

# THE PYRAMIDELLID MOLLUSKS OF THE OREGONIAN FAUNAL AREA.

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## INTRODUCTION.

The completion of the monograph of West American Pyramidellidae upon which the authors of the present paper have for some years been at work, being delayed by various causes—though in large part long ready for the printer—it was thought best to select from it, for immediate publication, the portion relating to the Oregonian fauna, which to a considerable extent is complete in itself, pending the completion of details relating to other faunal areas of the coast.

For the purposes of the present paper, subject to future modification with greater knowledge, the fauna here named Oregonian extends from the northern limit of the Alexander Archipelago southward along the coast to Point Conception, California. The limits of any fauna are never quite absolute, there is always a partial merging of the peripheral population with that of the adjacent faunal areas, but the proportion of Pyramidellid species in the present case, which are held in common with the faunas northwest and southeast of that here called Oregonian, is noticeably small.

Attention is called to the fact that it is a Pyramidellid fauna which is here discussed. The general molluscan fauna, still more the general invertebrate fauna of the coast in question, may or may not eventually be found to agree in distribution with our Pyramidellids. That is a question which we are not ready to decide at the present time and which will demand much more time and study than it has yet been possible to give to it.

Collections over this long stretch of coast, comprising some 22 degrees of latitude, or more than 1,300 geographical miles, have naturally been concentrated at the most accessible points, while there are long stretches of coast without harbors where as yet no collections whatever have been made. Neglecting the deep-sea dredgings, which have

afforded hardly any Pyramidellids in the area under consideration, the principal localities where collections have been made are: Sitka; the region about the eastern end of Vancouver Island, including the Straits of Fuca, the Gulf of Georgia, and Puget Sound; the vicinity of San Francisco, California; and Monterey Bay.

It is well to note that in the great archipelago extending from Fuca Strait to Cross Sound there is a marked difference between the fauna of the inner channels, which have their waters chilled by the discharges from a multitude of glacial streams, and that of the outer coast, which is washed by the comparatively warmer waters of the Pacific Ocean. Many southern forms creep up along the outer coast which are unknown from the inland bays and channels.

From the paucity of information in regard to a considerable part of the coast referred to, generalizations as to distribution at present can at best be of a purely tentative character, and are therefore submitted with due reserve.

The recognition of new species and the distribution by collectors of their discoveries under the new manuscript names has been going on for several years, and it seems essential that the publication of the data should be made with as little delay as possible, in order that these names may be used in local lists and other places without leading to confusion.

The junior author has prepared the text of this paper, with the exception of this introduction, and the part of the senior author has been chiefly the collecting of material for study and an editorial supervision of details, including the text herewith. The drawings of the species were in part prepared by the late Dr. J. C. McConnell and, since his death, chiefly by Miss Evelyn Mitchell.

#### Genus *TURBONILLA* Risso.<sup>a</sup>

*Turbonilla* Risso, Hist. Nat. Eur. Mer., IV, 1826, p. 224=*Euturbonilla* SEMPER, Arch. Nat. Fr. Meck., 1861, pp. 354-361.

Shell with sinistral apex, cylindro-conic, many whorled, generally slender; with a single columellar fold which varies in strength and frequently is not visible in the aperture.

*Type*.—*Turbonilla typica* Dall and Bartsch.

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<sup>a</sup>In the preparation of the present diagnoses the following terminology is used: "Axial sculpture," the markings which extend from the summit of the whorls toward the umbilicus.

The axial sculpture may be—

"Vertical," when the markings are in general parallelism with the axis of the shell.

"Protractive," when the markings slant forward from the preceding suture.

"Retractive," when the markings slant backward from the suture.

"Spiral sculpture," the markings following the directions of the coils of the whorls.

The following 6 of the 23 recognized subgenera are represented in the present faunal area: *Turbonilla* s. s., *Chemnitzia*, *Strioturbonilla*, *Pyrgolampros*, *Pyrgiscus*, and *Mormula*.

KEY TO SUBGENERA OF TURBONILLA.

Shell with spiral sculpture:

Varices present.....*Mormula* p. 510.

Varices absent.

Spiral sculpture consisting of many very fine incised striations.

Aperture subquadrate.....*Strioturbonilla* p. 495.

Aperture oval.....*Pyrgolampros* p. 498.

Spiral sculpture consisting of strong, incised spiral grooves...*Pyrgiscus* p. 504.

Shell without spiral sculpture:

Ribs interrupted at the periphery.....*Chemnitzia* p. 494.

Ribs continuing over the base.....*Turbonilla* p. 493.

Subgenus **TURBONILLA** Risso, s. s.

*Turbonilla* Risso, Hist. Nat. Eur. Mer., IV, 1826, p. 224; = *Euturbonilla* SEMPER (part), Arch. Nat. Fr. Meck., 1861, pp. 354-361.

Turbonillas without spiral sculpture, having prominent vertical ribs which extend from the summits of the whorls to the umbilical region; the same is true of the intercostal spaces. Usually both ribs and intercostal spaces are less strongly defined on the base, below the periphery, than on the exposed portion of the whorls above it. Columella straight or slightly twisted. All our West Coast forms belonging to this subgenus are small and slender, of semitranslucent bluish-white to milk-white color.

*Type*.—*Turbonilla typica* Dall and Bartsch, *T. plicata* Risso, 1826, not *Turbo plicatus* Brocchi, 1814.

**TURBONILLA (TURBONILLA) GILLI, new species.**

Plate XLIV, fig. 5.

Shell small, rather stout, inflated, dirty white. Nuclear whorls decollated, early post-nuclear whorls well rounded, later ones flat, broader at the summit than at the suture; sculpture of about fourteen strong, almost vertical, scalariform axial ribs on the second, and sixteen quite protractive ones on the succeeding whorls; on the penultimate turn, however, they are less oblique than on those preceding it. These ribs are very strongly developed at the summit of the whorls and render the deeply channeled suture decidedly coronated. Intercostal spaces deep, of about double the width of the ribs, interrupted suddenly at the decidedly angulated (almost keeled) periphery of the last whorl beyond which they reappear. Base strongly contracted, quite short, marked by the faint continuations of the axial ribs which extend to the umbilical region. Outer lip fractured; aperture? columella very strong, somewhat curved and revolute, provided with a subobsolete oblique fold.

The type and another specimen (Cat. No. 163009, U.S.N.M.) were collected by Mr. H. Hemphill at San Diego, California. The type has eight post-nuclear whorls, and measures: Length 3.3 mm., diameter 1.1 mm.

Two other lots belonging to the University of California have been examined—one, a single specimen, comes from Station 30 off Catalina Island. The other three specimens were obtained at Station 47, San Diego, California.

**TURBONILLA (TURBONILLA) GILLI DELMONTENSIS**, new subspecies.

Plate XLIV, fig. 7.

Shell, similar to *T. gilli*, but much more stout and less turreted, with the ribs less strongly developed and the peripheral thickening only weakly represented. The type has lost the nuclear whorls, the eight remaining measure: Length 3.4 mm., diameter 1.2 mm.

*Type*.—Cat. No. 195921, U.S.N.M. It was collected by Mr. S. S. Berry in 12 fathoms off Del Monte, Monterey, California.

**Subgenus CHEMNITZIA** D'Orbigny.

*Chemnitzia* D'ORBIGNY, Hist. Nat. Iles Canaries, 1839, p. 77; = *Euturbonilla* SEMPER (part), Archiv. Nat. Fr. Meck., 1861, pp. 354-361; = *Microbeliscus* SANDBERGER, 1874.

Turbonillas without spiral sculpture, having prominent axial ribs which fuse or terminate at the periphery. The intercostal spaces are deep and sunken and terminate at or a little above the periphery, extending upward to the summits of the whorls. Base smooth, devoid of all sculpture. Columella straight. All our West American species belonging to this group are small, slender, forms of semitranslucent bluish-white to milk-white color.

*Type*.—*Melania campanellæ* Philippi.

KEY TO SPECIES OF CHEMNITZIA.

Shell large, length 10 mm. or more..... *montereyensis*.  
Shell small, length 5 mm. or less..... *muricatoides*.

**TURBONILLA (CHEMNITZIA?) MONTEREYENSIS**, new name.

= *Turbonilla gracillima* GABB, Proc. Cal. Acad. Sci., 1865, p. 186; not *Chemnitzia gracillima* CARPENTER, Cat. Maz. Shells, 1856, p. 431.

