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DIAGNOSES OF NEW MOLLUSKS FROM THE SURVEY OF THE MEXICAN BOUNDARY.

By W. H. DALL,

Honorary Curator of the Department of Mollusks.

THE International Boundary Commission for the survey of the line between the United States and Mexico was accompanied by Dr. Edgar A. Mearns, U. S. A., who, with his associates, collected objects of natural history both along the line and from the ocean near its western terminus. A full report on the mollusks has been prepared by the writer, with suitable illustrations, but as this may be some time delayed in publication, waiting for the completion of other reports, the following diagnoses of new forms have been prepared.

Family HELICIDÆ.

PATULA STRIGOSA, Gould, var. CONCENTRATA, Dall.

Shell exactly mimicking the normal *P. strigosa*, with rounded whorls, but measuring only 13 mm. in minor and 16 mm. in major diameter, with a height of 8 mm.

Summits of the Hachita Grande and Huachuca Mountains, abundant.

EPIPHRAGMOPHORA ARIZONENSIS, new species

Shell small, moderately elevated; light brown, with a narrow brown band just above the periphery, mostly concealed by the suture, but visible internally in the aperture on the outer side; whorls four and a half, of which one and a half are nepionic and punctate, the remainder with

rather well-marked incremental lines and microscopic vermicular markings, of which the longer axes are subparallel to the lines of growth; suture distinct, whorls full and rounded, but with the periphery slightly above the middle, the last whorl descending a little near the aperture; base full and rounded; umbilicus narrow, deep; aperture expanded; the pillar lip reflected, but the outer lip not so. Height, 11; major diameter, 17; minor diameter, 13.5 mm.

Locality.—Banks of the Santa Cruz River, near Tucson, Arizona. Like *Arionta* var. *indioensis*, Yates, but smaller, with less oval aperture and narrower umbilicus. That species has the brown line not covered by the suture.

EPIPHRAGMOPHORA HACHITANA, new species.

Shell large, depressed, polished, sculptured with irregularly prominent, incremental lines, but without spiral striation or surface granulation; whorls four and a half, rounded; suture distinct; last whorl depressed near the peristome; aperture oblique, with a thickened and somewhat dilated but not reflected lip; pillar lip broad near the body; umbilicus moderate, deep, exhibiting nearly two whorls; the fresh shell livid waxen, or pale reddish-purple, with a single darker band, bordered by paler color, above the periphery. Major diameter, 26.5; minor diameter, 21; height, 12 mm.

Locality.—Hachita Grande Mountain, at an altitude of 8,270 feet, and in many other localities in the central region.

This resembles *E. magdalenensis*, Stearns, but is a much larger shell, and, when fresh, of a different color.

POLYGYRA CHIRICAHUANA, new species.

Depressed, thin and polished, dark brown, with five and a half whorls, and sculptured only with fine incremental lines; suture distinct, periphery rounded, with a constriction behind the peristome, which descends slightly; umbilicus deep, narrow; aperture oblique, with a narrow, livid, strongly reflected lip, which is somewhat flexuous and entirely destitute of internal teeth; body without teeth, the lips united by a thin smooth callus. Height, 7.7; major diameter, 18; minor diameter, 14.8 mm.

Locality.—Fly Park, Chiricahua Mountains, Arizona, at an elevation of 10,000 feet.

Like *P. levettei*, but larger and edentulous.

POLYGYRA MEARNSII, new species.

Shell pinkish-brown, depressed, five-whorled, sculptured only with fine lines of growth; spire much depressed, suture very distinct; periphery rounded, but above the middle of the whorl; base somewhat compressed, rounded; umbilicus deep and narrow; last whorl a little depressed and strongly constricted behind the peristome, which is

oblique and strongly reflected, united over the body by a well-marked callus, on which are two converging but not united lamellæ; basal part of the peristome with two distinct transverse lamellæ, outer lip broader, receding with a single oblique tooth deeper in the aperture. Height, 5.5; major diameter, 13; minor diameter, 11 mm.

Locality.—Hachita Grande and Huachuca Mountains, New Mexico.

Distinguished from all other species by its three well-marked teeth on the outer lip.

Family PUPIDÆ.

Genus HOLOSPIRA, Martens.

Subgenus HOLOSPIRA ss.

Axis with a plait in the penultimate whorl and with basal, parietal, and peripheral lamellæ projecting into the lumen of that whorl.

Type, *H. pilocerei*, Pfeiffer. The subgenus includes also *H. goldfussii*, Pfeiffer, and *H. goniostoma*, Pfeiffer.

Section BOSTRICHOCENTRUM, Strebel and Pfeffer.

Axis moderate, with a continuous plait nearly the whole length but with no lamellæ.

Type, *H. tryoni*, Pfeiffer. *H. veracruzianus* also belongs here.

Section HAPLOSTEMMA, Dall

Axis moderate, with a short, stout, axial lamella in the penultimate whorl only.

Type, *H. mearnsii*, Dall.

Section EUDISTEMMA, Dall.

Penultimate whorl with a short axial and a parietal lamella only. Axis moderate. Type, *H. arizonensis*, Stearns.

Section DISTOMOSPIRA Dall

Penultimate whorl with a short, strong, axial and a basal lamella only. Axis moderate, smooth. Type, *H. bilamellata*, Dall.

Subgenus METASTOMA, Strebel and Pfeffer.

Axis smooth, without plait or sinuosity, penultimate whorl without lamellæ. Type, *H. roemeri*, Pfeiffer.

This comprises most of the species usually denominated *Holospira*.

Subgenus COELOSTEMMA, Dall.

Axis vertically ribbed as in *Coelocentrum;* shell otherwise as in *Metastoma*. Type, *H. elisabethæ*, Pilsbry.

Genus COELOCENTRUM, Crosse and Fischer.

