HISTORY OF THE TWO SPECIMENS OF FOSSIL TREES IN THE SMITHSONIAN INSTITUTION, WASHINGTON, D. C.

The General of the Army, General W. T. Sherman, while on a tour across the continent in the fall of 1878, suggested to Lieut. Col. P. T. Swaine, Fifteenth United States Infantry, then in command of the post of Fort Wingate, N. Mex., the expediency of procuring two of the petrifactions of the country in that vicinity of reasonable dimensions for transportation, yet sufficiently large to be worthy of a place in the Smithsonian Institution. Acting upon this suggestion, an expedition was organized early in the spring of 1879 to proceed to the Lithodendron (stone trees) in Arizona. Thomas V. Kearns, a gentleman of long residence in that part of the country, and familiar with the locality to be explored, kindly volunteered his services, and success was, in a great measure, due to his efforts in carrying out the wishes of the General. The military detail consisted of Second Lieut. J. T. C. Hegewald, one sergeant, and twelve soldiers, all of the Fifteenth United States Infantry, and the party was well supplied with army wagon running gears specially arranged for hauling stone, and with tools and appliances complete. Lieutenant Hegewald has furnished a detailed and comprehensive statement of the events connected with this expedition, which is interesting as an appendix to this paper.

Only one of the two specimens obtained from the Lithodendron by Mr. Kearns and Lieutenant Hegewald was forwarded to Washington. This is the large dark-colored one. In the place of the second one brought in from the locality of the Lithodendron a better specimen was found on the Mesa to the north of and adjacent to Fort Wingate, about two miles from the flag-staff. This is the smaller and lighter colored one.

First. Lieut. S. R. Stafford, regimental quartermaster, Fifteenth United States Infantry, had a strong platform made of plank spiked together, and rolled each fossil on separately, fastening them in place with strap iron, and hauled them to Santa Fé, N. Mex., where they were detained in the government corral awaiting the collection of enough other curiosities to make up a car load, when they were shipped to Washington under the direction and care of agents of the Smithsonian.

P. T. SWAINE,

Lieutenant-Colonel Fifteenth Infantry, Brevet Colonel, U. S. A.

A STUDY OF THE PHRONIMIDÆ OF THE NORTH PACIFIC SURVEYING EXPEDITION.

By THOS. H. STREETS, M. D., U. S. N.

The identification of the *Phronimæ* has been attended with difficulty on account of the absence of properly-defined characters. Claus, who gives the most detailed account of them, combines in his description of *P. sedentaria* more than one species. I have had no opportunity to examine *P. sedentaria*. The following article is the result of close

study, and comparisons of a number of specimens of each species; and the specific characters here presented and figured were found to be constant, and apply to all sizes.

The family characteristics are as follows:

Head broad and rounded above, tapering below to the oral apparatus. Eyes on the dorsal and lateral surfaces of the head. Both pairs of antennæ present in the male, and long; in the female the inferior pair obsolete, and the superior pair short. Thorax broad anteriorly, and tapering posteriorly. The first and second pairs of thoracic feet short; the extremity of the fourth joint being more or less produced, and the fifth joint with a pair of wing-like appendages on either side of its apex. The fifth pair of thoracic feet developed into a stout, prehensile organ. The remaining pairs of feet simple. Abdomen narrow. The caudal appendages slender, cylindrical, and two-branched.

There is a very marked resemblance among the *Phronimidæ*. The family characters are many; the generic and specific characters are few, but constant.

The eggs of the female are carried in an incubatory pouch between the posterior thoracic feet. Females with the young in every stage of development within the eggs may be found swimming free; yet when the young leave the eggs, they are always found, I believe, inside the body of a *Pyrosoma*, a *Beroe*, or a *Medusa*, which the female amphipod appropriates as a home for her immature species. The parent and young are usually found inclosed in the same case. The former by this action manifests, apparently, a maternal solicitude for the welfare of her offspring. This is interesting as appearing in animals so low in the scale of being as the amphipods.