Mr. Gabb's description is as follows:

Shell small, very slender, long, white; vertex broken; whorls eleven or more, flattened on the sides; sutures strongly impressed, ribs about 23, large, obtuse, running from the suture to the margin of the base, base convexly truncated, smooth, aperture subcircular; columella thick. Length 10 mm., diameter 3.3 mm.

Habitat, Monterey, California; Dr. J. G. Cooper collector. This shell can be readily distinguished by its extremely slender form and the strong, slightly oblique ribs.

The type, according to Mr. Gabb, is in the collection of the California Geological Survey,<sup>a</sup> but appears to have been misplaced or lost. From the description we are led to believe that it is a form similar to *T. torquata*, but of considerably broader spire.

**TURBONILLA (CHEMNITZIA) MURICATOIDES, new species.**

Plate XLIV, figs. 2, 2a.

Shell small, slender, subdiaphanous to milk white; nuclear whorls  $2\frac{1}{2}$ , helicoid but slightly elevated, well rounded, having their axis at right angles to the axis of the post-nuclear turn. Post-nuclear whorls smooth, rather high between the sutures, moderately rounded, marked by strong sublamellar axial ribs, which are about half as wide as the spaces that separate them, and extend strongly to the very summit of the whorl where they render the well-marked sutures crenulate. There are 14 of these ribs upon the first, 18 upon the fifth, and 20 upon the penultimate turn. The depressed intercostal spaces terminate abruptly at the periphery. Base of the last whorl well rounded, smooth, without sculpture. Aperture: (outer lip fractured), columella slender, slightly twisted.

The type has seven post-nuclear turns and measures: Length 3.0 mm., diameter 1.0 mm. It is Cat. No. 195942, U.S.N.M., and comes from Monterey, California. Another specimen, Cat. No. 160488, U.S.N.M., was collected by Doctor Dall at the same place.

**Subgenus STRIOTURBONILLA Sacco.**

*Strioturbonilla* Sacco, I Moll. del Piemonte e della Liguria, 1892, p. 94.

Shell as in *Turbonilla* and *Chemnitzia* but finely and closely spirally striated on the spire and base.

*Type*.—*S. alpina* Sacco.

All our West American species, with the exception of *T. affinis* and *T. smithsoni*, are of bluish-white to milk-white color; the two exceptions being of a yellowish cast.

KEY TO SPECIES OF STRIOTURBONILLA.

- Whorls overhanging, shell stout.....*vancouverensis*.
- Whorls not overhanging, shell slender
  - Whorls strongly rounded, ribs sinuous.....*stylina*.
  - Whorls almost flattened, ribs straight.....*serræ*.

**TURBONILLA (STRIOTURBONILLA) VANCOUVERENSIS Baird.**

Plate XLIV, fig. 1.

*Chemnitzia vancouverensis* BAIRD, Proc. Zool. Soc., 1863, p. 67.

Shell solid, rather broad and stout, subdiaphanous, bluish to milk-white. Nuclear whorls two, large, helicoid, partly obliquely immersed in the first of the later turns. Post-nuclear whorls well rounded, with

<sup>a</sup>Proc. Cal. Acad. Sci., 1865, p. 183.

the greatest convexity on the lower half of the exposed portion; ornamented by about 10, very broad, strong, slightly protractive axial ribs on the second, 14 on the fifth, 16 on the eighth, and 18 on the penultimate whorl. These ribs terminate before they reach the periphery of the whorl, leaving a plain band above the suture, as in *T. torquata* Gould, but not as broad as in that species. Intercostal spaces deep, narrower than the ribs. Sutures well marked by the shouldering at the summit and the sudden sloping of the ribs just above the periphery of the whorls. Aperture subovate; lip thin, joining the short, somewhat revolute columella in a gentle, even curve. Entire surface marked by faint wavy spiral striations. The specimen figured has 10 post-nuclear whorls and measures: Length 6.0 mm., diameter 1.8 mm. Another specimen from the same locality, which has 12 post-nuclear whorls, but is minus the nucleus and probably the first of the succeeding turns, measures: Length 9.2 mm., diameter 2.5 mm.

This species resembles *T. torquata* Gould, but can easily be distinguished from it by its broader base, its large, partly immersed, slanting nucleus, and the robust character of its whorls and ribs, the latter being fewer and much broader; the intercostal spaces being comparatively narrower. Doctor Baird's type was collected at Esquimalt Harbor, Vancouver Island, British Columbia.

*Specimens examined.*

2. Kadiak Island, Alaska. 13 fathoms. W. H. Dall. Cat. No. 160489, U.S.N.M.
1. Lituya Bay, Alaska. 8 fathoms. W. H. Dall. Cat. No. 160490, U.S.N.M.
1. Port Etches, Alaska. W. H. Dall. Cat. No. 160993, U.S.N.M.
4. Victoria, Vancouver Island, British Columbia. C. F. Newcombe, Cat. No. 126670, U.S.N.M.
1. Puget Sound, Washington. Doctor Kennerley. Cat. No. 44938, U.S.N.M.
1. Monterey, California. 28 fathoms. S. S. Berry. In Mr. Berry's collection.
1. Carter Bay, British Columbia. Rev. G. W. Taylor. Cat. No. 196184, U.S.N.M.
1. Carter Bay, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
3. Port Simpson, British Columbia. Rev. G. W. Taylor. Cat. No. 196183, U.S.N.M.
11. Port Simpson, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
2. West of Rose Spit, Queen Charlotte Island, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
1. Alert Bay, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
20. Departure Bay, British Columbia. Rev. G. W. Taylor. Rev. G. W. Taylor collection.
5. Departure Bay, British Columbia. Rev. G. W. Taylor. Cat. No. 196185, U.S.N.M.

## TURBONILLA (STRIOTURBONILLA) STYLINA Carpenter.

Plate XLIV, figs. 11, 11a.

*Chemnitzia* (?*torquata* var.) *stylina* CARPENTER, Ann. Mag. Nat. Hist., 3rd ser., XV, 1865, p. 396.

*Turbonilla* (*Strioturbonilla*) *torquata stylina* DALL and BARTSCH, Mem. Cala. Acad., III, 1903, p. 272, in part.

Shell slender, subdiaphanous to milk-white. Nuclear whorls two, smooth, depressed, helicoid, scarcely extending beyond the outline of the spire and having their axis at right angles to the axis of the succeeding turns. Post-nuclear whorls well rounded, separated by strongly constricted sutures, rather high, ornamented by rather low, broad, rounded, sinuous, oblique axial ribs, of which there are 16 upon the first, 20 upon the fifth, and 28 upon the penultimate turn. Intercostal spaces moderately depressed, about as wide as the ribs, terminating a short distance above the sutures, thus leaving a narrow smooth band between the termination of the ribs and the suture as in *T* (*Strioturbonilla*) *torquata* Gould, but not quite as wide as in that species. Periphery of the last whorl well rounded. Base rather short, well rounded. Entire surface marked by very fine wavy spiral striations. Aperture subovate, outer lip thin, columella slender, moderately long, slightly twisted, almost vertical. The specimen described and figured (Cat. No. 56429, U.S.N.M.) was collected by Doctor Dall in 8 or 10 fathoms at Monterey, California. It has 11 post-nuclear whorls and measures: Length 6.5 mm., diameter 1.7 mm. (not 8 and 1.9 mm., as erroneously stated in the last-cited reference). Another specimen was dredged in 12 fathoms off Del Monte, Monterey, by Mr. S. S. Berry (Cat. No. 165199, U.S.N.M.). Two specimens (Cat. No. 163249, U.S.N.M.), both immature, dredged by the Bureau of Fisheries steamer *Albatross* at station 2932 in 50 fathoms off Coronado Island, are provisionally referred to this form.

## TURBONILLA (STRIOTURBONILLA) SERRÆ, new species.

Plate XLIV, figs. 8, 8a.

