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ADDITIONS TO OUR KNOWLEDGE OF SHIPWORMS.

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Since the publication of Bulletin 122, U. S. National Museum, "A Monograph of the American Shipworms," a large amount of material has come to hand, among which are a new subgenus and three new species from American waters, which are here described. In addition to these, the monographing of the Philippine forms and a study of the West Pacific members of the family have brought to light the fact that several additional superspecific groups will have to be recognized, and to these I am also giving a status in the present paper.

Bankia (Neobankia) orcutti, new species.

Orcutt Shipworm.

Shell small, subglobose, the anterior median portion pinkish, the rest white. The anterior portion with the usual sinus and reflected callus, which extends over the anterior external margin of the anterior part. From this the dental ridges extend first downward then backward, fan-shaped. These dental ridges are finely serrated at their free border and are about as wide as the spaces that separate them at the posterior margin. The umbones of the type are but slightly eroded, and I am therefore led to believe that the specimen, the largest in my possession, is not fully grown. It shows thirty-six ridges. The anterior and median parts meet in a curved line. The anterior median part is marked by rather broad dental ridges which are separated by slender lines only. The denticles, too, are very closely crowded. There are eighteen of these dental ridges in the line continuous with the ventral margin of the anterior part. The middle median portion forms a depressed groove, and is rather narrow. It is marked by coarse U-shaped lines of growth. The posterior median portion is a little broader than the anterior and middle median portions combined, and is marked by rather coarse lines of growth. The posterior part forms a moderately large auricle, which is slightly constricted at its junction with the posterior median portion. The interior is bluish white; the junction of

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the anterior and median portions are marked by a strong raised cord. The middle median portion is marked by a strongly impressed rough groove, and bears at the ventral margin the usual knob, while from under the umbone the broad, irregular flat blade extends ventrally for two-thirds the length of the cavity. The posterior part projects as a shelf over the posterior median part with a decidedly hollow cavity behind it. The posterior part is concavely spatulate in outline. The pallet is the most peculiar we have so far seen. The cone-in-cone shaped segments are closely crowded. The membrane covering the inside of the segments is finely fimbriated distally, while on the outside it is cut into a series of short, strong spines, which give to each segment a fine comblike appearance.

The type, Cat. No. 348191, U. S. N. M., was collected by C. R. Orcutt in Bacochibampo Bay, Sonora, Mexico. It measures: height, 3.4 mm.; length, 3.1 mm.; diameter, 3 mm. The pallet measures: length, 3.6 mm., of which 1.7 mm. go to the stalk; diameter of blade, .7 mm.

Zopoteredo, new subgenus.

In the present subgenus the posterior part overlaps the median part on the inside and is completely united with it, leaving no cavity between it and the median part at the anterior margin of the posterior part. In this respect the shell almost resembles *Psiloteredo*. In *Psiloteredo*, however, there is scarcely any indication of a suture at the junction of the anterior margin of the posterior part with the median part, while in the present subgenus there is a conspicuous demarcation. The pallet of the present form differs from all the other known *Teredos* in having the calcareous portion semi-disc shaped, that is, very short and broad, and the corneous portion partly slit and infolded in the median line on the outside, so as to practically divide that part into a double cup, as in *Teredothyra*, but this is not a true double cup, for it does not involve the calcareous portion.

Type *Teredo* (*Zopoteredo*) *clappi*, new species.

Teredo (Zopoteredo) clappi, new species.

Clapp Shipworm.