Subgenus SPARTOCENTRUM, Dall.

Axis as in *Bostrichocentrum:* otherwise as in the type of the genus. Type, *C. irregulare*, Gabb.

HOLOSPIRA (METASTOMA) CROSSEI, new species.

Shell small, compact, twelve-whorled, with two polished, smooth, blunt nuclear and four increasing whorls, followed by a cylindrical spire faintly transversely ribbed; suture distinct, base rounded with a shallow umbilical chink; aperture simple, slightly oblique, not projecting beyond the periphery of the preceding whorl, the lip entire, slightly expanded, without internal ridges. Height, 11; maximum diameter, 4 mm.

Top of Hachita Grande Mountain, New Mexico.

This resembles *H. goldfussii*, with an entirely different interior, and a less reflected and triangular peristome.

HOLOSPIRA (METASTOMA) PILSBRYI, new species.

Shell externally almost exactly like *H. tryoni*, Pfeiffer, as figured by Crosse and Fischer,[1] but that species has the internal characters upon which Strebel and Pfeffer based their section *Bostrichocentrum*. The present form has a height of 13 and a major diameter of 4 mm., and comprises two nuclear, six increasing, and six equal whorls.

Puebla, Mexico; Arizona, collected by Dr. Edward Palmer.

HOLOSPIRA (DISTOMOSPIRA) BILAMELLATA, new species.

Shell elongate, slender, blunt-tipped, with two smooth nuclear, six increasing, and nine subsequent equal whorls; sculpture of slightly raised, distant, straight riblets, obsolete on the middle of the shell, but strong on the last whorl, where they are crowded and rather irregular; umbilicus small, shallow; aperture as in *H. crossei*, but projecting beyond the periphery of the preceding whorl. Height, 20.5; maximum diameter, 5 mm.

Hachita Grande Mountain, New Mexico.

HOLOSPIRA (HAPLOSTEMMA) MEARNSII, new species.

Shell small, compact, with two nuclear, seven increasing, and five subsequent whorls; sculpture and aperture much as in *H. crossei*, the base slightly appressed and the ribs closer and more prominent than on the preceding whorls; umbilicus shallow; aperture projecting somewhat beyond the preceding whorl; the peristome hardly reflected, subtriangular, little thickened, and without folds internally; axis small, subcylindric, with a strong, short lamella near the base in the penultimate whorl; length, 14.5; major diameter, 4.5 mm.

Hachita Grande Mountain, New Mexico.

This resembles *H. crossei* externally, but is larger, with more projecting aperture.

HOLOSPIRA (BOSTRICHOCENTRUM) VERACRUZIANA, new species.

Shell closely resembling the enlarged figure of *H. microstoma*,[2] Pfeiffer, but with a shorter apical cone and larger aperture; it differs also by hav-

[1] Moll. Mexique. [2] Crosse and Fischer, Moll. Mex., p. 337, pl. XVII, figs. 9, 9*a*.

ing 17 whorls in a total length of 17.5 mm., against 18 whorls in a length of 15.5 mm. for *H. microstoma*. The last whorl in the present species is rounded below, that of *H. microstoma* angulated. *H. veracruziana* has the one and a half nuclear whorls polished, those of the apical cone finely ribbed, those of the rest of the spire striate, with a few coarse riblets just behind the peristome.

Locality.—Mizantla, Province of Vera Cruz, Mexico.

Family BULIMULIDÆ.

Genus BULIMULUS, Leach.

Subgenus PSEUDORHODEA, Dall.

Shell slender, small, with a gyrate and pervious axis in the last whorl and a half, without internal laminæ; jaw as in *Thysanophora*. Type, *Columna ramentosa*, J. G. Cooper, Lower California.

This group has a superficial resemblance to the South American *Rhodea*, Adams, but an anatomical examination shows it to be most nearly related to the *Bulimuli* of the subgenus or section *Leptobyrsus*, especially *B. artemesia*, Binney.

BULIMULUS LEVIS, Dall.

Bulimulus xantusi var. *levis*, Dall, Proc. U. S. Nat. Mus., XVI, p. 641, 1893.—Cooper, Proc. Cal. Acad. Sci., 2d ser., IV, p. 139, pl. v, fig. 14.

Fresh specimens sent by Dr. Cooper show this to be perfectly distinct from *B. xantusi*.

BULIMULUS COOPERI, Dall.

Bulimulus pilula, Crosse and Fischer, not Binney; Cooper, Proc. Cal. Acad Sci., 2d ser., IV, p. 139, pl. v, fig. 12, 1894.

This form, distinguished among other things by pale peripheral banding, is quite distinct from the true *B. pilula* of which the types are in the National Museum.

BULIMULUS BELDINGI, Cooper.

Bulimulus inscendens beldingi, J. G. Cooper, Proc. Cal. Acad. Sci., III, p. 209, 1892; p. 340, pl. xiii, fig. 5, 1893.

An examination of specimens sent by Dr. Cooper fails to show intermediate gradations between this species and *B. inscendens*. I have no doubt of its distinctness.

Family UNIONIDÆ.

UNIO MITCHELLI, Simpson, new species.

Shell rhomboidal, solid, rather inflated, rounded before, somewhat biangulate behind; dorsal margin curved; incremental lines strong, anteriorly irregular; epidermis varying from light brown to black, coarse, often shining; beaks moderately prominent, showing traces of

rather strong concentric sculpture; cardinal teeth strong, short, rather ragged; laterals short, club-shaped, heavy, granular, or striated; nacre soft silvery white; shell near the beaks with obscure, narrow plications. Height, 33; length, 55; diameter, 20 mm.

Locality.—Guadelupe River, Victoria County, Texas, Hon. J. D. Mitchell; Rio Salado, near New Leon, Mexico.

This species probably groups with *Unio rowellii* and *scamnatus*, though no other members of the group have pustules or plications.