Shell slender, very elongate-conic, subdiaphanous to milk-white. Nuclear whorls decollated. Post-nuclear whorls very high between the sutures, moderately rounded, slightly contracted at the periphery and somewhat shouldered at the summit, rendering the sutures sub-channelled. The whorls are marked by subequal and subequally spaced, rather broad, rounded, almost vertical axial ribs, which are a little wider than the intercostal spaces; the depressed portion of the latter terminating a little above the suture. In the type, which has lost the nucleus and probably the first two post-nuclear turns, there are 16 ribs on the third of the remaining whorls, 20 on the eighth, 22 upon

the eleventh, and 34 upon the next, the penultimate turn. On this whorl the axial ribs are less regular and less strongly developed, showing senile degeneration. Periphery of the last whorl well rounded. Base short, well rounded, marked by slender continuations of the axial ribs which extend feebly to the insertion of the columella. Entire surface of spire and base crossed by numerous closely placed spiral striations. Aperture subquadrate, posterior angle obtuse, outer lip thin, columella rather strong, somewhat oblique, and slightly revolute, without apparent fold in the aperture. The type has 13 whorls and measures: Length 7.7 mm., diameter 1.4 mm.

The type and seven specimens were collected by Mr. S. S. Berry, in 12 fathoms off Del Monte, Monterey, California, five of these are in Mr. Berry's collection, the type and one other form Cat. No. 196198, U.S.N.M. Cat. No. 196200, U.S.N.M., contains a specimen from 40 fathoms off Pacific Grove, Monterey, California, dredged by Mr. Berry. Another specimen in Mr. Berry's collection was dredged in shelly sand at Monterey, California, at a depth of 29 fathoms.

This species is nearest related to *Strioturbonilla stylina* Carpenter, but can readily be distinguished from it by its less rounded whorls, straighter and much stronger ribs, and by having the ribs continuing over the base and scarcely any space showing between the termination of the intercostal spaces and the suture.

**Subgenus PYRGOLAMPROS Sacco.**

*Pyrgolampros* Sacco, I. Moll. del Piemonte e della Liguria, 1892, p. 85.

Turbonillas with low, broad, rounded vertical ribs which almost always disappear as they pass over the periphery and base of the last whorl, and many very fine, faint, wavy spiral striations; surface covered by a thin epidermis. Columella usually somewhat flexuose.

*Type*.—*P. mioperplicatulus* Sacco.

All our west American species are of a light-yellow to chocolate-brown color. The intercostal spaces are not depressed as in *Chemnitzia*, but appear as simple shallow undulations between the axial ribs. The spiral striations, in perfect specimens, appear as if they were situated beneath the light-colored epidermis and were shining through it.

KEY TO SPECIES OF PYRGOLAMPROS.

Vertical ribs present

Shell large, adult more than 10 mm. long (dark brown).....*taylori*.

Shell less than 10 mm. long when adult.

Shell very slender, brown banded.

Space between the sutures dark brown with two light brown bands.  
*berryi*.

Space between the sutures white on the posterior half and brown on the anterior half.....*lyalli*.

Shell rather stout, yellow.	
Whorls concave between the sutures.	<i>victoriana</i> .
Whorls not concave between the sutures.	
Shell stout and stubby.	<i>valzei</i> .
Shell broadly conic.	
Uniformly golden-yellow.	<i>aurantia</i> .
Anterior half between the sutures yellow, posterior half white.	<i>newcombei</i> .
Vertical ribs obsolete.	<i>oregonensis</i> .

**TURBONILLA (PYRGOLAMPROS) TAYLORI**, new species.

Plate XLIV, figs. 9, 9a.

Shell very regularly elongate-conic, purplish-brown. Entire surface marked by numerous closely placed minute spiral striations. Nuclear whorls small, depressed helicoid, smooth, scarcely at all immersed, having their axis at a right angle to that of the later turns, the sides not projecting beyond the outline of the spire. Post-nuclear whorls quite high between the sutures, only slightly contracted toward the periphery and very weakly beveled at the appressed summits, marked by low, broad, retractive axial ribs, which are much more numerous and less strongly defined on the early whorls than on those succeeding. There are about 36 on the second, 30 upon the third, 24 upon the fourth, and 26 upon the antepenultimate post-nuclear turn. On the last whorl they become irregular and irregularly spaced, showing senility. The ribs become flattened and less strongly defined toward the summit and the periphery, disappearing at the well-rounded periphery. Sutures well marked. Base short, inflated, rounded. Aperture suboval, somewhat effuse anteriorly; posterior angle acute; outer lip thin, white edged, chestnut brown within except at the very base, which is white; columella slender, twisted, and slightly revolute anteriorly.

The above description is based upon two cotypes (Cat. No. 196210, U.S.N.M.): one, an immature specimen having the nucleus and 9 post-nuclear whorls measures: length 6.5 mm., diameter 1.9 mm., the other an adult individual having 10 whorls (is minus the nucleus and probably the first five post-nuclear turns) and measures: length 11.5 mm., diameter 3.1 mm.

The two cotypes and 30 specimens were collected by the Rev. G. W. Taylor at Departure Bay, British Columbia. The cotype and five specimens are in the U. S. National Museum (Cat. No. 196210). The rest are in the Taylor collection.

This species was collected at five additional stations in British Columbia by the Rev. Doctor Taylor, all the specimens being in his collection except where otherwise stated. One specimen at Carter Bay; 3 at Port Simpson, 1 of which is Cat. No. 196211, U.S.N.M.; 11 at Banks Island, 3 of which are Cat. No. 196212, U.S.N.M.; 6 at Alert Bay, 2 of which are Cat. No. 196213, U.S.N.M.

**TURBONILLA (PYRGOLAMPROS) BERRYI**, new species.

Plate XLIV, figs. 10, 10a.

Shell slender, very regularly acutely conic, bright-chestnut brown, with two narrow spiral bands of a lighter shade; one, the narrower of the two, is at the periphery, the other has its posterior edge at about the middle of the exposed portion between the sutures. Nuclear turns  $2\frac{1}{2}$ , smooth, depressed, helicoid, not immersed, having their axis at a right angle to the axis of the later whorls, their sides projecting slightly beyond the outlines of the spire. Postnuclear whorls very high between the sutures, slightly beveled at the summit and moderately constricted at the periphery, ornamented by well-developed, acute, retractive axial ribs, of which there are about 20 upon the second, 24 upon the fifth, and 26 upon the penultimate turn. These ribs extend quite strongly to the summit, where they feebly crenulate the well-impressed sutures. Periphery and base of the last whorl well rounded, marked by the continuations of the axial ribs, which gradually disappear as they cross the base. Entire surface marked by numerous very fine, closely spaced, wavy, spiral striation. Aperture suboval, somewhat effuse anteriorly; posterior angle acute; columella oblique, very slightly twisted and weakly revolute at its outer extremity.

The type (Cat. No. 196223, U.S.N.M.) has 9 post-nuclear whorls and measures: Length 8 mm., diameter 2.2 mm. It and another specimen in Mr. S. S. Berry's collection were dredged by him in 39 fathoms on sandy bottom in Monterey Bay.

Another specimen (Cat. No. 196225, U.S.N.M.) was dredged by the Bureau of Fisheries steamer *Albatross*, at Station 4564, in 9 to 10 fathoms, rocky bottom, with a temperature of  $59^{\circ}$ , 2 miles off Santa Cruz Light, Monterey Bay, California.

A fourth shell (Cat. No. 196224, U.S.N.M.) was dredged in 52 fathoms, off Catalina Island, California.

**TURBONILLA (PYRGOLAMPROS) LYALLI**, new species.

Plate XLIV, figs. 4, 4a.

Shell small and slender with strong sculpture, whitish with a broad chestnut band which extends almost halfway over the exposed portion of the whorls above the periphery and an equal distance anteriorly over the base below the periphery. Nuclear whorls two, closely appressed to each other, forming a polished depressed helicoid spire, which does not extend beyond the outline of the post-nuclear spire, is not at all immersed and has its axis at right angles to the axis of the succeeding turns. Post-nuclear whorls decidedly flattened, moderately contracted at the periphery, and slightly shouldered at the

summit, ornamented by strongly elevated, moderately broad, rounded retractive axial ribs, which become somewhat flattened toward the summit and periphery of the turns. There are about 22 ribs upon the second, 20 upon the fifth and the penultimate turn. Upon the first they are very weakly expressed. Intercostal spaces broad, almost double the width of the ribs. Sutures strongly impressed. Periphery and base of the last whorl well rounded, marked by the continuations of the axial ribs which extend feebly to the umbilical region. Entire surface marked by numerous closely placed spiral striations. Aperture pyriform, posterior angle acute, columella almost straight, obliquely inserted, slightly revolute.