There was observed a great disparity between the number of males and females collected in any locality. In the preparation of this article there were examined forty-five specimens belonging to the different genera of the family, and the proportion of males to females was found to be as 1 to 8. Until quite recently the male form—being so different—was not recognized as belonging to the same species. The discovery was made by Claus.

Phronima, Latreille.

Head, thorax, and abdomen as described under *Phronimidæ*. The first and second pairs of thoracic feet short and slender, with the fourth, or carpal joint *broadly produced;* the third and fourth pairs long, simple, and subequal. The fifth pair stoutly developed, and provided with a *strong prehensile organ, resembling the claw of some of the Cancridæ*. The last two pairs of legs shorter than the preceding, and subequal. The three pairs of caudal appendages long and slender, each furnished with two lanceolate branches. Telson short.

Sexual differences.—Males smaller than the females. In the female the inferior antennæ are absent. In the position of these organs—beneath the lateral eye—is a broad, rounded prominence, slightly projecting beyond the anterior margin of the head. The apex of this

prominence usually bears a single short hair. The superior antennæ are short and three-jointed, the last joint being beset with a few auditory hairs. In the male both pairs of antennæ are present, and are provided with long, flexible flagella; the last joint of the peduncle of the superior pair long, as in the female, but much more robust, and densely furnished with hairs; the peduncle of the inferior pair three-jointed. The abdomen of the male is stouter, and the bases of the swimming feet more nearly rounded; in the female the basal portion of these feet are oblong-ovate, and the last segment of the thorax is longer and narrower than the corresponding part in the male.

Phronima atlantica, Guérin.

(Plate I, Fig. 1, 1*a*, 2.)

Phronima atlantica, Guérin-Méneville, Iconogr., pl. 25, fig. 4; Mag. Zool., 1836, cl, vii, pl. 18, fig. 1.—Milne-Edwards, Hist. des Crust., 1840, iii, p. 93.—C. Spence Bate, Catalogue Amphi. Crust., 1862, p. 319, pl. 51, fig. 4.—Dana, U. S. Explor. Exped., 1852, p. 1001.

Female.—The first and second joints of the peduncle of the superior antennæ short; the last more than twice the length of the first two. The first and second pairs of thoracic feet with the carpal joint produced antero-inferiorly, and the produced portion evenly set with sharp spines along its anterior edge; the following joint, which antagonizes with the produced portion of the preceding, slightly arched and spinous along its inferior edge; the last joint notched below the end, and furnished with a ribbed, pectinated appendage on either side of its base; the third joint prolonged anteriorly below, truncated, and set around with short, sharp bristles or spines. The second pair of legs longer than the first. The third and fourth pairs with the basal joint armed behind, at its extremity, with a sharp spine; the basal joint of the fifth pair armed in the same manner as the two preceding, but the spine is much larger in the former; there is likewise a spine on the middle of the following joint, in front. The third joint of the fifth pair enlarged, arched above, and lengthened; the fourth joint, or palm, long, attenuated at its articulation with the third, and gradually broadening to its junction with the fifth joint, arched above, the inferior angle produced anteriorly into a long and stout point, corresponding to the immovable finger of the *Cancridæ*, the anterior border with two stout, prominent teeth, the upper the larger, tuberculated on the edge towards the movable finger, and beset with a few bristles or hairs; the fifth joint, or movable finger, longer than the anterior border of the palm, arched above, and with a broad prominence on the middle of the inferior margin; the last joint very small, and in old subjects fused with the preceding joint. The basal joint of the sixth and seventh pairs of legs armed at the extremity, in front, with a short spine; and the second and third joints of the last pair with a prominent, rounded projection on the anterior surface, that on the second joint more pointed. The first pair of caudal appendages extending almost as far backward as the extremity of the

third pair; the second pair falling short of the articulation of the rami of the third pair, and terminating about opposite the articulation of the rami of the first pair. Telson minute, unguiform.