EPIPHRAGMOPHORA ARNHEIMI, Dall.

Arionta californiensis, LEA, var. *ramentosa*, GOULD, small variety, W. G. BINNEY, Bull. U. S. Nat. Mus., XXVIII, p. 133, fig. 108, 1885.

This small species has been referred to *californiensis* as a subvariety, but a series of forty-three very uniform specimens from various localities indicates that it is a distinct species.

Type.—No. 39612, U. S. N. M.; Nachoguero Valley, California, Dr. Mearns: San Pablo, Arnheim.

CERION (MAYNARDIA) PINERIA, new species.

Shell small, whitish, obliquely mottled with pale brownish flammules, sometimes nearly all brownish, with about eight whorls; nucleus smooth, brownish, of a whorl and a half, followed by fine, narrow, oblique, subequal riblets crossing the whorl, with about equal interspaces; apex dome-shaped; body of the shell subcylindrical, base slightly attenuated, with no umbilicus; aperture rounded, except over the body, with a thick, white, well-reflected lip, parietal and pillar lips each with a low medial tubercle or tooth; length of shell, 14; diameter, 6.5 mm.

This is nearest related to *Pupa cyclostoma*, Küster, but is small and easily distinguished by its finer, closer, and more even ribbing. Like all the species of its genus it is variable, and has among others a small variety with very regular ribbing which hardly exceeds 10 mm. in length, and is doubtless the smallest form belonging to the genus which has yet been reported.

Type.—No. 107329, U. S. N. M.: Isle of Pines, Johnson.

DIAGNOSES OF NEW SPECIES OF MOLLUSKS FROM THE WEST COAST OF AMERICA.

By W. H. Dall,

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During the work of the *Albatross* on the west coast of America a number of interesting species new to science have been collected, some of which have been described and illustrated, but many more still remain to be worked up. Pending the completion of studies now in progress the following diagnoses of especially interesting forms are printed, to attract attention to certain groups not hitherto discriminated.

CALLIOSTOMA IRIDIUM, new species.

Shell thin, with pearly sheen; conical, with eight whorls; nucleus smooth, polished, bulbous, asymmetrical, of less than one whorl; subsequent whorls flattened, so that the sides of the spire are nearly straight, diverging at an angle of 60°, and sharply angular at the periphery, against which the suture is laid; base flattish, near the aperture more or less rounded, imperforate; sculpture on the spire of, first, a strong thread, bordering the suture on each side, this thread separated by a channel from the flattened area between the two threads, upon which area are (on the last whorl seven) spiral threads, which on the last whorl are beaded and separated by wider interspaces, above become fainter or lose the beading, are obsolete on whorls 4, 5, and 6, while on the apical whorls only the strong threads remain; the latter are also beaded on the later whorls; base spirally threaded, the threads more or less beaded by the intersection with them of arched, rather strong radiating lines of growth; threads stronger and more distant as they approach the smooth, broad axial rib; the periphery of the last whorl with two granulated keels; aperture subquadrate, brilliantly pearly, the pillar white, smooth, with no tooth or projection at its base; color of the shell pinkish-waxen, verging toward bluish near the apex, with variable delicate brown flammules, which cross or variegate the whorls and usually end as more or less distinctly paired brownish spots on the periphery of the last whorl, not being visible on the base; the

nacre shines through the outer coating of the shell quite conspicuously when it is wet. Height, 20; maximum diameter, 18; height of aperture, 7 mm.

West Mexico, in deep water; also at U. S. Fish Commission station 3387, and in the gulfs of Panama and California, in about 100 fathoms.

Type.—No. 122957, U. S. N. M.

This elegant species has an operculum with a great many very narrow whorls and entire margin. The animal is brilliantly painted with scarlet and black, and has well developed eyes and an unusually long muzzle.

CALLIOSTOMA TURBINUM, new species.

Shell small, margaritæ-form, with six and a half rounded whorls; nucleus minute, white, smooth, of one whorl, followed by strongly sculptured, rather inflated whorls separated by an inconspicuous suture; sculpture on the spire of rather elevated, narrow, spiral ridges, of which the most posterior is always beaded, though the beading on the others fails on the apical whorls; in front of this ridge is a smaller one, then three, or on the last whorl five, subequal, larger ones, the third forming the periphery of the whorl, the suture being laid against the most anterior ridge; the base has about twelve, subequal, more crowded, spiral threads, faintly or not at all beaded, larger toward the axis; the body of the shell is of a nacreous waxen tint, with transverse flammules of dark brown, which articulate the spirals, are much fainter on the interspaces, but do not reach the base, on which the spirals are more or less articulated with reddish-brown; the base is somewhat flattened, the periphery not keeled, the pillar short, white, with a minute umbilical chink; aperture subquadrate, nacreous, sulcate by the external sculpture; there is no projection at the distal end of the pillar. Height, 12; major diameter, 12.5 mm.

U. S. Fish Commission stations 2902 and 2972, among the Santa Barbara Islands, in about 100 fathoms.

Type.—No. 122578, U. S. N. M.

This is a pretty species, with a polished outer coat, through which the nacre shines very distinctly.

Genus ANAPLOCAMUS, Dall.

Shell short-spired, with a thick brown periostracum, with a simple, sharp, outer lip, parietal callus, arched pillar, the anterior extreme of the aperture slightly produced and pointed, as in some Litorinas; the base imperforate, the aperture destitute of liræ, teeth, or other projections; operculum, relatively to the size of the animal, large; area of attachment, small; form, U-shaped, the apex without any spiral inclination, rather blunt, the increment being applied to the proximal end, and the edges entire.

Type.—*A. borealis*, Dall.

ANAPLOCAMUS BOREALIS, new species.