The unique type (Cat. No. 196221, U.S.N.M.) was collected by Rev. G. W. Taylor at Banks Island, British Columbia. It has 9 post-nuclear turns and measures: Length 5.7 mm., diameter 1.4 mm.

**TURBONILLA (PYRGOLAMPROS) VICTORIANA, new species.**

Plate XLIV, fig. 6.

Shell elongate-conic, wax yellow to light brown. Nuclear whorls and the early succeeding turns eroded in all the specimens examined. Post-nuclear whorls quite high between the sutures, somewhat concave in the posterior two-thirds of the exposed portion, only slightly contracted toward the periphery and faintly shouldered at the summit; ornamented by low, rounded, somewhat sinuous axial ribs, which are about as wide as the shallow intercostal spaces. Sutures well marked. Periphery and base of the last whorl somewhat inflated, marked by weak continuations of the axial ribs which extend feebly to the umbilical region. Entire surface crossed by numerous, wavy spiral striations. Aperture rather elongate, oval, outer lip thin; columella moderately long, decidedly twisted and somewhat revolute in its free anterior portion; the twist at its insertion appearing as a fold.

The type (Cat. No. 126660a, U.S.N.M.) was collected by Dr. C. F. Newcombe at Victoria, Vancouver Island, British Columbia. It has the last seven and a half whorls and measures: Length 7 mm., diameter 2.1 mm. Ten additional specimens were collected by Rev. G. W. Taylor, at Departure Bay, Vancouver Island, British Columbia, 4 of which form Cat. No. 196220, U.S.N.M.

This species appears nearest related to *Turbonilla (Pyrgolampros) newcombei* Dall and Bartsch, but is readily distinguished from that form by its concave whorls.

## TURBONILLA (PYRGOLAMPROS) VALDEZI, new species.

Plate XLIV, figs. 3, 3a.

= *Turbonilla (Pyrgolampros) gibbosa* DALL and BARTSCH, Mem. Cala. Acad. Sci., III, 1903, pp. 27-9, pl. 1, figs. 2, 2a, not *Chemnitzia gibbosa* CARPENTER, Cat. Maz. Shells, 1857, p. 430, No. 525.

Shell inflated, robust, broad and stumpy, of light, fulvous coloration. Nuclear whorls decollated in the type. Post-nuclear whorls flattened, somewhat contracted at the periphery and rounded at the summit, traversed by broad, coarse, irregularly slanting axial ribs, which extend over the inflated periphery of the last whorl to the umbilical region, appearing less prominent on the base. About 16 of these ribs occur upon the second, 18 upon the fifth, and 24 upon the penultimate post-nuclear whorl. Entire surface of the shell crossed by very minute, close spiral striation. Suture subchanneled and wavy. Aperture ovate, outer lip thin, joining the twisted and revolute columella in a broad curve.

The type (Cat. No. 32273, U.S.N.M.) was collected at Monterey, California. It has 7 post-nuclear whorls and measures: Length 5.6 mm., diameter 2.1 mm.

Another specimen, not quite adult (Cat. No. 176624, U.S.N.M.), comes from Pacific Grove, California. This has the nuclear whorls preserved, which are two, depressed helicoid, smooth, obliquely about one-fourth immersed in the first of the succeeding turns, and having their axis at right angles to that of the later whorls. The left side of its nucleus projects slightly beyond the outline of the spire.

The present form is in every way much more robust than *T. (P.) gibbosa* Carpenter, which was described from Mazatlan, Mexico.

## TURBONILLA (PYRGOLAMPROS) AURANTIA Carpenter.

Plate XLV, fig. 5.

*Chemnitzia* (? var.) *aurantia* CARPENTER, Journ. de Conch., XII, 1865 (3d ser., V.), p. 147.

Shell similar to *T. (P.) chocolata* Carpenter, but much broader, with the close spiral striation a little more pronounced than in that species, covered by a golden-yellow epidermis. Nuclear whorls decollated in all our specimens. Post-nuclear whorls moderately rounded, but little contracted at base and but very slightly shouldered at the summit, ornamented by about 22 moderately developed, slightly retractive axial ribs on each of the whorls. These ribs become quite obsolete as they pass over the well-rounded periphery and base of the last whorl. Intercostal spaces weak, much narrower than the ribs. Sutures quite prominent, simple. Aperture large, broadly ovate, posterior angle obtuse, somewhat effuse at base; outer lip thin, columella slender, quite oblique, twisted, and revolute.

Doctor Carpenter's type (Cat. No. 4493*b*, U.S.N.M.), upon which the description is based, has 6 post-nuclear whorls and measures: Length 5.8 mm.; diameter 2.4 mm. It bears the two localities Puget Sound and Santa Barbara, and probably comes from Puget Sound.

Three other specimens (Cat. No. 126660, U.S.N.M.) were collected by Dr. C. F. Newcombe at Victoria, Vancouver Island, British Columbia, and five more by the Rev. G. W. Taylor at Departure Bay, British Columbia, one of which is Cat. No. 196205, U.S.N.M., the others being in the Taylor collection. This one has 9 whorls remaining and measures: Length 9.5 mm.; diameter 2.8 mm.

**TURBONILLA (PYRGOLAMPROS) NEWCOMBEI**, new species.

Plate XLV, fig. 6.

Shell regularly, broadly conic, white on the posterior half and light brown on the anterior half of the exposed portion of the whorl; base white. Nuclear whorls decollated in all the specimens seen. Post-nuclear whorls somewhat overhanging, decidedly contracted toward the periphery from the anterior fifth of the exposed part; almost flattened posterior to this, and closely appressed at the summit, separated by strongly marked sutures. Ribs about 18 upon all the turns, almost vertical, moderately elevated, rounded in the middle, decidedly flattened and widened at the summit, disappearing at the periphery. Intercostal spaces not depressed below the general surface, a little wider than the ribs. Periphery and the moderately long base well rounded, smooth, excepting the fine spiral striation which covers the entire surface of the shell. Aperture subquadrate, posterior angle acute; outer lip thin, showing the color bands within; columella slender, oblique and slightly revolute.

The type (Cat. No. 126660, U.S.N.M.) was collected by Dr. C. F. Newcombe, at Victoria, Vancouver Island, British Columbia. It has 7 post-nuclear whorls which measure: Length 5.4 mm., diameter 2.1 mm. Eighteen additional specimens were collected by Rev. G. W. Taylor at Port Simpson, British Columbia, 12 of which are in his collection, the other 6 form Cat. No. 196214, U.S.N.M.

**TURBONILLA (PYRGOLAMPROS) OREGONENSIS**, new species.

Plate XLV, fig. 2.

Shell elongate-conic, wax-yellow, with two yellowish-brown spiral bands, the posterior one of which encircles the turns a little above the periphery, while the anterior one, which is a little wider, is immediately posterior to it, the two being separated by a space about as wide as the posterior band. Nuclear whorls decollated in all our specimens. Post-nuclear turns very slightly rounded, moderately contracted at the periphery and closely appressed to the preceding turn

at the summit. There are no well-defined ribs, the axial sculpture being reduced to mere lines of growth with here and there a weakly impressed area, probably representing an obsolete intercostal space. Sutures strongly impressed. Periphery of the last whorl faintly angulated. Base short, well rounded. Entire surface marked by fine, regular, close, spiral striation. Aperture pyriform, posterior angle acute; outer lip thin, columella somewhat twisted, scarcely revoluted at its free end.

The type has  $8\frac{1}{2}$  whorls remaining which measure: Length 8.5 mm., diameter 2.7 mm. It and another specimen (Cat. No. 181112, U.S.N.M.) were dredged by the United States Bureau of Fisheries steamer *Albatross* at Station No. 2885 off Oregon, in 30 fathoms, with a bottom temperature of  $49^{\circ}$ .

Another specimen (Cat. No. 196222, U.S.N.M.) was dredged at Station No. 2868, off the coast of Washington, in 31 fathoms on gray sand with a bottom temperature of  $46.9^{\circ}$ .

The absence of ribs differentiates this form from all the other *Pyrgolampros* mentioned in this paper. It is allied to two species not yet described, one of which belongs to the Californian and the other to the Alaskan fauna.

