Phys. Hist. Nat. Genève, 1858, 14, p. 457, pl. 3, fig. 21.

*Cambarus cubensis consobrinus* FAXON, Bull. Mus. Comp. Zoöl., Oct. 1912, 54, p. 458.

In this form of the Cuban Crayfish the rostrum is narrower than in the typical *C. cubensis*, more deeply concave above, its margins more distinctly raised and less convergent between the base and the pair of lateral spines near the distal end; these lateral rostral spines, moreover, are much better developed than in the typical form, and the rostral acumen is longer; the post-orbital ridge is more prominent, distinctly grooved along its outer face, and produced anteriorly into an acute spine much more strongly emphasized than in the typical *C. cubensis*; there is, too, an evident lateral spine on each side of the carapace, on the hind border of the cervical groove,— a spine which is not present in *C. cubensis cubensis*. The external sexual organs are alike in the two forms.

Nine specimens of this crayfish (5 ♂, 4 ♀), M. C. Z., No. 7,343, were secured by Dr. Thomas Barbour from lads who were using them for fish-bait, at San Antonio de los Baños, in the interior of the Province of Habana, Cuba, April, 1909.

Cotypes of Saussure's *Cambarus consobrinus* are now dispersed among the Museums of Geneva, Paris, Berlin, and Washington. It is very likely that Saussure's material included some of the typical form of *C. cubensis*; his description and figures, nevertheless, were grounded on the form with long rostral acumen, and distinct rostral and lateral thoracic spines; the type locality of *consobrinus*, moreover, as specified by Saussure, is the *central part* of the island.

In the cotype in the U. S. National Museum (No. 20,684, *ex Mus. Geneva*),

<sup>1</sup> A New Species of the Genus *Cambarus* from the Isle of Pines. Ann. Carnegie Mus., May 5, 1913, 8, p. 414-417.



a male, dried and transfixed with a pin, the rostrum is abnormal, the right margin thereof being pared away toward the tip, carrying with it the right marginal spine. This deformity was evidently present in the living specimen. On the left side the marginal rostral tooth or spine is well developed, as are also the spines at the anterior end of the post-ocular ridges. The lateral thoracic spines too are fairly well marked.

CAMBARUS CUBENSIS RIVALIS FAXON.

*Cambarus cubensis rivalis* FAX., Bull. Mus. Comp. Zoöl., Oct., 1912, 54, p. 459.

Differs from typical *C. cubensis* (which lives in the low country, near the sea-level) in having a much shorter and broader areola, a shorter, broader, and more heavily granulated claw; the sides of the rostrum, furthermore, are more nearly parallel and they bear a pair of distinct lateral spines at the base of the acumen. In so far as the rostrum is concerned this subspecies resembles *C. c. consobrinus*, yet it differs from *consobrinus* by having a short and wide areola and by the absence of lateral thoracic spines. The sexual parts are like those of *C. cubensis*.

Length of an ovigerous female, 44 mm., length of carapace, 21 mm., length of areola, 6 mm., breadth of areola, 2 mm.

This form is an inhabitant of the mountain streams of western Cuba. The extent of its distribution remains to be determined by further exploration of the island. The type specimens (M. C. Z. No. 7,406), two males of the second form and three females, were caught by Dr. Thomas Barbour in a mountain stream near San Diego de los Baños, in the Province of Pinar del Rio, Feb., 1912. There are also specimens in the U. S. National Museum from the same place (Nos. 28,626, 28,627) and also from a mountain brook north of the town of Pinar del Rio (Nos. 23,656, 23,657).

CAMBARUS SIMULANS FAXON.

*New localities*:— TEXAS: Sourlake, Hardin Co. (U. S. N. M.). ARKANSAS: Saline R., Benton, Saline Co. (U. S. N. M.). OKLAHOMA: Mount Scott, Comanche Co. (U. S. N. M.).

Under the name *Cambarus gallinus* this species has been recorded by Messrs. T. D. A. Cockerell and Wilmath Porter (Proc. Acad. Nat. Sci. Phila., 1900, p. 434-435) from the Gallinas River at Las Vegas, San Miguel Co., in lakes at Watrous, Mora Co., and from Roswell, Chaves Co., in the State of New Mexico.

Its range is now known to include the five states, Texas, Arkansas, New Mexico, Oklahoma, and Kansas.

CAMBARUS GRACILIS Bundy.

*New localities*:— ILLINOIS: Abingdon, Knox Co. (U. S. N. M.); Oquawka, Henderson Co. (U. S. N. M.).

CAMBARUS HAGENIANUS Faxon.

Plate 1; Plate 7, Fig. 1, 7.

*Cambarus carolinus* HAGEN, nec Erichson.

*Cambarus hagenianus* FAXON, Proc. Amer. Acad., 1884, 20, p. 14.