Shell short, rude, of about four and a half whorls (the apex in each specimen eroded), smooth, except for lines of growth and darker lines, which might indicate resting stages; whorls somewhat flattened above and near the apex, more or less appressed at the suture; periphery rounded, or, in the younger shells, obscurely angular; base full, smooth, with no indication of an umbilicus or axial depression; aperture subovate, pointed in front or behind; outer lip thin, sharp, simple; pillar rather thick, white, with a smooth, well-marked callus over the body; operculum dark brown, with strong incremental lines. Height of (somewhat eroded) shell, 17; of last whorl, 15; of aperture, 10; major diameter of shell, 13; of aperture, 7 mm.

Pacific Ocean, south of Unimak Island, in 61 fathoms, mud, C. H. Townsend.

Type.—No. 122592, U. S. N. M.

This very remarkable shell recalls a fresh-water genus at once, and would easily be overlooked amid a quantity of *Anculosa dilatata*. But, when studied, it is seen to be unlike any fresh-water form or any marine form hitherto known. It is probably referable to the family Trichotropidæ, as the peculiar production of the aperture, the thick, brown epidermis, and the curious operculum all have points in common with species of *Trichotropis*.

SOLARIELLA NUDA, new species.

Shell turbinate, recalling *Margarita*, smooth, polished, except for obscure spiral markings which do not interrupt the surface, of about four whorls; color, white, with a pink or blue nacre glowing through; whorls rounded, flattened in front of the suture; base rounded; umbilical margin keeled; umbilicus wide, funicular; aperture rounded, oblique, hardly angulate by the umbilical rib, and with a very short interruption between the inner and outer lips; operculum light brown, thin, with about ten whorls. Height, 15; major diameter, 19; minor diameter, 15.5 mm.

U. S. Fish Commission stations 2928, 3187, and 3348, in 298 to 455 fathoms, off Lower California.

Type.—No. 122580, U. S. N. M.

SOLARIELLA CERATOPHORA, new species.

Shell thin, with a pale olive, silky epidermis, and six whorls beside the (decollate) nucleus; early whorls smooth, gradually taking on two rows of projecting points or sharp nodules, which are, on the later whorls, connected by a slender spiral thread; periphery with a slender granular thread, on which the suture is laid; base with five similar threads, closer as they approach the umbilicus; umbilicus small, verti-

cally striate; aperture rounded, slightly angulated by the sculpture; the outer lip thin, sharp; the inner reflected over part of the umbilicus. Height, 28; diameter, 24 mm. The operculum has four or five whorls.

U. S. Fish Commission station 3432, in 1,421 fathoms, mud, in the Gulf of California, off La Paz.

Type.—No. 122960, U. S. N. M.

The single specimen obtained has repaired an injury of the base so as to somewhat distort the umbilical region. Except for the presence of an umbilicus this might well be referred to *Turcicula* or *Bathybembix*, and examination of the anatomy may show that to be its proper location.

RIMULA (?) EXPANSA, new species.

Shell low, rounded, expanded; apex small, prominent, subcentral, recurved to the right; foramen like an exclamation point without the dot (ˈ), the small end anterior, the suture in front of the foramen inconspicuous, marked by a narrow raised line on the interior of the shell; anterior slope convex, gently rounded; posterior a little excavated; sculpture of evenly spaced, similar, close, fine, rounded threads overrunning radiating, rounded, little elevated threads of three sizes, the larger starting at the apex, the others intercalary toward the periphery as the interspaces widen; margin of the shell slightly crenulated by the sculpture; interior smooth, yellowish white, the septum convexly arched without buttresses. Height, 10; length, 32; width, 26 mm.

U. S. Fish Commission stations 3358, in 555, and 3047, in 885 fathoms, Gulf of Panama.

Type.—No. 122967, U. S. N. M.

This species recalls *R. asturiana*, Fischer, but is lower and more expanded, a thinner shell, and with more delicate sculpture.

EMARGINULA FLABELLUM, new species.

Shell small, translucent white, depressed, wider in front, narrow behind, squarish at both ends, with the incurved apex terminal behind; slit short, one-fourth as long as the shell, widest in front, straight; fasciole depressed, with an elevated keel on each side; sculpture of fine concentric incremental lines and very fine elevated threads, which start from the anal fasciole and curve outward toward the margin with very few intercalated threads; margin smooth, interior polished, the fasciole convex inward; front margin twice as wide as the posterior margin. Length, 10; height, about 2.5 mm.

U. S. Fish Commission station 2902, in 460 fathoms, sand, off Clarion Island, Lower California.

The only specimen taken, though living, was slightly crushed.

CHORISTES CARPENTERI, new species.

Shell large, solid, of three and a half rounded whorls, covered with a pale olivaceous epidermis, sculptured only with somewhat irregular,

rude, incremental lines; suture deep, the whorl in front of it slightly excavated; base rounded, the umbilicus narrow, deep; aperture subovate, not interrupted by the body; the inner lip nearly straight, the outer lip simple, sharp-edged; the interior of the aperture white. Height (somewhat eroded), 21; diameter, 21 mm.

U. S. Fish Commission station 3382, in 1,793 fathoms, mud; Gulf of Panama.

Type.—No. 123039, U. S. N. M.

This is the second species of this very interesting genus, and the first from the Pacific. It is larger, more elevated, and much more solid than the form from the North Atlantic on which Dr. P. P. Carpenter erected the genus.

BENTHODOLIUM PACIFICUM, new species.

Shell resembling *B. abyssorum*, Verrill and Smith, from the North Atlantic, from which it differs by its much more elevated spire with the same number of whorls, its smaller last whorl and aperture in proportion to the whole shell, its more slender pillar and larger umbilicus, and especially by having its spiral sculpture less crowded, and reticulated by narrow, flattened threads overrunning the spirals and in harmony with the lines of growth. Height, 30; diameter, 20 mm., but less perfect specimens attain twice this size.