#### Subgenus PYRGISCUS Philippi.

*Pyrgiscus* PHILIPPI, Wieg. Arch., I, 1841, p. 50. = *Pyrgostelis* MONTEROSATO, *Conch. Medit.*, 1884, p. 89. = *Ortostelis* ARADAS, *Atti Dell Acad. Giov. di Catania*, 1843, XX.

Turbonillas having prominent vertical ribs and deeply incised spiral lines, but no varices or internal lirations on the outer lip. Columella usually somewhat flexuous.

*Type*.—*Melania rufa* Philippi.

#### KEY TO SPECIES OF PYRGISCUS.

Axial ribs terminating at the periphery.....	<i>canfieldi</i> .
Axial ribs passing feebly over the periphery and base of the last whorl.	
Periphery of the last whorl angulated.	
Ribs retractive .....	<i>morchi</i> .
Ribs vertical .....	<i>antestriata</i> .
Periphery of the last whorl well rounded.	
Adult shell more than 10 mm. long.....	<i>eucosmobasis</i> .
Adult shell less than 7 mm. long.....	<i>tennicula</i> .
Axial ribs extending prominently over the periphery and base of the last whorl.	<i>castanea</i> .

#### TURBONILLA (PYRGISCUS) CANFIELDI, new species.

Plate XLVII, figs. 4, 4a.

Shell slender, elongate-conic, with the posterior half of the exposed portion of the whorls on the spire white and the anterior half chestnut brown, base white. Nuclear whorls  $2\frac{3}{4}$ , large, smooth, forming a

depressed helicoid spire whose axis is at right angles to the axis of the succeeding turn; not immersed and extending slightly beyond the outline of the spire on both sides. Post-nuclear whorls very slightly rounded, weakly roundly shouldered at the summit and very moderately contracted at the periphery, ornamented by very strong, broad, low, rounded, almost vertical axial ribs of which there are 22 upon the first, 24 upon the antepenultimate, and 28 upon the penultimate turn. These ribs extend prominently to the summit and crenulate the subchannelled sutures. Intercostal spaces narrow, not more than half the width of the ribs, crossed by 19 incised spiral lines which are of almost equal width and subequally spaced with the following exceptions, the seventh, eleventh, and the last three above the periphery are much wider, appearing as quadrangular pits in the intercostal spaces, the eleventh falling on about the middle of the exposed portion of the whorl on the spire, and the seventh about halfway between this and the summit. Periphery and base of the last whorl well rounded, the latter marked by the feeble continuations of the axial ribs which gradually disappear after crossing the periphery, and about 16 subequally spaced incised spiral lines. Aperture oval, somewhat effuse anteriorly, columella oblique, somewhat twisted with a weak oblique fold a little anterior to its insertion.

The type (Cat. No. 196229, U.S.N.M.) was dredged by Mr. S. S. Berry in 12 fathoms off Del Monte, Monterey, California. It has 10 post-nuclear whorls and measures: Length 6.3 mm., diameter 1.2 mm.

**TURBONILLA (PYRGISCUS) MORCHI, new species.**

Plate XLV, figs. 1, 1a.

Shell broadly elongate-conic, the posterior third of the exposed portion of the whorls on the spire and a narrow area about the umbilical region flesh-colored, the rest of the shell light chestnut brown. Nuclear whorls  $2\frac{1}{2}$ , small, smooth, forming a depressed helicoid spire which has its axis at right angles to the axis of the succeeding turns and is about one-fifth immersed in the first of them. Exposed portion of the post-nuclear whorls flattened in the middle, posterior fourth sloping gently toward the summit, which is closely appressed to the preceding turn; the anterior portion slopes more abruptly, roundly toward the periphery. The whorls are ornamented by strong rather distantly spaced, moderately acute, slightly protractive axial ribs, of which 18 occur upon the first three, 16 on the next three, 18 on the seventh, and 20 upon the penultimate turn. The ribs weaken slightly and become somewhat flattened as they approach the constricted sutures. Intercostal spaces broad, almost double the width of the ribs, crossed by 7, equal and equally spaced, deeply incised spiral lines, which extend up on the sides of the ribs and feebly across

them. The space between the second and third lines appears slightly nodulose on the ribs. Periphery of the last turn angulated, crossed by the continuations of the ribs, which disappear as they pass on to the short and well-rounded base. Base marked by 13 continuous incised spiral lines of about equal strength which are much more closely spaced near the umbilicus than the periphery, the distance between the succeeding striations diminishing in regular ratio from the periphery to the umbilical area, the first two below the periphery being considerably more distantly spaced than the rest, the spaces inclosed between them being about equal to the space inclosed between the spiral lines on the spire. Aperture subquadrate, posterior angle acute, outer lip thin, showing the external sculpture within; columella slender, oblique, somewhat twisted and slightly revolute.

The type (Cat. No. 173081, U.S.N.M.) has 9 post-nuclear whorls and measures: Length 6.4 mm., diameter 2 mm. It was collected by Mr. H. N. Lowe at Long Beach, California. Another specimen is in the collection of the University of California from Station No. 122, near Redondo. Another (Cat. No. 176622, U.S.N.M.) was dredged by Mr. John Paine in 8 fathoms off Catalina Island. Five (Cat. No. 196230, U.S.N.M.) were collected by Mr. H. N. Lowe at San Diego, and four additional specimens from the same locality are in Mr. Lowe's collection. One, collected at Station No. 83, off San Diego, is in the collection of the University of California.

A specimen collected by Mr. S. S. Berry in 29 fathoms off New Monterey, Monterey Bay, California, is provisionally placed here until more material can be examined. It agrees with *T. (P.) morchi* in general form and type of sculpture, but is much more slender and has more ribs.

This species is nearest related to *Turbonilla (Pyrgiscus) latifundia* Dall and Bartsch, from the post-Pliocene of San Pedro, California.

**TURBONILLA (PYRGISCUS) ANTESTRIATA, new species.**

Plate XLV, figs. 4, 4a.

Shell large and strong, light brown. Nuclear whorls  $2\frac{1}{2}$ , small, smooth, forming a depressed rounded helicoid spire, which projects somewhat beyond the left side of the outline of the spire of the later whorls and has its axis at a right angle to the axis of these, being about one-fourth immersed in the first turn. Post-nuclear whorls slightly rounded, ornamented by low, rounded, narrow, vertical axial ribs which become decidedly flattened and enfeebled near the summit of the turns; there are 9 of these ribs on the second, 20 upon the fifth, and 28 upon the penultimate post-nuclear turns. Intercostal spaces about double the width of the ribs, shallow, rounded, crossed by 6 equal and equally spaced, strongly incised, spiral lines which extend

stronger upon the sides of the ribs and feebly over their summits. In addition to this sculpture, the spire is marked by many fine lines of growth and many fine spiral striations between the incised lines. Sutures well marked, simple. Periphery of the last whorl subangulated, marked by the feeble continuations of the axial ribs, which disappear at the periphery. Base short, marked by 11 continuous, equal, strong, incised spiral lines which are more closely spaced above the umbilical area than at the periphery; the space between the first basal incised line and the first suprapерipheral one being a little wider than the space inclosed between the spiral lines on the spire. Aperture subquadrate, outer lip thin, showing the external sculpture within; columella almost straight and vertical, slightly revolute.

The above description is based upon 2 cotypes. One, an adult shell (Cat. No. 168867, U.S.N.M.), has the last 10 whorls, having lost the nucleus and probably the first two and one-half post-nuclear turns, and measures: Length 9.7 mm., diameter 2.8 mm. It was dredged by the U. S. Bureau of Fisheries steamer *Albatross* at Station No. 3194 in 92 fathoms, on gray sand, bottom temperature 45° 9, off Esteros Bay, California. The other (Cat. No. 196232 U.S.N.M.) was collected by Mrs. Oldroyd at San Pedro, California, and has the nucleus and 9 post-nuclear turns, and measures: Length 5.5 mm., diameter 1.8 mm. Three specimens (Cat. No. 196233, U.S.N.M.) were dredged by the Fisheries steamer *Albatross* at Station No. 2902 in 53 fathoms, fine gray sand and mud bottom, temperature 45°, off Santa Rosa Island. One in the collection of the University of California comes from Station No. 122, near Redondo; another in the same institution was dredged at Station No. 12, off Point Vincent. Two (Cat. No. 196231, U.S.N.M.) were dredged in 12 fathoms at San Pedro by Mr. H. N. Lowe. Another specimen was dredged by the University of California at Station No. 30, off Catalina Island, and two at Station No. 58, off San Diego, California, the last two lots being in the University collection.