Shell subglobular, pale olivaceous horn colored. The anterior portion of the anterior part shows the usual curved sinus with a reflected smooth callus, from the edge of which the dental ridges radiate backward in a fan-shaped manner, spreading first downward and then backward. At the posterior extremity they are about half as wide as the dental ridges. The latter are finely serrated on their free border. In the type the umbones are largely eroded, but fifty-four ridges are present. It is probable that more than that number have been eroded. The posterior margin of the anterior part joins the anterior margin of the median part in a curved line. The anterior portion of the median part is very broad and crossed by prominent dental ridges, which join the ridges of the anterior part almost at right angles. The dental ridges of the median part are marked with numerous tubercles which are finely denticulated at their free margin. Of these, thirty-seven are present in the type in a line continuous with the ventral

border of the anterior part. The middle median portion is narrow and marked by rough, curved lines. The posterior median portion is about half as wide as the anterior median portion, and is marked by rough, upward curved incremental lines. The posterior part or auricle is very narrow and separated from the posterior median portion by a narrow groove. The interior is bluish white. The umbones are quite strong, with the usual blade springing from the under side. The blade, which is scythe shaped, curves downward and forward. The junction of the anterior and median parts is marked by a thickened cord. The middle median portion is somewhat roughened and bears the usual knob at its ventral termination. The posterior part is attached to the posterior median portion in such a way that no cavity appears behind it, but there is a conspicuous groove showing the termination of the anterior margin of the posterior part. It is very broad and its extent would scarcely be surmised by the inconspicuous auricle shown on the outside. The pallets have a long, symmetrically curved stalk. The calcareous portion of the blade bends down over the stalk and invests it as a sheath for some little distance. The calcareous blade is short and rather broad, almost forming a semicircular disc. The corneous portion on the distal end is fully as long as the calcareous part, and bears a deep impression on its outer margin in a median line, which almost divides this part into a double cup, suggesting in that manner *Teredothyra*. The outer portion of the calcareous lining of the burrow shows a double chambered tube with a calcareous rib at the lateral median border, which is evidently coincident with the bifid aspect of the corneous portion of the pallet.

The type, Cat. No. 348189, U. S. N. M., was taken from a piece of oak timber, probably an old ship's keel, by the author, at Key West, Florida, last June. The type measures: height, 4.8 mm.; length, 4.3 mm.; diameter, 4.2 mm. The pallet measures: length, 3.5 mm., of which 2.3 mm. go to the stalk; diameter of blade, 1.2 mm.

Cat. No. 348190, U. S. N. M., contains a lot of additional specimens from the same log, and Cat. No. 348188, U. S. N. M., an alcoholic specimen received from the Marine Piling Committee of the National Research Council, their No. 997 Y D 701 A, transmitted by Dr. W. F. Clapp, for whom I take pleasure in naming the species.

Teredo (Teredothyra) atwoodi, new species.

Atwood Shipworm.

Shell subglobular, pale brown. Umbones eroded. The anterior portion with a narrow, smooth zone anteriorly, which is slightly reflected backward as a thin callus. From this the dental ridges spread in a fan-shaped manner, curving first slightly downward then almost straight to the posterior margin of the anterior part. These ridges are triangular and exceedingly finely denticulated at their free margin, where they are separated by spaces a trifle wider than the width of the ridges. 47 of these are present in the type, though many must have been lost at the eroded umbone. These ridges join the dental ridges of the anterior median part almost at right angles. The anterior median portion is about three times as wide as the

middle and posterior median portions combined. The dental ridges are closely approximated, separated, in fact, by mere impressed lines, and bear numerous closely crowded, elongated tubercles, which have their long axes at right angles to the dental last. The middle median portion is about as wide as the posterior median portion, but the middle median portion is crossed by rather strong, curved lines of growth, which become enfeebled on the posterior median portion. The posterior part forms a slender auricle which projects as a weak claw. Interior pale brown. The umbonal knob only moderately strong, provided with a slender blade. The ventral knob also rather feeble. The anterior and median portion fuse in a tumid line. The posterior margin does not form a projecting shelf, but fuses with the posterior portion of the median part without a sign of suture. Pallets long, spatulate, bifurcated at the free end, where they are doubly cupped, with a short twisted stalk marked off from the blade by a raised ring. The calcareous tube lining shows two siphonal openings.