U. S. Fish Commission station 3375 in 1,201 fathoms, ooze, near Malpelo Island, Gulf of Panama.

Type.—No. 123031, U. S. N. M.

The operculum is narrower and less spiral than that of the Atlantic species.

PHOS COCOSENSIS, new species.

Shell elongate, acute, eleven-whorled, including a nucleus of four whorls; color, yellowish white, with variable brown spiral banding; sculpture of 11 or 12 narrow, little elevated, distant ribs, more or less angulated at the shoulder; spiral sculpture of numerous rather sharp, close threads, flatter on the last whorl, with a few more prominent between the suture and the shoulder; suture distinct, whorls moderately rounded; aperture longer than wide, with an entire outer lip, slightly thickened and internally lirate; throat white, pillar with a groove near its anterior edge; canal short, deep; siphonal fasciole moderate; body with a thin white callus. Height, 47; last whorl, 28; diameter, 19 mm.

The operculum is smooth-edged, as in *Fusus*.

U. S. Fish Commission station 3368 in 66 fathoms, near Cocos Island, Gulf of Panama.

Type.—No. 123010, U. S. N. M.

COMINELLA BRUNNEOCINCTA, new species.

Shell compact, solid, livid pinkish, with narrow, brown, distant, spiral lines and a few brown flammules near the suture; nucleus smooth,

small, white, of two whorls, followed by five subsequent whorls; spire acute, whorls moderately rounded, the last much the largest; sculpture on the early whorls decussate by fine transverse riblets, strongest near the suture, and flattish spiral threading; later the whorls are polished, smooth, except for lines of growth and narrow, distant, sharp grooves; suture with a narrow channel; aperture long, narrow, with a shallow narrow sinus behind and a deep siphonal sulcus in front; outer lip thickened, flexuous, obscurely lirate behind, body with a thin callus; pillar white, concave, with a prominent margin, shorter than the aperture. Operculum narrow, elongate oval, with an apical nucleus. Height of shell, 31.5; of last whorl, 24.5; diameter, 13 mm.

U. S. Fish Commission station 3390, in 56 fathoms, sand; temperature, 62.6°; in the Gulf of Panama.

Type.—No. 122009, U. S. N. M.

FUSUS (?) RUFOCAUDATUS, new species.

Shell elongate, acute, thin, with six or more whorls (partly eroded) covered with a delicate yellow-brown epidermis, the pillar and canal, when fresh, of a pronounced rufous-brown or brown-pink, which fades more or less in the dry shell; whorls drawn out, rounded, with a deep but not channeled suture; nucleus eroded; the remaining whorls sculptured with about a dozen flattened subequal spirals with narrower grooves between them, crossed by lines of growth and (on the last whorl about 20) sharp flexuous riblets, which cross the whorl and are obsolete on the canal; base attenuated; pillar long, very straight, attenuated, twisted, almost pervious; aperture narrow; outer lip very thin, sharp, concave near the shoulder, produced in front, modified by the sculpture, but not lirate. Height of (eroded) shell, 30; of last whorl, 21; diameter, 9 mm.

U. S. Fish Commission stations 3360, 3374, 3392 and 3415, in 1,270 to 1,879 fathoms, Gulf of Panama.

This elegant little shell recalls *Boreotrophon* in its sculpture, and may not be a true *Fusus*. The spirals in some of the specimens are narrower and more numerous than in the type, and in the young the ribs are less sharp and the color more ashy.

Genus TRACTOLIRA, Dall.

Shell slender, drawn out in its coil, fusiform, with a short canal and pervious axis; outer lip simple, not expanded or lirate; body not callous, the axis twisted, with a single strong plait at its anterior edge, the young showing five or more narrow, low, thread-like ridges behind the one above mentioned, but which become obsolete in the adult.

This singular shell appears to be a degenerate abyssal form of Volutidæ, but which can not be assigned to any of the genera yet established.

Type.—*T. sparta*, Dall.

TRACTOLIRA SPARTA, new species.

Shell elongate, slender, with a greenish or ashy adherent epidermis (more or less eroded near the apex in all the specimens), and about six whorls; nucleus apparently as in *Scaphella*, large, with an apical spur; whorls drawn out, rounded, with a distinct suture, the upper whorls at first smooth, then with irregular, partly obsolete, transverse wrinkles, some of which cross the whorl, but which are too irregular to call ribs; surface everywhere sculptured with numerous, even, fine, flattish spiral threads, with equal or slightly wider interspaces, and with well marked but not regular lines of growth; aperture subovate, rather wide in front, the outer lip simple and hardly thickened; the throat white, a thin wash of callus on the body, the pillar thin, pervious, short; the canal short and wide, with hardly any siphonal fasciole; operculum absent. Height of shell, 60; of last whorl, 43; of aperture, 28; diameter, 19 mm.

U. S. Fish Commission stations 3360, 3374, 3414 and 3415, in 1,672 to 2,232 fathoms, Gulf of Panama, to Acapulco, Mexico.

Type.—No. 122999, U. S. N. M.

This is a very characteristic and singular abyssal shell.

SCAPHELLA BENTHALIS, new species.

Shell recalling *S. magellanica*, Sowerby; but stouter, with more rounded whorls, the aperture shorter and wider, with a broad flexure where the lip turns to meet the body whorl, while in *S. magellanica* the posterior part of the aperture is pointed; the latter has two strong plaits on the pillar; *S. benthalis* has three, all obsolete, the middle one most perceptible, and has a less-marked canal and siphonal fasciole. The interior of the aperture is pale flesh color; the exterior seems to have been like that of *S. magellanica*, but is almost entirely decorticated. It has five whorls beside the nucleus, and there is no operculum. Height, 125; of the last whorl, 90; of the aperture, 70; width of the aperture, 35; of the (decorticated) shell, 60 mm.