**TURBONILLA (PYRGISCUS) EUCOSMOBASIS, new species.**

Plate XLV, figs. 8, 8a.

Shell quite large, of very regular outline, creamy white. Nucleus rather small, composed of  $2\frac{1}{2}$  whorls, helicoid with much depressed spire, somewhat obliquely about one-third immersed in the first of the succeeding turns, the axis of the nuclear spire being almost at a right angle to the axis of the later whorls. Post-nuclear whorls moderately rounded, widest a little above the suture, sloping gently toward the summit and more abruptly toward the base, ornamented by moderately strong, rounded, somewhat flexuous, axial ribs, of which about 18 appear upon the second, 20 upon the seventh, 22 upon the eighth, and

27 upon the penultimate whorl. Intercostal spaces only moderately deep, a little wider than the ribs, marked by 6 strong incised spiral lines which extend up on the sides of the ribs and frequently pass over their summits; the uppermost or posterior one of these incised lines is least pronounced, the second one above the suture, and the third one about half again as far apart as the remaining, which are equally spaced. In addition to these the shell is marked by many faint wavy spiral striations between the deep ones. Sutures plain, well defined. Base of the last whorl very short, well rounded, marked by the faint continuations of the axial ribs and about 15 well defined more or less equally spaced deep spiral striations with fainter ones between them as on the exposed portion of the whorls of the spire; the first deep basal spiral striation and the one above the suture are some little distance apart and mark a plain band excepting the fainter sculpture. Aperture quite large, subquadrate; columella short, somewhat twisted, revolute.

The type (Cat. No. 162679, U.S.N.M.) was dredged by the U. S. Bureau of Fisheries steamer *Albatross* at Station No. 2902, off Santa Barbara, California, in 53 fathoms. It has 12 post-nuclear whorls which measure: Length 11.2 mm.; diameter 2.8 mm.

Another specimen (Cat. No. 162680, U.S.N.M.) was dredged at Station No. 3195, in 252 fathoms, on green mud, bottom temperature  $43^{\circ}.2$ , in San Luis Obispo Bay, California. Four specimens (Cat. No. 162681) were dredged at Station No. 2901 on grey sand and mud bottom, at a depth of 48 fathoms, temperature  $55^{\circ}.1$ , off Santa Rosa Island. The University of California has two lots, one specimen dredged at Station No. 32, off Catalina Island, and two from Station No. 59, off San Diego, California.

#### TURBONILLA (PYRGISCUS) TENUICULA Gould.

Plate XLV, figs. 3, 3a.

*Chemnitzia tenuicula* GOULD, Bost. Jour. Nat. Hist., VI, 1853, pp. 383, 384, pl. xiv, fig. 15.

*Turbonilla (Pyrgiscus) tenuicula* GOULD, Mem. Cala. Acad., III, 1903, pp. 275-276, pl. II, figs. 7, 7a.

Shell small, elongated, lanceolate, turritid, rather solid, shining, wax yellow, a little dusky below the suture; whorls 10, flat, slightly shouldered above, marked by about 20 direct, longitudinal folds, the summits of which are cut by numerous fine revolving striae, deeper in the interstices, which also extend over the base of the shell, though the folds terminate at the periphery, or are extended in delicate furrows; aperture narrow, ovate; lip sharp; revolving striae apparent within.

*Dimensions*.—Length 7.5 mm.; diameter 1.3 mm.

Found at Santa Barbara.

The above is the original description by Gould. *Turbonilla* (*Pyrgiscus*) *tenuicula* Gould is the most abundant and most variable species of all the west American forms, presenting many varieties or incipient species; to describe these would not aid science or the collector, but would only add to the confusion which this paper is intended to dispel. The following comprehensive description will embrace, we believe, all the forms coming under this name:

Shell slender to somewhat stubby and inflated, varying in color from milk-white to waxy yellow or to dark brown, variously banded or plain monocolored; nuclear whorls three, moderately large, planorboid, slightly slantingly immersed; post-nuclear whorls rounded to flattened, contracted at base and strongly shouldered at the summit, traversed by 18 to 28 strong vertical ribs, which are excurved and usually somewhat thickened, and connected at their summits, which appear beaded; these ribs extend feebly over the rounded base of the last whorl; the entire shell is crossed by incised spiral lines, 10 to 16 or more of which appear on the exposed portion of the whorls, and more, closer placed, wavy ones on the base of the last whorl; the suture is deep, subchanneled and wavy; aperture ovate, produced at base; outer lip thin, meeting the oblique, slightly curved and revolute columella in a broad curve; a faint callus connects the posterior angle of the aperture with the insertion of the columella.

*Dimensions.*—Length 6.5 mm.; diameter 1.9 mm.

The specimen figured is from Todos Santos Bay, Lower California, and has 9 post-nuclear whorls. One of the same number of whorls from San Pedro measures: length 6.2 mm.; diameter 1.7 mm.

The U. S. National Museum contains the following specimens:

*Specimens of Turbonilla (Pyrgiscus) tenuicula* Gould.

Number of specimens.	Locality.	Collector.	Catalogue No.
2	Monterey, California.....	P. P. Carpenter.....	32245
1	Santa Barbara, California.....	Colonel Jewett.....	a 16267
2	San Pedro, California.....	E. W. Roper.....	151724
1	.....do.....	Mrs. T. S. Oldroyd.....	196227
25	.....do.....	.....do.....	196226
2	.....do.....	Mrs. Johnston.....	152198
1	.....do.....	.....	160480
7	.....do.....	F. L. Button.....	191547
1	Pacific beach, San Diego.....	H. Hemphill.....	192228
3	San Diego.....	Stearns collection.....	46504
7	San Diego, ocean beach.....	F. W. Kelsey.....	153065
2	San Diego.....	.....do.....	b 153049
2	.....do.....	C. R. Orcutt.....	60933
5	.....do.....	.....	160481
1	Point Abreojos, Lower California.....	H. Hemphill.....	105585
2	.....do.....	.....do.....	106510
7	Todos Santos Bay, Lower California.....	Stearns collection.....	32284

**TURBONILLA (PYRGISCUS) CASTANEA, new species.**

Plate XLVII, fig. 7.

Shell very large, stout and heavy, chestnut brown. Nuclear whorls decollated. Post-nuclear whorls well rounded, ornamented by many broad, flattened, more or less regular, and evenly placed retractive axial ribs, of which about 22 appear upon the third, 26 upon the fifth, and

40 upon the seventh whorl. On the penultimate and antepenultimate whorls they are more or less irregular in form, number, and spacing. Intercostal spaces much narrower than the ribs. The spiral sculpture consists of 8 deep, quite regularly spaced lines of pits which are very pronounced in the intercostal spaces and on the sides of the ribs, but do not appear to cross their summits except on the penultimate and the last whorl. Sutures well defined, simple. Periphery and base of the last whorl evenly rounded, the latter ornamented by the prolongation of the axial ribs and quite a number of continuous well-impressed spiral lines with faint spiral striation between them. Aperture sub-oval, somewhat effuse anteriorly, posterior angle obtuse (outer lip fractured, very thick); columella strong, slightly curved and strongly revolute with a weak, very oblique internal fold near its insertion; parietal wall and umbilical region covered by a weak callus. Columella and extreme anterior portion of the aperture white.

The type (Cat. No. 74000, U.S.N.M.) belongs to the Stearns collection and was obtained at Monterey, California. It has 10 post-nuclear whorls (the nucleus and perhaps the first three being lost), and measures: Length 13.5 mm., diameter 3.7 mm.

This species is remarkable for being the largest known member of the section *Pyrgiscus* on the west coast of America.

#### Subgenus *MORMULA* A. Adams.

*Mormula* A. ADAMS, Journ. Linn. Soc. London, VII, 1864, p. 1;=*Pyrgostylus* MONTEROSATO, Il. Nat. Hist. Sicil., 1884, p. 90.

Turbonillas having vertical ribs and deeply incised spiral lines; also irregularly disposed varices on the outer surface, which usually mark internal lirations on the outer lip. Sculpture never nodulose.

Type.—*Mormula rissolina* A. Adams.