This species has been hitherto known only through the type specimen in the Museum of Comparative Zoölogy (No. 232), a male of the first form received early in the history of the Museum from Professor Lewis R. Gibbes of Charleston, S. C. The United States National Museum has recently received it in ample numbers from the Agricultural College, Oktibbeha Co., Miss., and also from Muldon, Monroe Co., Miss., and Farmdale, Ala. It is a pest to the cotton growers of these regions, riddling the fields with its burrows, and devouring the young plants; to a less degree it is destructive to young blades of maize or Indian corn.<sup>1</sup>

Hagen's Crayfish attains to a length of three inches. It is nearly related to *C. gracilis* Bundy, replacing that species in more southern localities. In *C. gracilis* the sides of the rostrum are more nearly parallel; the sub-orbital angle, which is pronounced in *C. gracilis*, is wanting in *C. hagenianus*. The branchio-cardiac lines, although contiguous in both *C. gracilis* and *C. hagenianus* for a considerable distance, obliterating the areola, are united for less distance in the former than in the latter; the abdomen is much broader in *C. gracilis*, and the longitudinal rib on the upper side of the inner branch of the last pair of abdominal appendages terminates in a spine which lies some distance from the posterior margin, while in *C. hagenianus* this rib extends clear to the margin, where the spine projects freely. The gonopods of the first form male are formed after a similar fashion in *C. hagenianus*, *C. gracilis*, and *C. simulans*; there are three terminal teeth (one of which is compressed or laminate) in *C. gracilis* and *C.*

<sup>1</sup> See U. S. Depart. Agric., Rept. Bureau Biol. Surv. for 1911, p. 9; and A. K. Fisher, Crawfish as Crop Destroyers, Yearbook U. S. Depart. Agric. for 1911, 1912, p. 319-324, pl. 22.

*simulans*, but the smallest of the three is smaller in *C. simulans* than in *C. gracilis* and lacks the horny texture; in *C. hagenianus* the truncate end of the gonopods bears but two teeth.

In the second form of the male the gonopods are less perfectly finished at the tips, the terminal teeth being blunter and membranous. The annulus ventralis of the female *C. hagenianus* is much like the annulus of *C. gracilis*, being produced on each side of the median line into a prominent tubercle, each tubercle tending to denticulation.

The specimens from Muldon, Miss., are peculiar in having a beard along the internal border of the upper face of the hand in the males, as in *Cambarus barbatus* and *Astacus gambelii*.

Colour of living specimens from Muldon, Miss.:— Male (Plate 1, fig. 2), metacarapace violet-gray with round greenish spots on the branchial regions; procarapace greenish, dashed with red anteriorly; abdomen light orange, with two longitudinal rows of irregular olive spots; chelae and carpus olive, the tubercles and granules green; fingers and antennae orange, beard whitish. Female (Plate 1, fig. 1), metacarapace bluish; procarapace, abdomen, and chelae tending to green at the expense of the orange tints.

Few cases of colour differences correlated with sex have been noted among Crustacea. See Andrews, Zool. Anz., Apr. 25, 1911, 37, p. 401.

#### CAMBARUS VERSUTUS Hagen.

*New locality*:— Auburn, Lee Co., Alabama (M. C. Z.).

#### CAMBARUS BLANDINGII (Harlan).

*New localities*:— VIRGINIA: Cape Henry, Princess Anne Co. (U. S. N. M.). NORTH CAROLINA: Mattamuskeet Lake, Hyde Co. (U. S. N. M.); Reedy Fork, Cape Fear River, Greensboro, Guilford Co. SOUTH CAROLINA: Charleston Co. (U. S. N. M.).

#### CAMBARUS BLANDINGII ACUTUS (Girard).

*New localities*:— ILLINOIS: Greathouse Creek, Wabash Co. (U. S. N. M.). ARKANSAS: Bruce Lake, Little Rock, Pulaski Co. (U. S. N. M.). MARYLAND: Fulton Co. (U. S. N. M.). MISSISSIPPI: Rosedale, Bolivar Co. (U. S. N. M.). LOUISIANA: Frierson, De Soto Co. (U. S. N. M.). TEXAS: Angelina River (U. S. N. M.).

A large male, form I., in the U. S. National Museum, collected in 1897 in the Mississippi River at New Orleans, La., measures  $5\frac{3}{8}$  in. from the tip of the rostrum to the end of the telson, the chelipeds are  $6\frac{7}{8}$  in. long, the chelae  $3\frac{3}{4}$  in. long. The dimensions of a male of about the same size were given on page 23 of my Revision of the Astacidae. This specimen also came from New Orleans (M. C. Z., No. 3,327) and is the same one whose measure was given by Dr. Hagen on page 37 of his Monograph of the North American Astacidae with an error of over an inch in the length.

CAMBARUS HAYI Faxon.

*New locality*:— Agricultural College, Oktibbeha Co., Mississippi (U. S. N. M.).

CAMBARUS FALLAX Hagen.

*New localities*:— FLORIDA: Auburndale, Polk Co.; Kissimmee River, between L. Hatch and Kissimmee, Osceola Co.; Lake Monroe, near Sanford, Orange Co.; St. Johns R., at Palatka, Putnam Co.; St. Johns River at Beecher Point.

CAMBARUS ACHERONTIS Lönnberg.

*New locality*:— Eustis, Lake Co., Florida, 2 ♂ f. II., 7 ♀, in U. S. N. M.

CAMBARUS CLARKII Girard.