Male.—The fifth pair of thoracic legs relatively shorter in the male; all the joints of the leg individually shorter and stouter than the corresponding parts in the female. The produced portion of the fourth joint, corresponding with the immovable finger of a crab, more produced downward, and less anteriorly, and arises from about the middle of the inferior surface. The fifth joint is more curved at its proximal extremity, so as to antagonize with the produced portion of the fourth joint. These sexual characters of the fifth pair of legs are only developed in the mature male; in the young of this sex, the fifth pair partakes of the characters, more or less, of the young female.

There were examined twenty-eight specimens of this species, coming from many different localities in the Pacific Ocean, varying in length from 4 to 21^{mm}, and there was found no material variation in the structural character of the prehensile organ, dependent upon age (presuming the size of the specimen to be dependent upon its age); that of 4^{mm}, as well as that of 21^{mm}, presenting all the essential characteristics of the species as described and figured by Guérin. The shape of the hand varies somewhat with size, but not sufficient to lead to a mistaken identity of the species. In the young of from 4 to 6^{mm}, the hand is almost as deep posteriorly as anteriorly, and all the joints are relatively shorter and stouter. As the animal increases in size the parts become lengthened, and the hand is much narrower posteriorly than anteriorly. In one specimen only, did the teeth on the anterior surface of the hand show any variation; in that, the detached tooth, nearest the produced portion, was wanting. *P. custos*, probably, represents this occasional variation. In another example, the prominence on the concave surface of the movable finger was very prominent, almost tooth-like. With these exceptions, I found no tendency to variation in these parts, which is contrary to the researches of Claus. According to this authority, *P. atlantica* is nothing more than the immature female form of *P. sedentaria*. I think, however, that the validity of the species will no longer be questioned, now that the male form of *P. atlantica* is presented.

Locality (of those examined): Pacific Ocean, north and south of the equator, from latitude 30° 42′ south to 37° north; and from longitude 81° 40′ west to 169° 25′ west. The temperature of the water varied from 60° to 79° Fahr.

Phronima pacifica, Streets.

(Plate I, Fig. 3, 3*a*.)

Phronima sedentaria, Claus, Zeitschrift wissen. Zoologie, Leipzig, 1872, XXII, pls. xxvi, xxvii, fig. 1–12.

Phronima pacifica, Streets, Bulletin of the National Museum, No. 7, Washington, 1877, p. 128.

Female.—The first and second joints of the superior antennæ short (the first narrow, the second broad); the last joint about twice the length

of the first and second combined. The structure of the first and second pairs of thoracic feet similar to those of *P. atlantica*. The spine on the posterior extremity of the basal joint of the third and fourth pairs is wanting in the present species, and in its place is a bristle-like hair. The fifth pair of legs are relatively shorter, when compared with those of *atlantica;* a prominent spine on the posterior extremity of the basal joint, but none on the following joint, in front; the third joint short, broad, and considerably arched above; the fourth joint (palm) broadly quadrate, almost as broad as long, the superior border rounded posteriorly to the articulation of the third joint, the lower border slightly curved, the character of the dentition on the anterior border similar to that of *atlantica* in the general arrangement of the teeth, but the teeth are not nearly so prominent, or pointed, the lower, single tooth but slightly separated from the larger crenulated tubercle; the prolonged inferior angle more curved upward, and shorter than in the former species. The fifth joint curved, about as long as the anterior margin of the palm, a low convexity on the inferior margin. The first pair of caudal appendages do not reach as far backward as the third pair, extending to, or slightly beyond, the middle of the rami of the last pair; the second pair extends to, or slightly beyond, the point of articulation of the rami of the third pair, and more than half way the length of the branches of the first pair.

The characters of the fifth, or prehensile pair of legs, and the relative length of the second pair of caudal appendages are sufficient to readily distinguish this species from *P. atlantica*.

In the young of 3^{mm} the shape of the hand is the same as in the adult. On the anterior margin there are, in the place of the dentated tubercle, two or three pointed teeth, springing from a slightly elevated base. The hand of the male is similar to that of the female, except that the immovable finger rises from a more receding angle, which, however, is less receding than that observed in *P. atlantica*.