#### KEY TO SPECIES OF *MORMULA*.

- Adult shell more than 20 mm .....*lordi*.  
 Adult shell less than 15 mm.  
     Deeply incised lines on the whorl between the sutures: 5 .....*tridentata*.  
     Deeply incised lines on the whorl between the sutures: 12 .....*eschsoltzi*.

#### *TURBONILLA* (*MORMULA*) *LORDI* E. A. Smith.

Plate XLV, figs. 7, 7a.

*Chemnitzia lordi* E. A. SMITH, Ann. Mag. Nat. Hist., VI, 1880, p. 288.

Shell very large, light brown to pale yellowish-white, variously banded. Nuclear whorls two, smooth, helicoid, moderately elevated, having their axis at right angles to the axis of the succeeding turns and about one-fourth immersed in the first of them. Postnuclear whorls well rounded, ornamented by heavy, broad, low axial ribs, of which about 14 occur upon the second, 16 upon the eighth, 22 upon

the eleventh, and 30 upon the penultimate whorl. Intercostal spaces not deeply depressed, about as wide as the ribs, ornamented by about 12 to 15 irregularly spaced spiral striations between the sutures; those near the summit of the whorls are closer and more feeble than those near the periphery of the whorls. Sutures strongly impressed, somewhat wavy. Periphery of the last whorl somewhat angulated in young specimens, moderately well rounded in adults. Base rather short, marked by faint continuations of the axial ribs and faint wavy spiral striation. Aperture subrhombic, posterior angle obtuse, outer lip thin, showing the external sculpture and banding within; columella stout, slightly twisted and revolute, provided with an oblique internal fold. The color markings in the specimen here described and figured consist of a pale yellowish-brown band, about a quarter of the width of the whorl between the sutures, covering the posterior part, followed by a narrow band of the yellowish-white ground color, which is followed by a band of brown a little darker than the first and about as wide as the last-named white band; then a broad pale white band, lastly a narrow pale yellow one above the periphery finishes the marking between the sutures. The periphery is marked by a narrow band of white followed by a deep brown one which shades gradually to the white about the umbilical region.

The characters which ally this species to *Mormula* are only feebly developed, now and then two ribs become fused and suggest a varix; the internal lirations, too, are only very feebly expressed and appear in the aperture of only one specimen. The specimen figured has 14 post-nuclear whorls and measures: Length 20.8 mm., diameter 5.1 mm.; it was collected in 12 fathoms at Sitka Harbor, Alaska, and is Cat. No. 160492, U.S.N.M. No. 160069, U.S.N.M., contains 7 individuals from the same locality; No. 133234, U.S.N.M., has 2 from Port Orchard, Washington, and No. 4480, U.S.N.M., 1 from Puget Sound, Washington. Seven specimens were collected by Rev. G. W. Taylor at Banks Island, British Columbia. One of these, a young individual, Cat. No. 196234, U.S.N.M., has furnished the description of the nucleus. It has 9 post-nuclear whorls and measures: Length 5.2 mm., diameter 2.1 mm.

This is the largest species known from the west coast of America.

**TURBONILLA (MORMULA) TRIDENTATA** Carpenter.

Plate XLV, fig. 9.

*Chemnitzia tridentata* CARPENTER, Jour. de Conch., XIII (3d ser., V), 1865, p. 147.—  
*Turbonilla (Lancea) tridentata* DALL and BARTSCH, Mem. Cala. Acad., III,  
p. 273, 1903, pl. II, figs. 1, 1a.

Shell large, broad; chestnut colored, obscurely banded; nuclear whorls three, helicoid, about one-third immersed, scarcely extending beyond the margin of the spire, their axis being at a right angle to the

axis of the later whorls. Post-nuclear whorls slightly convex, somewhat contracted at the periphery and slightly shouldered at the summit; traversed by about 20 to 24 strong, well-rounded, somewhat oblique axial ribs, which continue faintly over the decidedly angular periphery of the last whorl and the base to the umbilical region; these ribs are considerably enfeebled on the last whorl of old shells and frequently become almost obsolete on these. The exposed portion of the whorls is traversed by five spiral grooves, which appear most prominently in the shallow and broad intercostal spaces, and less so on the ribs; these deep spiral lines are regularly spaced, leaving a broader interval on the middle of the exposed portion of the whorl; the base of the last whorl is likewise ornamented by spiral grooves, but here they appear less developed than on the spire. In addition to this the entire surface of the shell is marked by numerous very fine, somewhat wavy, spiral and axial striae, which show most prominently on the last whorl and base, and give the shell a very minutely reticulated secondary sculpture. At irregular intervals the whorls are marked by thick callous varices, which are usually of a lighter color than the remainder of the shell. Aperture large, subquadrate; posterior angle acute; outer lip thin, having three strong internal lirations, joining the whitish, short, straight, revolute columella at a little less than a right angle. By transmitted light two spiral, light color-bands become apparent on the inside of the lip, each of which is bordered by a zone of a darker color than the remaining shell. The general color effect of the exterior is that of a flesh-colored shell, covered by a dark epidermis, which is stretched tight over the ribs, permitting the lighter color beneath to shine through it at their summits.

Doctor Carpenter's type (Cat. No. 15315*b*, U.S.N.M.) was collected at Monterey, California. It has 11 post-nuclear whorls and measures: Length 11.1 mm., diameter 3.2 mm. The specimen figured (Cat. No. 150983, U.S.N.M.) is from San Pedro, California. It has 13 post-nuclear whorls and measures: Length 12.8 mm., diameter 3.6 mm.

The U. S. National Museum has five lots of this species: Cat. No. 15315*b* is the type from Monterey, California; Cat. No. 196239, four specimens dredged by the Bureau of Fisheries steamer *Albatross* at station No. 2902, off Santa Rosa Island, in 53 fathoms, fine gray sand and mud, with a bottom temperature of 45°; Cat. No. 196240, ten specimens from San Pedro, collected by Mrs. T. S. Oldroyd; Cat. No. 150983, three individuals, one of which is figured, dredged by Mrs. Oldroyd in 4 fathoms, at San Pedro; Cat. No. 46505, two shells from San Diego in the Stearns collection. In addition to these, specimens have been determined for Mr. Berry, from Monterey, 12 to 39 fathoms; University of California, off Catalina Island; Mrs. Oldroyd and Mr. Lowe, at San Pedro; Mr. Kelsey and Mr. Arnold, from San Diego.

## TURBONILLA (MORMULA) ESCHSCHOLTZI, new species.

Plate XLV, fig. 10.

Shell large, elongate-conic, brown, having three obscure bands of dark brown, one of which is at the summit, another at the periphery, while the third is halfway between these on the exposed portion of the whorl of the spire. Nuclear whorls decollated. Post-nuclear turns moderately rounded, ornamented by low, rounded, rather distantly spaced, slightly protractive axial ribs which become weakened and somewhat flattened as they approach the appressed summit, and many fine lines of growth both on the ribs and in the intercostal spaces. In addition to the axial sculpture the whorls are crossed by twelve deeply incised, somewhat irregularly spaced spiral lines, the raised spaces between which are again divided by many fine striae. All the spiral markings pass over the intercostal spaces and the ribs. Periphery of the last whorl obscurely angular, marked by the feeble continuations of the ribs which vanish immediately below the periphery and the usual fine lines of growth and spiral striation. Base rather short, well rounded, brown, with a narrow whitish band about the umbilicus, marked by closely spaced continuous wavy spiral striation, which varies in strength, several finer striae alternating with the stronger. Aperture subquadrate, outer lip thin, showing four narrow dark-brown bands within, upon a lighter background—these are the three already referred to—and a fourth one on the base adjoining the periphery; columella almost vertical, slightly twisted and revolute.

The type (Cat. No. 196241, U.S.N.M.) was collected by Rev. G. W. Taylor, at Carter Bay, British Columbia; it has 11 post-nuclear whorls (the nucleus and probably three of the post-nuclear whorls being lost), and measures: Length 13.3 mm., diameter 4 mm. Another specimen from the same locality is in the Taylor collection. Three additional lots were collected by him in British Columbia; one, a fragment, from west of Rose Spit, Queen Charlotte Islands; 6 at Departure Bay, one of which is Cat. No. 196242, U.S.N.M.; 15 at Port Simpson, 5 of which are Cat. No. 196243, U.S.N.M. No. 196242 is the largest specimen, it has  $12\frac{1}{2}$  whorls, having lost the nucleus and probably the first three of the succeeding turns and measures: Length 17.8 mm., diameter 4.5 mm.