*New localities*:— TEXAS: Fort Clark, Kinney Co.; Seguin, Guadalupe Co.; San Marcos, Hays Co.; Houston, Harris Co.; Corpus Christi, Nueces Co.; Angelina River; Beaumont, Jefferson Co. LOUISIANA: Lake Lepourde, Morgan City, Saint Mary Co.; Melville, Saint Landry Co.; Frierson, De Soto Co. ARKANSAS: Little Rock, Pulaski Co., (1 ♀ coll. by O. P. Hay, U. S. N. M., No. 19,762). All of the above are in the U. S. National Museum.

As noted in my Revision of the Astacidae, p. 26, specimens of *C. clarkii* from New Orleans, La., differ slightly from the typical specimens from western Texas in having the branchio-cardiac lines in close apposition for a long distance through the procarapace, obliterating the areola and reducing the size of the anterior and posterior triangular fields. This is well shown in Roetter's beautiful drawing of a specimen from New Orleans in Hagen's Monograph of the North American Astacidae, Pl. 4.

## CAMBARUS CLARKII PAENINSULANUS, subsp. nov.

The examples of Clark's crayfish found in the peninsular portion of the State of Florida differ slightly, albeit constantly, from the typical Texas form in being smoother, in having a more tapering rostrum, and a shorter and broader antennal scale; there is moreover a slight difference in the shape of the tip of the male sexual appendages: the anterior terminal tooth being narrower and more acute than in the typical form in which this tooth is broader, more laminate and less acute at the tip; in the Floridan subspecies, too, the anterior half of the telson bears on each side from three to five spines, while in the typical *C. clarkii* there are but two spines on each side.

*Type*: M. C. Z., No. 3,530, 1 ♂ f. II. Three miles below Horse Landing, St. John's River, Florida, Feb. 9, 1869, J. A. Allen.

There are a good many specimens of this subspecies in the U. S. National Museum collected by W. C. Kendall at Beecher's Point, St. John's River, Fla., in February and March, 1897, Nos. 28,587, 28,589.

## CAMBARUS WIEGMANNI Erichson.

This species is still imperfectly known; Erichson's type, which came from Mexico, is no longer extant; it was described as having hooks on both the third and fourth pairs of legs in the male. A female individual from Mexico, in the collection of the Academy of Natural Sciences of Philadelphia, was referred to this species by Dr. Hagen and myself, although with some doubt on account of the want of male specimens. In 1906 Dr. Ortmann (Proc. Washington Acad. Sci., 8, p. 15-19) described and assigned to this species a male belonging to the Philadelphia Academy, collected by Professor E. D. Cope in 1885 in Lake Xochimilco, south of the City of Mexico, in the Federal District; in this specimen the legs of the third pair are furnished with a very small tubercle only, while those of the fourth pair are armed with a strongly developed hook.

Four specimens, three male, one female, recently collected by Mr. W. M. Mann at San Miguel, State of Hidalgo, Mexico, and now in the Museum of Comparative Zoölogy, conform to Ortmann's description of the Cope specimens, barring the fact that there is no vestige of even a tubercle on the third pair of legs of the male, the fourth pair alone being provided with hooks; these specimens may represent an undescribed species, but on account of the sad dearth of requisite material and the loss of the type of *C. wiegmanni* the elucidation of this question must needs be deferred to a later time.

## CAMBARUS VIAE-VIRIDIS, sp. nov.

## Plate 5.

*Male*, form I: — Rostrum long, triangular, plane above, margins raised so as to form a sharp rim, destitute of lateral spines or angles; acumen strongly deflexed, not clearly defined; a shallow depression or foveola at the posterior end of the rostrum. Carapace punctate above, finely granulate on the sides; post-orbital ridges terminating bluntly before; cervical groove sinuate, interrupted on each side; no lateral spine, branchiostegian spine minute; areola narrow, equal in length to about one half the distance from the cervical groove to the tip of the rostrum. Abdomen punctate, pleural angles rounded off, hind border of anterior section of the telson bispinose on each side. Anterior process of the epistome triangular, with slightly convex sides. Antennal scale short and very broad, truncate at the anterior end. Chelipeds of moderate length; upper margin of the meros serrated, below there are two series of spines; carpus tuberculate and spinulose on the inner face; chela of moderate proportions, with slender fingers; superior margin of the hand spinulose, outer and inner faces spinuloso-tuberculate; dactylus spinulose through the proximal quarter of the superior border. Basal segment of last pair of thoracic appendages provided with a crest which is produced on the inner side into a projecting tooth. Third segment of third and fourth pairs of legs hooked. First pair of abdominal appendages rather short, tip truncate, outer part furnished with a prominent horny tooth and two minor denticles, inner part terminating in a straight spine, the end of which does not reach to end of the largest tooth of the outer part.

Length 45 mm., carapace 23 mm., areola 7.5 mm., width of areola 5 mm. Length of hand 17.5 mm. Length of palm 8 mm., width of palm 5.5 mm. Length of fingers 9.5 mm.

Annulus ventralis of the female transversely broad, with a deep sigmoid sulcus which is open in front.

St. Francis River, Greenway, Clay Co., Arkansas, Aug. 1894, S. E. Meek coll. M. C. Z., No. 7,336, 10 specimens, ♂ and ♀.