Claus confuses this species with *P. sedentaria*. (*Vide* Zeitschrift wissen. Zoologie, Leipzig, 1872, xxii, pls. xxvi, xxvii, fig. 1–12.)

The number of specimens examined was ten—nine females and one male. Their lengths varied from 3 to 12^{mm}.

Locality.—Pacific Ocean, north and south of the equator—from latitude 40° north to 30° 42′ south; and from longitude 97° 14′ west to 157° 37′ west. The temperature of the water of the localities whence the specimens were obtained varied from 66° to 73° Fahr.

The following facts may be deduced by comparison with *P. atlantica*. The present species is smaller in size, less numerous in the localities given, and a relatively larger proportion of those in the collection came from localities south of the equator.

Phronimella, Claus.

The shape of the head and antennæ, and the general form of the thorax and abdomen very similar to *Phronima*. The third pair of

thoracic feet *long*—much longer than the succeeding pair. The fifth pair enlarged, and used for prehension; *the extremity, or claw, resembling that of the Squilla*—the movable finger (fifth joint) flexing against the anterior aspect of the palm, which is furnished with teeth. Three pairs of styliform caudal appendages;* the second, or middle pair short, or rudimentary.

Sexual differences.—Males smaller than the females, and more robust. In the females the second pair of caudal appendages are rudimentary, almost obsolete; in the males well developed.

In respect to the antennæ and other parts of the body the sexual differences are similar to those observed in *Phronima.*

PHRONIMELLA ELONGATA, Claus.

(Plate I, Fig. 4, 4*a*, 5, 5*a*.)

Phronima elongata, Claus, Würzburger naturwissen. Zeitschrift, Würzburg, 1862, III, p. 247, pl. vi, fig. 6–11 (male and female).—Zeitschrift f. wissen. Zoologie, Leipzig, 1863, XII, p. 193, pl. xix, figs. 2, 3, 7 (female).

Phronimella elongata, Claus, Zeitschrift f. wissen. Zoologie, Leipzig, 1872, XXII, pp. 333, 336, 337.

Anchylonyx hamatus, Streets, Bulletin of the National Museum, No. 7, Washington, 1877, p. 131 (female).

Female.—The first joint of the superior antennæ short; the second long and with a few auditory hairs at its apex. The first and second pairs of thoracic feet shorter than the succeeding pairs; the first shorter than the second, with the fourth joint hardly produced at its posterior distal extremity, the produced portion spine-like; the second pair with the fourth joint elongate and slender, and with the spine on the posterior distal extremity often wanting; where it is present it is much smaller than that on the corresponding joint of the first pair. The third pair of thoracic feet extremely elongate, nearly as long as the animal, the excessive lengthening being in the last two joints; the bases of the third and fourth pairs of feet spinous along the posterior edge. The base of the fifth, or prehensile, pair longer than that of the preceding pairs, and spinous on the anterior edge, two or three spines on the posterior edge near the distal extremity; the anterior edge of the second, third, and fourth joints spinous; the fourth joint enlarged at its extremity, and armed with four or five large teeth, against which the following joint, or finger, impinges; the lowest of the teeth the largest, and touches the finger about its middle; the fifth joint about one-third the length of the fourth, arched; the claws of all the pairs of feet anchylosed with the fifth joint, and fixed at a right angle to it, forming a hook, and the apex of the fifth joint slightly produced as a straight, acute spine. The bases of the last two pairs somewhat club-shaped,

* Claus states that there are "only two pairs of styliform caudal appendages." This is true of the female, but not of the male. In one of his plates, where the caudal extremity of a male is given, the three pairs of styliform appendages are very clearly represented.

Fig. 1.

Fig. 2.

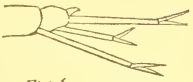

Fig. 1a.

Fig. 3.

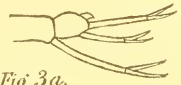

Fig. 3a.