The type, Cat. No. 348186, U. S. N. M., was taken from creosoted piles in Guantanamo Bay, Cuba, and transmitted to me by Colonel William G. Atwood of the Committee on Marine Piling Investigations of the National Research Council, for whom I take pleasure in naming the species. It measures: height, 5.7 mm.; length, 5.3 mm.; diameter, 5.4 mm. The pallets measure: length, 9.5 mm., of which 2.5 mm. go to the stalk; diameter, 2.4 mm.

An additional lot of specimens from the same station is entered as Cat. No. 348187, U. S. N. M.

This species is the second of this subgenus known from the West Atlantic. The first one, *Teredo* (*Teredothyra*) *dominicensis* was described in my "Monograph of the American Shipworms," Bulletin 122, U. S. Nat. Mus., 1922. The present species is at once distinguished from that by its much larger size.

Eoteredo, new genus.

Blade not projecting from the under side of the inside of the umbones, but attached to the middle of the broad shelf that constitutes the inward projection of the posterior part of the shell. Pallets unknown.

Type *Eoteredo philippinensis* Bartsch.

All the shipworms so far examined have the blade extending from the inside of the umbone. The present form marks an entirely different type of departure, for here it is attached to the middle of the shelf formed by the inward projection of the auricle. I deem this sufficiently distinct to merit generic separation. It is unfortunate not to have pallets of this species, which would at once show to which of the three genera that I have recognized in my monograph the present genus is most nearly related.

Eoteredo philippinensis, new species.

Philippine Shipworm.

Shell subglobular, yellowish white, with the posterior portion forming the merest trace of an auricle on the outside. Umbones eroded even in very young specimens. The anterior part very broad with its anterior portion

terminating in a somewhat curved sinus, the edge of which is slightly reflected posteriorly as a thin callus. The rest of the anterior part is marked by dental ridges, which make an even open curve from the anterior margin ventrally, then posteriorly to their posterior termination, where they join with the dental ridges of the posterior median part. 82 of these ridges remain in the type and a good many more must have been eroded at the umbone. The ridges of this anterior portion are triangular with their free border finely, evenly serrated. The posterior median portion covers two-thirds of the posterior part, and is marked by dental ridges which join those of the anterior part at right angles. The denticles here are broad and sharply cusped. The median middle portion is about one-eighth the width of the posterior median portion and is marked by curved, rough lines of growth. The posterior median portion is about as wide as the middle median portion and marked by feebler continuations of the lines of growth than those that characterize the middle median portion. The posterior part, or auricle, constitutes a very small projection when viewed from the outside, the merest indication of a claw, as it were. Interior bluish white. The anterior and median portion are marked by a roughened suture. The umbonal and ventral knobs are prominent. The erosion of the posterior umbonal region, even in young specimens, forms an opening in this region on the inside. Anteriorly this is bordered by a strong shelf which extends from the umbones to the posterior ventral margin as a shelf. From the under side of the middle of this shelf the broad blade bends down toward the ventral knob. It is the peculiar position of the blade in this instance which has prompted me to give to this form a generic designation. Pallets unknown.

The type, Cat. No. 311281 U. S. N. M., comes from a piece of wood dredged at U. S. Bureau of Fisheries Station 5243, off Uanivan Island, Pujada Bay, S. E. Mindanao, in 218 fathoms on gray mud bottom. The type, the largest specimen, measures: height, 4.2 mm.; length, 3.9 mm.; thickness, 4.2 mm.

Cat. No. 311282 U. S. N. M., contains additional specimens which were obtained at the same station.

Coeloteredo, new subgenus.

In this subgenus the blade of the pallet forms a half hollow cone; that is, the outer portion is convex while the inner portion of the blade is almost flat. The entire structure is very thin. The stalk is short with the basal half expanded into an oval knob, which is fully three times as wide as the narrower neck of the stalk.

Type *Teredo* (*Coeloteredo*) *mindanensis*, new species.

Teredo (Coeloteredo) mindanensis, new species.

Mindanao Shipworm.