This species is allied to *Cambarus evermanni* Fax. from Pensacola, Fla. It differs in having the upper surface of the rostrum flatter, with depressed acumen, the areola narrower, the hand broader, and also by the different character of the tips of the male appendages. It falls into the group of species represented by *C. evermanni* Fax., *C. barbatus* Fax., *C. wiegmanni* Erichs., *C. hinei* Ortm., and *C. alleni* Fax.

## CAMBARUS ALLENI Faxon.

*New localities*:—FLORIDA: Fort Florida, Volusia Co. (M. C. Z.); ponds near Tampa, Hillsboro Co. (U. S. N. M.); Lake Butler, Tarpon Springs, Hillsboro Co. (U. S. N. M.); Lake Yohopekalize, Kissimmee, Osceola Co. (U. S. N. M.).

## CAMBARUS SHUFELDTII Faxon.

There is a male of this species, 21 mm. long, in the U. S. National Museum, collected by Robert Kennicott at Cairo, Ill. It has been previously known only from the original type lot collected near New Orleans, La., by Dr. R. W. Shufeldt in 1883.

## CAMBARUS MONTEZUMAE Saussure.

*New locality*:—Acambaro, State of Guanahuato, Mexico (Field Mus. Nat. Hist.).

## CAMBARUS MONTEZUMAE DUGESII Faxon.

*New localities*:—MEXICO: Chalco, State of Mexico; Celaya, State of Guanahuato; Lake Quitzeo, Huingo, State of Michoacan; La Barca and Lagos, State of Jalisco; all of these are in the Field Museum of Natural History; they were collected by Prof. S. E. Meek in 1901.

## CAMBARUS MONTEZUMAE CHAPALANUS Faxon.

*New localities*:—Patzcuaro and Zirahuen, State of Michoacan, Mexico (Field Mus. Nat. Hist.).

## CAMBARUS MONTEZUMAE OCCIDENTALIS Faxon.

Two males, collected by Prof. S. E. Meek, in Lake Quitzeo, Huingo, State of Michoacan, Mexico, and now deposited in the Field Museum of Natural History, appear to belong to this subspecies. It has been already recorded from the same place by Dr. A. E. Ortmann (Proc. Washington Acad. Sci., 1906, 8, p. 20).

## CAMBARUS SLOANII Bundy.

Four specimens, males of the second form, collected by Mr. W. P. Hay between Paoli and Wyandotte, Ind. (U. S. N. M., No. 19,776), and determined by Mr. Hay as *C. sloanii*, differ in some important regards from the types of *C. sloanii* from New Albany, Ind.: The tip of the inner ramus of the gonopods is not deflected inward so strongly, the rostrum is longer, with a longer acumen, the large claws are distinctly narrower, with relatively longer fingers, and the outer row of spines on the lower face of the merus of the cheliped is reduced to a single terminal spine. These specimens perhaps represent a new species or subspecies, but in the absence of the first form of the male and the female I refrain from naming it.

## CAMBARUS AFFINIS (Say).

*New localities*:—MARYLAND: Sam's Creek, Frederick Co. (U. S. N. M.); Little Pipe Creek at Union Bridge and near New Windsor, Carroll Co. (U. S. N. M.); Northwest Branch near Hyattsville, Prince Georges Co. (U. S. N. M.). VIRGINIA: Orkney Springs, Shenandoah Co. (U. S. N. M.). MASSACHUSETTS: Bancroft's Pond, Brown's Pond and Spring Pond, Peabody, Essex Co. (M. C. Z.); Mansfield Pond, Great Barrington, Berkshire Co. (M. C. Z.);

This species, whose real home is in the rivers that flow into the Atlantic in New Jersey, Pennsylvania, Maryland and Virginia, is now well established in the town of Peabody, Essex Co., Mass. How or when it got there I do not know. The first report of it came to me in 1901 when the late J. H. Sears brought me a specimen 90 mm. long, which he had caught in Bancroft's Pond, Peabody, on the 4th of August of that year. In Sept., 1911, Dr. John C. Phillips secured a good many (43) specimens from Spring Pond, Brown's Pond and Bancroft's Pond in Peabody, some of them attaining a length of 98 mm.<sup>1</sup> Dr. Phillips's collector searched for crayfishes in the following ponds in Essex County with negative results:—Hood's, Stephens, Four-Mile, Stiles's, Spofford's and Perley Pond in Boxford, and Chebacco, Beck's, Round and Gravelly Ponds in Hamilton.

On the 14th of June, 1912, I captured a female *C. affinis*, with young under her abdomen, in Mansfield Pond, Great Barrington, Berkshire Co., Mass.

<sup>1</sup>The largest specimen of *C. affinis* in the Museum of Comparative Zoölogy, a female from Havre de Grace, Md., No. 180, collected in 1854, measures 124 mm. from the tip of the rostrum to the end of the telson. This is the individual figured, slightly lengthened, on Plate 5 of Hagen's Monograph of the North American Astacidae.



I was told in Great Barrington that these animals were introduced 10–15 years ago into Lake Buel, on the borders of the neighboring towns of Monterey and New Marlborough, by anglers who were using them as fish-bait, that they are now exceedingly numerous in Lake Buel and have been probably transferred thence to neighboring ponds by boys.

*C. affinis* has been introduced into Europe as a piscicultural experiment in acclimatization at the Station Agricole at Fécamp, France,<sup>1</sup> and elsewhere.