U. S. Fish Commission station 3360, in 1,672 fathoms, sand, in the Gulf of Panama; temperature at bottom, 42° F.

At first sight one would be disposed to think that this specimen represented a northward extension by 3,300 miles of the Magellanic species, but a more careful examination shows numerous points of difference.

CANCELLARIA CENTROTA, new species.

Shell solid, short, ashy or pinkish white, with a smooth, small nucleus of two whorls, and five and a half strongly sculptured subsequent whorls; spire subtabulate, rather pointed; sculpture of five or six strong spiral threads, of which that at the shoulder is much the largest, crossed by (on the last whorl nine) sharp, recurved varices, spiny at the

intersections in well-developed specimens, the spines at the shoulder much longer than the others, while in some depauperate specimens the only spines are at the shoulder; there is also some obscure spiral striation between the threads on the last whorl, and the lines of growth are irregular and often prominent; aperture subtriangular, with three strong plaits on the pillar, and, in fully adult shells, some faint liration inside the outer lip; canal short, distinct, forming a strong fasciole around a narrow, deep umbilicus, over which the inner lip is partly reflected; body with a wash of callus; throat whitish. Height of shell, 35; of last whorl, 25; of aperture, 18; width of shell exclusive of the spines, 20 mm.

U. S. Fish Commission station 3368, in 66 fathoms, near Cocos Island, Gulf of Panama.

Type.—No. 122996, U. S. N. M.

This is the most thorny species yet described.

CANCELLARIA IO, new species.

Shell fusiform, solid, whitish or pink, with a more or less olivaceous epidermis, and about six whorls; spire pointed, whorls rounded, somewhat constricted in front of the suture, which is appressed; sculpture of numerous flattened spiral threads, with about equal interspaces, uniform over the whole surface, but with occasional finer intercalary threads; these are crossed by (on the last whorl about 13) rather stout, rounded ribs, strongest at the shoulder, obsolete beyond the periphery, and not reaching the suture behind them; aperture rather long, outer lip simple, smooth, not reflected or lirate; pillar rather straight, with three strong plaits; canal shallow, wide, pointed, making no perceptible fasciole; umbilicus none; body with a thin wash of callus. Height of shell, 43; of last whorl, 33; of aperture, 25; width of last whorl, 21 mm.

U. S. Fish Commission station 3354, in 322 fathoms, Gulf of Panama.

This species has much the look of a gigantic *Admete*, but without the arched pillar. Most of the specimens were eroded, and the species has a genuine abyssal aspect.

PLEUROTOMA (STEIRAXIS) AULACA, new species.

Shell large, solid, white, fusiform, with about five whorls (nucleus eroded) covered with a pale straw-colored epidermis; whorls rounded, with rather distinct lines of growth crossed by numerous very sharp, narrow, prominent, subequal spiral ridges with about equal or narrower interspaces; the periphery is formed by a sort of rib, on which stand two to four similar keels, but smaller than the others and more crowded; in front of the rib there is a faint constriction of the whorl; the keels are less prominent on the canal, which is moderately long and recurved; on the penultimate whorl there are about 14 keels between the sutures; aperture elongate, reflecting the sculpture, but without

lirae; outer lip very flexuous, with a broad, rather shallow anal sulcus behind, and arched forward in front of the peripheral rib; body white, not callous; pillar thin, attenuated, and obliquely truncate in front, concave, twisted, exhibiting a pervious axis; canal shallow, not producing a fasciole; operculum like that of *Mohnia frielei*. Height of shell, 60; of last whorl, 48; of aperture, 38; maximum diameter, 26 mm.

U. S. Fish Commission station 3415, in 1,879 fathoms, globigerina ooze; bottom temperature, 36° F.; off Acapulco, Mexico.

Type.—No. 123099, U. S. N. M.

The initiatory part of the operculum is spiral, as in *Mohnia*, thus differing from the other deep-water Pleurotomidae, which it in general resembles. They have the nucleus of the operculum apical and not spiral.

If it be thought necessary to use a sectional name for this species, it might be called *Steiraxis*, differing from the other Pleurotomas as *Mohnia* differs from the species of *Chrysodomus*.

PLEUROTOMELLA CASTANEA, new species.

Shell polished, thin, resembling *P. cingulata*, Dall, of a chestnut-brown color, fading to a paler pinkish-brown, with seven whorls, the nucleus eroded, the early whorls with four or five flattened elevated spirals with wider interspaces in front of a somewhat sloping anal fasciole, more or less reticulated by narrow, slender, irregular, elevated riblets in harmony with the lines of growth, and which form on the fasciole delicate arches concave forward: the suture is appressed; on the body are about 20 spirals, stronger at the shoulder, smaller and closer forward, the wide interspaces finely spirally striate, while the most prominent spirals are undulate or obscurely nodulous; the transverse sculpture is nearly obsolete and hardly to be distinguished from the incremental lines; aperture elongate, oval; outer lips thin, sharp, crenulated by the sculpture, but not lirate; anal sulcus shallow, wide, directly in front of the suture; body with a thin wash of callus; pillar thin, gyrate, attenuated in front, forming a narrowly pervious axis, the whole of a pinkish-brown color; canal short, shallow, not recurved. Height of shell, 53; of last whorl, 38; of aperture, 28; diameter, 23 mm.

U. S. Fish Commission, station 3400, in 1,322 fathoms, ooze; temperature, 36° F.; eastward from the Galapagos Islands.

Type.—No. 123134, U. S. N. M.

This differs from *P. cingulata*, Dall, by its smaller size, more sloping whorls, more delicate and reticulate sculpture, and by its pervious axis. The animal is blind, and there is no operculum.

NUCULA IPHIGENIA, new species.