Shell small, subglobular, white, the extreme anterior portion of the anterior part with a moderately deep sinus that is covered with a smooth callus, which is slightly reflected over the exterior portion. The remaining

anterior part is crossed by moderately strong dental ridges which first bend downward and then backward in an even, gentle curve, separated at the posterior extremity by spaces about twice as wide as the dental ridges. These dental ridges slope a little more abruptly dorsally then ventrally, and are very finely denticulated at their free border. There are forty-two of these in the type, in which the umbone is partly eroded. A perfect specimen would therefore show a larger number. The anterior part of the median area is marked by closely crowded dental ridges, which are about as wide as those of the anterior area. The denticles of these are quite fine. Of these ridges twenty-two are present in a line parallel to the ventral margin of the anterior part. The middle median portion is slightly concave and crossed by the non-denticulated decidedly curved continuations of the dental ridges of the anterior median portion, and fine incremental lines. The posterior median portion is marked by rather rough lines of growth, and is a little wider than the anterior and middle portions of the median part combined. The posterior part is developed into a rather pronounced auricle, which is marked by a series of strong wavy lines, appearing almost like ridges. The posterior median part bends rather abruptly downward to join the auricle. The interior is white. The junction of the anterior and median portion is marked by a rather strong cord. The middle median portion forms a slightly depressed roughened groove, at the basal termination of which the usual strong knob is situated. The auricle overlaps the posterior median portion decidedly and forms a rather strong shelf. The cordlike markings described for the exterior are also apparent on the inside. A strong, somewhat irregular curved blade extends from the inner side of the umbone two-thirds of the way toward the basal knob. The pallets consist of half a hollow cone; that is, the external portion is curved while the inner portion is almost flat. The cavity of the cone extends to the insertion of the stalk. The stalk is short and bears an expanded knob at its free end.

The type, Cat. No. 310975, U. S. N. M., was collected in a piece of wood dredged during the U. S. Bureau of Fisheries Albatross Philippine Expedition at Station 5252, in 28 fathoms on coral bottom, off Linao Point, Gulf of Davao, Mindanao. It measures: altitude, 2.2 mm.; length, 2.2 mm.; diameter, 2.2 mm. The pallets measure: length, 2.6 mm.; diameter, 1.3 mm., of which 1.2 mm. go to the stalk.

A lot of specimens from the same piece of wood are entered as Cat. No. 246127, U. S. N. M.

Nototeredo, new subgenus.

Shell as in *Neoteredo*; that is, with the posterior part so attached to the posterior median portion of the median part as to form a decided shelf, which projects inward. Pallets spoon shaped as in *Psiloteredo.*

Type *Teredo* (*Nototeredo*) *edax* Hedley.

In my "Monograph of the American Shipworms," Bull. 122, U. S. Nat. Mus., 1922, I recognized among those having spoon shaped, not terminally cupped pallets, two subgenera, *Teredora* and *Psiloteredo.* In *Teredora* we have the posterior part shaped like a spatula and attached to the posterior

portion of the median part in such a way that a shelf projects inward about as much as the auricle projects outward. In *Teredora*, too, the pallets have a nail-like depression on the outside which may be marked by concentric lines of growth, or these may become even riblike, and here we may have longitudinally radiating riblets, usually confined to the basal portion of the nail-like part. These, likewise, may be strong and riblike. In *Psiloteredo* the posterior part fuses with the posterior median portion in such a manner on the inside that no shelf projects. In fact, in some of the species it is difficult to note even the suture. The pallets are spoon shaped, with the outer distal portion slightly excavated.

In the present subgenus we have the posterior portion projecting inwardly over the posterior median part to form a strong shelf, as in *Neoteredo*. It differs from this at once by the possession of entirely different pallets, which are like those of *Psiloteredo*.

I am indebted to Mr. C. Walton, Peterhead, South Australia, for a lot of specimens of this species recently received, which reveal the fact that a new group designation is required to embrace it.