This species has also been found of late in Central Park Lake, New York City, and in Prospect Park Lake, Brooklyn; it has also been reported as introduced into a lake in East Hampton, Middlesex Co., Conn. (Bull. N. Y. Zoöl. Soc., Nov. 1912, 16, p. 924).

#### CAMBARUS PROPINQUUS Girard.

*New localities*:—NEW YORK: Munnsville, Madison Co.; Glennmark Creek, North Rose, Wayne Co.; Chaumont River, Batavia, Genesee Co.; Seneca Lake; Mud Creek and Saint Lawrence River, Cape Vincent, Jefferson Co.; Griffin's Creek, Chaumont, Jefferson Co.; Stony Island, Jefferson Co.; Stony Creek, Henderson Harbor, Jefferson Co.; Sandy Creek, North Hamlin, Monroe Co.; Nine-Mile Point, Webster, Monroe Co.; Selkirk, Oswego Co.; Marsh Creek, Point Breeze, Orleans Co.; Tonawanda Creek; Canada Way Creek, Dunkirk, Chautauqua Co.; Van Buren Point, Chautauqua Co.; Silver Creek, Chautauqua Co.; Cattaraugus Creek. OHIO: Cowles Creek, Geneva, Ashtabula Co.; Conneaut Creek, Kingsville, Ashtabula Co.; Rocky River, Olmsted Falls, Cuyahoga Co.; Port Clinton, Ottawa Co.; Catawba Island, Ottawa Co.; Lakeside, Ottawa Co. INDIANA: Tippecanoe River, Delong, Fulton Co.; Sims, Grant Co.; Winona Lake, Kosciusko Co.; Eagle Lake, Warsaw, Kosciusko Co.; Evansville, Vanderburg Co.; Eel River and Blue River, Columbia City, Whitley Co. ILLINOIS: Wabash R., Hutsonville, Crawford Co. (Mus. Comp. Zoöl.); Kankakee River, Momence, Kankakee Co.; Illinois River, Havana, Mason Co. MICHIGAN: Raisin River, Monroe, Monroe Co.; Black Creek, Lexington, Sanilac Co.; Port Sanilac, Sanilac Co.; Grand River below Lansing, Ingham Co.; Wolf Lake, Jackson Co.; Long Lake, 8 miles north of Alpena, Alpena Co.; Tawas City, Iosco Co.; Au Sable River, Au Sable, Iosco Co.; mouth of Carp River, 12 miles from Straits of Mackinac; Mullet Lake, Cheboygan Co. (U. S. N. M.). MEXICO: Jimenez, State of Chihuahua (Field Mus. Nat. Hist.).

The locality Jimenez, Mexico, is such an extraordinary one for this species

<sup>1</sup> Acclimatation des Écrevisses Américaines. Revue Scientifique, Jan. 9, 1897, ser. 4, 7, p. 56.

that one might well suspect some error if the origin of the specimens were not so well attested. Seven specimens, males of the first form, now in the Field Museum of Natural History, were collected by Mr. S. E. Meek, together with four female *C. virilis*, June 9, 1901, in the drainage of the Rio de los Conchos, one of the southern tributaries of the Rio Grande. They were picked out from among the fishes which were the chief object of Mr. Meek's exploration of Mexico and sent to me for determination in January, 1902.

The conditions obtaining at the time and place of their capture are thus described by Mr. Meek in his account of the fishes secured during his Mexican explorations of 1901:<sup>1</sup>

"At Jimenez the Rio Conchos was nearly dry. Our collections were made from a few deep holes about two miles below the city. These contained a large amount of aquatic vegetation, which made collecting difficult and unsatisfactory. The water was very clear, and in the deeper places were seen many large suckers which we were unable to capture. Sunfishes were very abundant. All of these streams become large and deep in the rainy season, at which time the Rio Conchos at Jimenez becomes two hundred or more feet in width and as much as fifteen feet in depth."

#### CAMBARUS PROPINQUUS SANBORNII Faxon.

*New localities*:—OHIO: Black River, Elyria, Lorain Co.; Hudson, Summit Co.; Vermilion River; Cuyahoga River, Kent, Portage Co.; Dover Creek, Dover, Cuyahoga Co. WEST VIRGINIA: Horse Creek (U. S. N. M.).

#### CAMBARUS OBSCURUS Hagen.

*New localities*:—NEW YORK: Cattaraugus Creek. WEST VIRGINIA: Cassity, Randolph Co.; Cheat River, Ises Ferry, Sand Run, Childer's Run, and Trubie's Run, near Buckhannon, Upshur Co.; Queens, Upshur Co.; Weston, Lewis Co.; Hacker's Creek, near Janelew, Lewis Co.; Ten-Mile Creek at Lumberport, Harrison Co.; Decker's Creek above Morgantown, Monongalia Co. (U. S. N. M.).

*Cambarus obscurus* is an abundant river species in the Upper Ohio River Basin in northern West Virginia, and western Pennsylvania. It is also found in the Lake Erie and Lake Ontario drainage in the states of Pennsylvania and western New York, and in Wills Creek, an affluent of the Potomac River, at Hyndman, Bedford Co., Pa., and Eilerslie, Allegany Co., Md.<sup>2</sup> In the U. S.