Shell large, solid, much like *Iphigenia brasiliana* in outline, anterior end produced, rounded, longer than the posterior; hinder end obliquely truncate, attenuated; beaks elevated, somewhat pointed, opisthogyrous;

sculpture of feeble, narrow, irregular concentric wrinkles, crossed by fine, sharp, rather distant incised lines; lunule narrow, elongate, bordered by a faint ridge; escutcheon small, broader than long, set off by an impressed line from the large posterior area, which is flattened but not definitely limited, the margin of the valve projecting somewhat in the middle line; base rounded in front, somewhat impressed posteriorly; interior brilliantly nacreous, with a strong pallial line and subequal adductor scars; the pallial area more or less punctate; basal margin denticulate; hinge with about 30 anterior and 15 posterior teeth, strong, projecting, and somewhat angular; chondrophore narrow, pear-shaped, projecting forward from the hinge line. Height of shell, 22.5; length, 35; diameter, 16 mm.

U. S. Fish Commission station 3396, in 259 fathoms, Gulf of Panama; temperature, 47.4° F.

Type.—No. 122896, U. S. N. M.

This fine shell is one of the largest known, and peculiar from its elongated shape and posterior attenuation. The periostracum seems to have been thin, dull, and yellowish.

LIMOPSIS COMPRESSUS, new species.

Shell large, thin, compressed, with a yellowish-brown, pale, pilose epidermis; surface reticulated with fine radiating striæ and rather irregular elevated lines of growth; beaks low, but conspicuous, small, and swollen; area narrow, long, about equal on each side of the beaks; dorsal line straight, anterior end rounded, posterior produced, rounded; interior white, smooth, with plain margins; posterior adductor scar larger and lower than the anterior; ligament central, lozenge-shaped, thin; hinge with about six posterior and eight anterior teeth, small, obscure, separated by a wide edentulous space, and obsolete in senile specimens. Length of shell, 45; height, 37; diameter, 17.5 mm., exclusive of the hair-like processes of the periostracum.

U. S. Fish Commission station 3382, in 1,793 fathoms, Gulf of Panama; temperature, 36° F.

Type.—No. 122889, U. S. N. M.

PHILOBRYA ATLANTICA, new species.

Shell small, thin, short-mytiliform, covered with a conspicuous, thin, greenish epidermis, prominent on the ribs and at the margin; valves rather inflated, the beaks crowned with the subovate glochidial valves of the nepionic young, bordered by a narrow elevated margin, then smooth and inflated for a short distance, then radiately ribbed, with about 11 squarish elevated ribs, marked with projecting epidermis, between which the margin is slightly excavated; anterior end short, projecting a little beyond the beaks; area linear, amphidetic; ligament internal, short, almost terminal; interior of valves smooth, the hinge line rather broad, edentulous; the scars as in *Mytilus;* the byssal gape very narrow. Length of shell, 4; breadth, 3; diameter, 2 mm.

U. S. Fish Commission station 2770, off Spiring Bay, Argentine coast; attached to seaweed dredged in 58 fathoms.

Type.—No. 97057, U. S. N. M.

This little species is interesting as being the first marine Pelecypod in which the existence of a glochidium stage was recognized. An examination of *P. setosa*, Carpenter, from Cape St. Lucas shows that it agrees in this particular. The genus was originally named *Bryophila*, which proved to be preoccupied, and was changed to *Philobrya*.[1] The genus is apparently related to *Pteria*, rather than to *Pinna*, as supposed by Carpenter.

CALLOCARDIA STEARNSII, Dall.

Callocardia stearnsii, DALL, Proc. U. S. Nat. Mus., XVII, p. 693, fig. 1 A, 1895.

Shell closely resembling *C.* (*Vesicomya*) *venusta*, Dall, but larger, less inflated, the anterior end higher, the base more rounded, and the posterior end more angular and proportionally longer. Internally the flexure in the pallial line below the posterior adductor scar is more marked, and the ligament and also the posterior tooth in the right valve are conspicuously shorter. *C. stearnsii* has the same pale straw-colored epidermis and feeble incremental sculpture as *C. venusta*, but the lunule is narrower and the line circumscribing it less impressed. Height, 17.5; length, 25; diameter, 11.5 mm.; the vertical of the beaks is behind the anterior end about 7 mm.

Off the coast of Washington, near Tillamook, at U. S. Fish Commission station 3346, in 786 fathoms, mud; temperature, 37.3° F.

This genus is remarkable for its subfoliobranchiate gills, so very different from the loosely reticulate branchia of the shallow-water *Isocardia*, with which until recently *Callocardia* was associated as a mere subgenus. These are described in the paper to which reference is made above, but, the species having been only named in manuscript at that time, it was thought best to add the present description.

CALLOCARDIA LEPTA, new species.

Shell large, thin, earthy, white, compressed, with an olivaceous or yellowish, dehiscent epidermis, with concentric wrinkles and projecting laminæ, which in the young are somewhat regularly spaced and distant, in the adult crowded and irregular; beaks small, low, not conspicuous, moderately inflated; valves evenly arcuate below, rounded at both extremities, the anterior shorter and less high than the posterior; lunule narrow, long, bounded by an incised line; ligament external, long, set in a groove, with the escutcheon narrow, its edges elevated above the dorsal margins of the valves and obtusely keeled, extending one-half longer backward than the length of the ligament; interior smooth, or

[1] Smithsonian Miscellaneous Collections, X, No. 252, Mollusks of Western North America, by P. P. Carpenter, index, p. 21, December, 1872.

slightly radially striate, margins flattish, smooth; anterior adductor scar narrow, posterior wider, the pallial line joining it in front of its posterior edge, producing an indentation, though not a sinus, of the pallial line; hinge narrow; teeth small, compressed, three (more or less obscure) in each valve; in the right a long, strong anterior lamella, extending most of the way between the umbo and the adductor scar, with a socket around its posterior end, above this a short, small, thin lamina, joined around the socket with a thicker lamina, obscurely wavy and extended backward; in the left valve a stout subtriangular central, joined to a thin, short, anterior lamina, with a socket under it; a short, obscure, radial tooth behind the central one; no lateral teeth in either valve, and the cardinals, as usual in this group, somewhat variable, obscure, or ill-defined. Height of shell, 40; length, 58; diameter, 23 mm.; the vertical of the beaks, 17 mm. behind the anterior end of the shell.