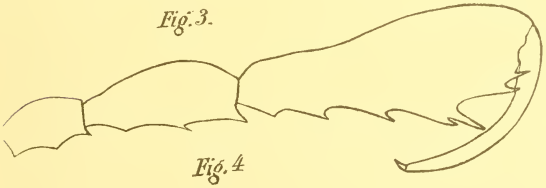

Fig. 4

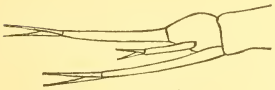

Fig. 4a.

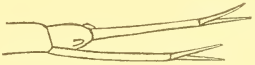

Fig. 5a.

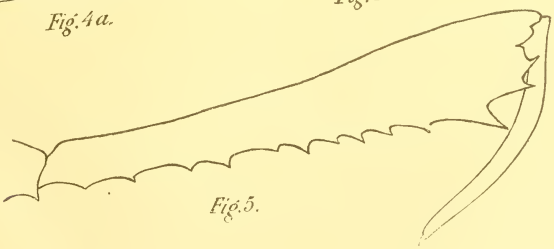

Fig. 5.

PHRONIMIDÆ OF NORTH PACIFIC SURVEYING EXPEDITION.

and apex armed with a spine in front; a spine on the anterior edge of the following joint. The first pair of caudal appendages terminate half way the rami of the third pair; the second pair rudimentary, represented only by a projecting tubercle.

Male.—The base of the superior antennæ stouter than in the female, the first joint broad, the second long and straight, with its inferior apex produced, and its lower edge densely hairy; the first and second joints of the flagellum subequal, and together about as long as the third; the third and fourth subequal, the remainder of the flagellum lost. The inferior antennæ more slender than the superior; peduncle three-jointed, and bent upward at the third joint; the first joint broad, the others successively diminishing in breadth; flagellum very long, one-half, or more, than the length of the body, filamentous, joints elongate, the first the longest, the remainder subequal. The under surface of the flagella of both pairs furnished with long, equidistant hairs. The body of the animal smaller and stouter than the female; the last two joints of the third pair of feet relatively shorter, and all the feet shorter and more robust; the fifth joint of the fifth pair about one-half the length of the fourth joint, and impinges on the large tooth anterior to its middle. The second pair of caudal appendages well developed, and extend to the commencement of the rami of the first pair.

The number of specimens examined was seven—six females and one male—varying in lengths from 9 to 15^{mm}, and coming from localities in the Pacific Ocean north and south of the equator, from latitude 34° 00′ north to latitude 30° 40′ south, and from longitude 102° 43′ west to longitude 150° 00′ west. Claus first describes the species as coming from the Mediterranean Sea. The length of the male specimen, 10^{mm}.

EXPLANATION OF PLATE I.

FIG. 1. *Phronima atlantica* (female). Fifth thoracic foot; 1 *a*. Caudal appendages.
FIG. 2. *Phronima atlantica* (male). Fifth thoracic foot.
FIG. 3. *Phronima pacifica* (female). Fifth thoracic foot; 3 *a*. Caudal appendages.
FIG. 4. *Phronimella elongata* (male). Fifth thoracic foot; 4 *a*. Caudal appendages.
FIG. 5. *Phronimella elongata* (female). Fifth thoracic foot; 5 *a*. Caudal appendages.

WASHINGTON, D. C., *March* 1, 1882.

DESCRIPTION OF SEVERAL NEW RACES OF AMERICAN BIRDS.

By ROBERT RIDGWAY.

1. METHRIOPTERUS CURVIROSTRIS OCCIDENTALIS.*

CH.—Similar to *M. curvirostris*, Swains., but tail much longer, colors darker and browner, spots of lower parts better defined and regularly

*METHRIOPTERUS CURVIROSTRIS OCCIDENTALIS Ridgw., MS.

"*Harporhynchus curvirostris*" LAWR. Mem. Boston Soc. N. H. II. pt. iii, No. 2, 1874, 267 (Tepic and Mazatlan).