<sup>1</sup> A Contribution to the Ichthyology of Mexico. Field Columbian Museum, Publ. 65, Zoöl. Ser., May, 1902, 3, p. 65.

<sup>2</sup> Ortmann, Mem. Carnegie Mus., 1906, 2, p. 445.

National Museum there is a female crayfish (No. 22,518) collected by D. S. Jordan in northern Wisconsin which looks like this species, but the locality is an extraordinary one for this species and should not be accepted as authentic until confirmed by securing more material.

CAMBARUS RUSTICUS Girard.

*New localities*:— IOWA: West Fork of Des Moines River, Spring Vale, Humboldt Co. (M. C. Z.). OHIO: Sandusky River, Fremont, Sandusky Co.; Presque Isle, Perrysburg, Wood Co. INDIANA: Moot's Creek, White Co.; Salmonie River, Mount Etna, Huntington Co. KENTUCKY: Salt River. TENNESSEE: Richland Creek, Nashville, Davidson Co. (U. S. N. M.).

CAMBARUS NEGLECTUS Faxon.

*New localities*:— MISSOURI: Indian Creek, McDonald Co. (U. S. N. M.). COLORADO: Republican River, Wray, Yuma Co. (M. C. Z.).

CAMBARUS SPINOSUS GULIELMI, subsp. nov.

*Cambarus spinosus* HAY, Proc. U. S. Nat. Mus., 1902, 25, p. 439 (*nec* Bundy).

Cephalothorax shorter than the abdomen, densely punctate above, granulate on the sides, the granules largest on the hepatic region where they assume the form of small tubercles; the whole surface, but more particularly the sides, is clothed with fine setae arising as pencils from the pits of the dorsal surface and the granules of the sides; the rostrum is deeply excavated above, its sides parallel from the base to the lateral pair of teeth at the base of the moderately long, triangular apex; the post-orbital ridges are prominent and provided with a small tooth at the anterior end; the sub-orbital angle is obliterated, but there is a well-developed branchiostegian spine, as well as a lateral spine on the cervical groove; the section of the carapace behind the cervical groove in the median dorsal line is a little less than one half the distance from the cervical groove to the tip of the rostrum. Areola of moderate width. The anterior segment of the telson bears two spines on each side. The anterior process of the epistome is moderately broad, its sides convex, its anterior angle rounded off. The antennal flagella are long and slender,—longer than the body; the scale or scaphocerite is of moderate width, widest at a point a little anterior to the middle. The chelae, like the carapace, bear numerous setae springing from the pits and

tubercles on its surface; the inner border of the hand is furnished with squamoid tubercles disposed for the most in two longitudinal rows; along the distal half of the outer border of the hand there runs a low, but well-marked, carina; the dactylus is tuberculate on its free border, blunt-toothed (like the immobile finger) along its prehensile edge and ridged longitudinally along its outer face; the carpus is armed with an acute spine on the middle of its internal border, and with a small tubercle at each end of the same border; below, the median carpal spine is well pronounced and there is a small acute spine at the inferior point of articulation with the propodus; the two customary spines are present near the anterior end of the upper margin of the merus; the outer of the two rows of spines on the lower face of the merus is reduced to two at the distal end. The dorsal carina of the inner branch of the last abdominal appendages terminates in a tooth a little distance within the hind margin.

The gonopods, in the second form of the male, are long and straight, reaching forward, when the abdomen is flexed, as far as the basal segments of the second pair of legs; their rami are rather thick, blunt at the tip, and the outer one is but a trifle longer than the inner one; when viewed from the inner side the two rami are fused up to within a short distance of the end of the organ.

The annulus ventralis of the female is bituberculate in front, unituberculate behind, the anterior and posterior walls being separated by a transverse fossa which is divided longitudinally by the sigmoid fissure.

Dimensions of a female:—length, 73 mm., length of carapace, 37 mm., length of rostrum from tip to a level with the post-orbital spines, 11 mm., width of rostrum at base, 5 mm., length of areola, 12 mm., width of areola, 2 mm., length of cheliped, 54.5 mm., length of chela, 27.5 mm., breadth of chela, 12 mm., length of dactylus, 16 mm.

This crayfish is closely related to the *Cambarus spinosus* of Bundy, but is different in the following respects:— the body is more villous, the metacarapace longer in proportion to the procarapace, the anterior process of the epistome is much narrower than in the types of Bundy's species and (what has most weight in regarding it as a subspecies) the external sexual organs are clearly different. The gonopods in *C. s. guielmi* being shorter, the rami thicker, blunter, nearly equal in length, and separate for but a short distance from the tip, while in *C. spinosus* the rami are slender, pointed, the outer one exceeding the inner by a great distance and the split between the two parts involving a large part of the length of the organ. The annulus ventralis of the female, though of the same type as that of the typical *C. spinosus*, differs slightly in having a more open transverse fossa.

The villosity may be an evanescent character, as it is a condition often apparent in individuals that have recently undergone a moult; at a later period the setae are apt to disappear by attrition.

U. S. National Museum, Nos. 26,379, 12♂ f. II., 14♀. From a small stream flowing from a pond fed by the cave stream known as John Ross Spring, near Rossville, Walker Co., Georgia, Aug. 23, 1901, William Perry Hay coll.