Type.—No. 126751, U. S. N. M., from U. S. Fish Commission station 3009, in the Gulf of California, off Concepcion Bay, in 857 fathoms, mud; temperature, 38° F. Also specimens (No. 106857, U. S. N. M.) from station 3346, off Tillamook, Oregon, in 786 fathoms.

This large, rather compressed species has somewhat the outline of the Indo-Pacific *Tapes*.

CALLOCARDIA OVALIS, new species.

Shell resembling the last species, but smaller, more oval, the posterior dorsal border more arched, the proportional inflation greater, the lunule wider, the ligament proportionally and actually longer, the epidermis more adherent and without projecting fringes or lamellæ; internally the teeth are smaller and more feeble, and the pallial line recedes less at the posterior adductor scar. Height, 26; length, 36; diameter, 16 mm.; the vertical of the beaks 8 mm. behind the anterior end of the shell.

U. S. Fish Commission station 3360, in the Gulf of Panama, in 1,672 fathoms, sand; temperature, 36.4° F.

Type.—No. 106898, U. S. N. M.

CALLOCARDIA GIGAS, new species.

Shell large, rather thin, inflated, with a thin, wrinkled, olivaceous epidermis over an earthy, concentrically, irregularly striated surface; beaks low, inconspicuous; lunule and escutcheon somewhat impressed, but not limited by any distinct line; valves elongated, recalling the shape of *Modiola capax*, Conrad, in a general way; the anterior side shorter and less high, the base impressed in the middle, more expanded in front and behind; dorsal margin rather evenly arched; both ends rounded; internally dentition strong, like that of *C. lepta*, but more distinctly developed; ligament short (about 20 mm.), set in a groove; interior of valve somewhat radially striate; posterior adductor scar

somewhat larger, the pallial line set in below it, somewhat irregular, but not forming a distinct angular sinus; margins of valve thin, smooth. Height, 63; length, 110; diameter, 50 mm.; vertical of the beaks, 24 mm. behind the anterior end of the shell.

U. S. Fish Commission station 3009, off Concepcion Bay, in the Gulf of California, in 857 fathoms, mud; temperature, 38° F.

This relatively enormous shell was obtained only as a number of fresh valves without the soft parts but from the shell characters it can hardly be anything but a giant *Callocardia*.

CALLOGONIA ANGULATA, new species.

Shell elongate, moderately inflated, the surface as in the other species; the anterior end rounded, shorter; the posterior end produced, pointed; ligament short, set in a groove; the posterior dorsal border marked by two obscure ridges radiating from the beak, the outer one of which terminates at the posterior extreme of the valve, angulating the margin; the epidermis is denser and lamellose in the interspaces between these ridges; lunule obscure; basal margin nearly straight, rounded up toward the ends; beaks low, anterior; interior white, with some radial striæ; hinge narrow; right valve with two low cardinals coalescent above, and a third, higher, springing between them; pallial line distinct, with an angular, rather short, sinus. Height, 35; length, 58; semidiameter, 10 mm.; the vertical of the beaks, 18 mm. behind the posterior end of the shell.

U. S. Fish Commission station 3392, in 1,270 fathoms, hard bottom; temperature, 36.4°; in the Gulf of Panama.

A single right valve of this distinct species was collected as above, and differs from *Callocardia* especially by its angular pallial sinus.

PERIPLOMA STEARNSII, new species.

Shell suborbicular, thin, whitish, with pale straw-colored epidermis, sculptured with faint concentric irregularities harmonizing with the lines of growth and by very fine pustules arranged in radiating lines, stronger and more adjacent near and upon the rostrum; beaks not prominent, fissured; left valve slightly less convex than the right; rostrum about two-thirds as wide as the shell, not strongly differentiated, but with the epidermis coarser, and, especially on the left valve, more raised and wrinkled, and the basal margin slightly excavated; interior faintly pearly; pallial sinus large, rounded, shallow; chondrophore strong, spoon-shaped, inclined obliquely forward. Length of shell, 46; height, 35.5; diameter of the right valve, 9 mm.; the rostrum 20 mm. wide, rounded, and moderately gaping; total diameter, 18 mm.

U. S. Fish Commission station 3034, in 24 fathoms, mud; off Point Fermin, at the head of the Gulf of California.

This differs from *P. discus*, Stearns, in the radial arrangement and larger size of its surface granules, its wider rostrum and more compressed form. It needs no comparison with other species.

PERIPLOMA CARPENTERI, new species.

This species is of much the outline of *P. stearnsii*, Dall, and is best described by comparison with it. In *P. stearnsii* the shell is somewhat less inflated and the beaks are nearer the posterior end, but nearer the anterior end in *P. carpenteri*; in the latter the surface granules are more crowded and coarser and not arranged in rows separated by a clear space, as in *P. stearnsii;* the rostrum in *P. carpenteri* is less distinctly marked off from the arch of the base, the epidermis has a more greenish tint, the interior is more pearly, with a larger pallial sinus, and the chondrophore is wider and vertically, not obliquely, directed. The right valve is 10 mm. in diameter, with a height of 39 and a length of 47 mm.

Only one right valve was dredged at the U. S. Fish Commission station 3389, in 210 fathoms, mud, in the Gulf of Panama.

Type.—No. 106891, U. S. N. M.

This is the third orbicular species from West America.