CAMBARUS PUTNAMI Faxon.

Upward of one hundred specimens of a crayfish closely resembling *C. putnami* were collected by Mr. W. P. Hay in southwestern West Virginia in the summer of 1900. They were found in the shallower parts of streams, usually under flat stones,—in Barrenshe Creek, near Perryville, U. S. N. M., No. 25,018, 28,613, and Horsepen Creek, (U. S. N. M. No. 28,612) and War Creek (U. S. N. M. No. 28,614). In these specimens the rami of the gonopods are a trifle longer than in the types of *C. putnami* from Kentucky, the rostrum, moreover, shows a pretty constant faint carina on its upper surface, near the tip, and the anterior angle of the epistome is truncate. These peculiarities do not seem to me important enough to separate this form nominally from *C. putnami*.

According to Mr. Hay's notes their colour when alive was olive-green on the dorsal surface of the body and chelipeds, changing to vinaceous on the sides, under parts and other appendages; the tips of the fingers were horn-yellow and preceded by a rather broad band of dark orange-red.

CAMBARUS LONGIDIGITUS Faxon.

*New locality*:—James River, Springfield, Green Co., Missouri (U. S. N. M. No. 20,856).

James River, Missouri, without further specification of locality, is the type locality of *Cambarus whitmani* Steele,<sup>1</sup> which as far as can be seen from the description is the same as *C. longidigitus*.

CAMBARUS VIRILIS Hagen.

*New localities*:—INDIANA: Prairie Creek, Scotland, Green Co. ILLINOIS: Henderson Co.; Kankakee River, Momence, Kankakee Co. MICHIGAN: Belle Isle, Detroit, Wayne Co.; Pigeon River, Caseville, Huron Co.; Bird Creek, Port

<sup>1</sup> Univ. Cincinnati Bull. No. 10, 1902, p. 24.

Austin, Huron Co.; Sand Beach, Huron Co.; Pinnebog River, Port Crescent, Huron Co.; Mud Creek, Bay Port, Huron Co.; Black River, near Port Huron, Saint Clair Co.; Pine River, West Harrisville, Alcona Co.; Au Sable River, Au Sable, Iosco Co.; Rabbit's Back Creek, 5 miles above Saint Ignace, Mackinac Co.; 12 miles from Straits of Mackinac. MINNESOTA: Deer River, Itasca Co.; Lake of the Woods. NORTH DAKOTA: Borit's Ford, Cheyenne River. NEBRASKA: Lincoln Creek, York, York Co. MISSOURI: Clinton, Henry Co. (U. S. N. M.). COLORADO: Republican River, Wray, Yuma Co. (M. C. Z.). MEXICO: Jimenez, State of Chihuahua (Field Mus. Nat. Hist.).

The Mexican specimens (four females) were collected by Mr. S. E. Meek from deep holes, Rio de los Conchos, about two miles below Jimenez, June 9, 1901. For the circumstances of their capture, see under *Cambarus propinquus*, page 373, 374.

CAMBARUS IMMUNIS Hagen.

Plate 2, 6.

*New localities*:—NEBRASKA: Norfolk, Madison Co. (U. S. N. M.); Elkhorn River, Fremont, Dodge Co. (U. S. N. M.); Omaha, Douglas Co. (M. C. Z.). MISSOURI: Lake City, Jackson Co. (M. C. Z.). IOWA: West Fork of Des Moines River, Spring Vale, Humboldt Co. (M. C. Z.). MICHIGAN: Pine River near West Harrisville, Alcona Co. (U. S. N. M.); Caseville, Huron Co. (U. S. N. M.); mouth of Bunce River, south of Port Huron, St. Clair Co. (U. S. N. M.). ILLINOIS: Wabash Co. (U. S. N. M.); Indian Creek, Abingdon, Knox Co. (U. S. N. M.); Illinois River, Havana, Mason Co. (U. S. N. M.). OHIO: Cedar Point, and Presque Isle, Toledo, Lucas Co. (U. S. N. M.); Toussaint River, ten miles below Port Clinton, Ottawa Co. (U. S. N. M.). NEW YORK: Pond near the mouth of Cattaraugus Creek, Chautauqua Co. (U. S. N. M.); Silver Creek, Chautauqua Co. (U. S. N. M.); Fish Creek, Buffalo, Erie Co. (U. S. N. M.); Stony Island, Jefferson Co. (U. S. N. M.). MASSACHUSETTS: Pontoosuc Lake, Lanesborough, Berkshire Co. (M. C. Z.); Onota Lake, Goodrich Pond and Housatonic River, Pittsfield, Berkshire Co. (M. C. Z.); East Washacum Pond, Sterling, Worcester Co. (M. C. Z.); Blackstone River, Uxbridge, Worcester Co. (M. C. Z.); Lake Boone, Stow, Middlesex Co. (Boston Soc. Nat. Hist.); Walden Pond, Concord, Middlesex Co. (M. C. Z.). NEW HAMPSHIRE: Lake Winnepesaukee (U. S. N. M.).

*Cambarus immunis*, taken as a whole, has an enormous range, as a common species, through the western states, from northern Ohio, through Indiana,

Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas and Nebraska, into Colorado and Wyoming.<sup>1</sup> To the eastward of Lorain County, Ohio, it has hitherto been recorded from only two localities, both in the state of New York: in 1891 Mr. Gerrit Smith Miller, Jr., brought me three specimens which he found in July of that year in a small stream flowing into Oneida Lake; these were recorded by me in 1898 (Proc. U. S. Nat. Mus., 20, p. 654); in 1906 Dr. Ortman (Mem. Carnegie Mus., 2, p. 467) called attention to specimens in the New York State Museum which had been taken by Mr. F. C. Paulmier in Rensselaer Lake, Rensselaer Co., N. Y. I can now add to the New York stations for this species the following:—pond near the mouth of Cattaraugus Creek, and Silver Creek, Chautauqua Co. (U. S. N. M. Nos. 22,417, 22,408); Fish Creek, Buffalo, Erie Co. (U. S. N. M. No. 22,418); and Stony Island, at the eastern end of Lake Ontario, Jefferson Co. (U. S. N. M. No. 22,409).

My first knowledge of this species as an inhabitant of Massachusetts was obtained when I was walking across the mud-flats at the upper end of Pontoosuc Lake on the 11th of November, 1899. The numerous mud-towers or "chimneys" here rising above the level of the flat at once betrayed the abode of some kind of burrowing crayfish. Although the soil was then frozen so as to make exploration difficult, I satisfied myself that the builders of the little mud-towers had withdrawn to their brumal retreats in the deeper waters of the Lake, leaving behind them only one dead companion, a first-form male *C. immunis spinirostris* (M. C. Z. No. 6,687). Here the matter rested until, during a visit to Berkshire in 1911, I ascertained that this crayfish was abundant on the 12th of August among the water-weeds at the head of Pontoosuc Lake. Two days later I searched for it at the northern end of Onota Lake in Pittsfield and again found it in altogether similar surroundings, albeit in much smaller numbers than in the neighbouring Pontoosuc or Lanesborough Pond.

On the 15th of June, 1912, I again collected this crayfish at the outlet of Goodrich's Pond and in the Housatonic River just above Pomeroy's Mills, in Pittsfield.

These specimens from Berkshire Co., Mass., agree in most respects with the types of *C. immunis spinirostris*, which were collected in Obion County, Tennessee. The rostrum in the Massachusetts examples tapers a little more between the base and the ante-apical teeth and, the antennal scales are a little shorter in proportion to the length of the rostrum. Compared with the typical

<sup>1</sup> There are two specimens of *C. immunis*, ♂ f. II. and ♀, in the U. S. National Museum, No. 3,257, labelled as coming from Orizaba, Mexico, through Professor Sumichrast.

form of *C. immunis* from Illinois, *C. immunis spinirostris* differs in having a distinct spine or tooth on each side of the rostrum near the tip, more prominent post-orbital and branchiostegian spines and a shorter posterior section of the carapace in relation to the section in front of the cervical groove (the proportion being 1:2 or even less in *C. i. spinirostris*); the claw, too, is narrower, with proportionally longer and slenderer fingers.

In full-grown living specimens from Pontoosuc Lake (Plate 2, fig. 2) the dominant colour of the carapace is a rich Vandyke brown shading into tawny olive on the sides; the cardiac area is conspicuously marked off by being a much lighter colour,—tawny olive; the abdomen is beautifully mottled above with darker and lighter shades of tawny olive; the legs are olive-coloured.

In the young, 27 mm. long, from the same locality (Plate 2, fig. 1), the brown of the adult is replaced by an olive-green which pervades the whole dorsal side of the creature and is delicately varied by mottling of olive-buff; the cardiac area is of the latter hue and is continued backward, through the whole length of the abdomen, as a broad median band; the appendages are delicate olive-green, changing to a pinkish tint at the tips of the claws.

*C. i. spinirostris* was first described from Obion County, Tennessee; it has also been recorded from Omaha, Nebraska (Pearse), Shawnee County, Kansas (Faxon), Douglas County, Kansas (Harris), Vigo County, Indiana (W. P. Hay), Ottawa Co., Ohio (Pearse), and Long Point Creek, Canada (Pearse). As a matter of fact, specimens of *C. immunis* agreeing more or less closely with the form which I described as var. *spinirostris* are to be found pretty much throughout the range of the species. I have seen such among material collected in Nebraska, Kansas, Missouri, Michigan, Illinois, Indiana, Ohio, and New York. I am therefore disposed to regard it as a variety rather than a true geographical race or subspecies, although it is true that all of the Massachusetts specimens possess the characters of *spinirostris*.

When *Cambarus immunis* was first discovered in Berkshire County, Mass., it had been recorded from only one place (Oneida Lake, N. Y.) east of Lorain County, Ohio, and in the State of Ohio it had been recorded from but three localities — Huron River at Huron, Erie County (Osburn and Williamson, 6th Ann. Rept. Ohio State Acad., 1898, p. 11), Sandusky, Erie County (Faxon, Proc. U. S. Nat. Mus., 1898, 20, p. 654), and Lake Erie, Lorain Co. (Osburn and Williamson, *l. c.*). I was therefore formerly inclined to think that its presence in Berkshire County, Mass., was due to artificial introduction, like the *Cambarus affinis* in the ponds of Essex County, Mass.; but I have now before me specimens from