## Genus ODOSTOMIA Fleming.

*Odostomia* FLEMING, Edinburgh Encyc., VII, 1813, Pt. 1, p. 76—*Odontostomia* JEFFREYS, Mal. and Conch. Mag., 1839, p. 33.—*Turritostomia* SACCO, Moll. del Piemonte e del Liguria, 1892, p. 41.

Shell with sinistral apex, usually short, few whorled, subconic or ovate, with a single columellar fold which varies in strength and sometimes is not apparent at the aperture.

Type.—*Turbo plicatus* Montagu.

The following 6 of the 41 subgenera and sections of *Odostomia* are represented in the present faunal area: *Chrysallida*, *Ividia*, *Iolaea*, *Menestho*, *Evalea*, and *Amaura*.

## KEY TO SUBGENERA OF ODOSTOMIA.

Sculpture nodulose.....	<i>Chrysallida</i> , p. 514.
Sculpture consisting of axial and spiral lamelle.....	<i>Ividia</i> , p. 517.
Sculpture consisting of spiral lirations and slender axial threads in the depressed spaces:	
Shell umbilicated.....	<i>Iolaea</i> , p. 518.
Shell not umbilicated.....	<i>Menestho</i> , p. 520.
Sculpture consisting of spiral striation only:	
Shell very large.....	<i>Amaura</i> , p. 528.
Shell small.....	<i>Evalea</i> , p. 522.

## Subgenus CHRYSALLIDA Carpenter.

*Chrysallida* CARPENTER, Cat. Maz. Shells, 1857, p. 416.—*Noemia* DE FOLIN, Fonds de la Mer, 1873, p. 314, not *Noemia* PASCO, 1857.—*Noemianca* DE FOLIN, Zool. Rec., 1885, p. 94 (Mollusca).

Odostomias having strong axial ribs crossed by equally strong spiral keels between the sutures, the intersection of these two elements forming nodules. The axial ribs pass only faintly over the base, while the spiral sculpture remains quite prominent.

*Type*.—*Chrysallida communis* Carpenter.

## KEY TO SPECIES OF CHRYSALLIDA.

Spiral keels between the sutures 4.	
Sutures deeply channelled.	
Base with 7 narrow and slender spiral keels.....	<i>stricta</i> .
Base with 8 broad and rounded spiral keels.....	<i>cooperi</i> .
Sutures not channelled.....	<i>montereyensis</i> .
Spiral keels between the sutures on the last whorl more than 5.....	<i>oregonensis</i> .

## ODOSTOMIA (CHRYSALLIDA) COOPERI, new species.

Plate XLVI, fig. 7.

Shell broadly conic, white. Nuclear whorls smooth, largely obliquely immersed in the first of the succeeding turns above which only about half of the last turn projects. Postnuclear whorl moderately rounded, slopingly shouldered at the summit, the shoulder bearing the first of the four stronger tuberculate spiral ridges. The connections which join the tubercles in the spiral series are a little more strongly developed than those which link them vertically, the spaces inclosed between them being deep squarish pits. The tubercles are very prominent and rounded, there are about 16 upon the second, 20 upon the third, and 26 upon the penultimate turn. The axial series slants retractively from the posterior suture. Sutures deep and broad, considerably wider than the spaces between the keels. Periphery of the last whorl deeply channelled, the channel marked by a

weak extension of the axial bars which terminate at the first supra-peripheral keel. Base prolonged, well-rounded, marked by seven strong moderately raised, spiral keels which, like the channels that separate them, diminish regularly in width from the periphery to the umbilical area; the last, the eighth, immediately behind the columella, being less distinct and considerably broader than the rest. The channels between the keels are about equal to the keels in width and are crossed by numerous very slender raised threads, which extend up on the sides of the keels but do not cross them. About five of these threads fall in the space between two tubercles on the spire, in the first supra-peripheral groove. Aperture oval, large, effuse anteriorly, posterior angle obtuse, outer lip rather thick, not showing the external sculpture within; columella somewhat twisted, revolute anteriorly, reenforced by the attenuated base, and provided with a weak fold at its insertion; parietal wall covered by a callus which joins the columella with the posterior angle of the aperture and renders the peristome almost complete.

The type (Cat. No. 162771, U.S.N.M.) was collected by Doctor Dall at Monterey, California. It has five postnuclear whorls and measures: Length, 3.1 mm.; diameter, 1.4 mm.

ODOSTOMIA (CHRYSALLIDA) ASTRICTA, new species.

Plate XLVI, fig. 1.

Shell elongate-conic, bluish-white. Nuclear whorls decollated. Post-nuclear whorls very slightly rounded, separated by deeply channelled sutures. In this species the vertical ribs exceed the four spiral keels in strength, their junction forming elongated tubercles the long axis of which coincides with the spiral keels. The vertical ribs, of which there are 16 upon all of the turns, slant decidedly backward toward the aperture. They are rather distantly spaced and the spaces inclosed between them and the spiral keels are deep oblong pits, the long axis of which coincides with the spiral sculpture. Periphery of the last whorl marked by a deep, wide channel across which the ribs extend feebly to the first subperipheral keel. Base rather long and well rounded, marked by seven rather narrow, slender spiral keels which successively decrease in strength from the periphery to the umbilical area, the anterior ones being only faintly indicated; the spaces which separate the keels are about twice as wide as the keels and are crossed by many very slender raised vertical threads. Aperture oval, outer lip rather thick, columella twisted, reenforced by the attenuated base and provided with a moderately strong fold at its insertion; parietal wall covered by a strong callus.

The type (Cat. No. 196280, U.S.N.M.) was collected by Mr. F. L. Button at Monterey, California; it has the 6 last whorls remaining, having lost the nucleus and probably the first post-nuclear turn, and measures: Length, 2.9 mm.; diameter, 1.2 mm.

## ODOSTOMIA (CHRYSALLIDA) MONTEREYENSIS, new species.

Plate XLVI, fig. 4.

Shell broadly conic, milk-white to subdiaphanous. Nuclear whorls smooth, largely immersed in the first of the succeeding turns, above which only half of the last whorl projects. Postnuclear whorls separated by broad, deep sutures; well rounded between the sutures where they are ornamented by four strongly tuberculate spiral ridges, the spiral connections between the tubercles are equal to the axial connections or ribs, of which 16 appear upon the second, 18 upon the thirtieth, and 20 upon the penultimate whorl. The spaces inclosed between the axial ribs and the spiral connections which join the rounded tubercles are deep squarish pits. The axial ribs extend strongly across the deep peripheral channel and stop at the first subperipheral keel. Base moderately long, well rounded, marked by 5 equal and subequally spaced, well raised, strong, spiral keels, and a sixth, much broader, low, and rounded at the columellar margin. The grooves between the keels are equal to the width of the keels near the periphery, but diminish in breadth successively from the periphery to the umbilical area. They are crossed by numerous slender raised axial threads, which extend up on the sides of the spiral keels, but do not cross them. There are about 5 of these threads between each two ribs in the first subperipheral channel; aperture oval, somewhat effuse anteriorly; posterior angle acute; columella reenforced by the attenuated base, against which it appears like a thickened callus, provided with a moderately strong oblique fold at its insertion; parietal wall covered by a thick callus, which joins the columella with the posterior angle of the aperture.

The type (Cat. No. 196281, U.S.N.M.) has 5 postnuclear whorls and measures: Length, 3.0 mm.; diameter, 1.3 mm. It was collected by Mr. S. S. Berry, in 12 fathoms, off Del Monte, Monterey Bay, California. Three specimens from the same station are in Mr. Berry's collection. Another specimen (Cat. No. 74003, U.S.N.M.) was collected by Doctor Canfield at Monterey, and a sixth (Cat. No. 196282, U.S.N.M.) by Mr. F. L. Button at the same place. A seventh (Cat. No. 162767, U.S.N.M.) was collected by Mrs. T. S. Oldroyd at San Luis Obispo, California.

## ODOSTOMIA (CHRYSALLIDA) OREGONENSIS, new species.

Plate XLVI, figs. 10, 10a.

Shell elongate-conic, slender, subdiaphanous to milk-white. Nuclear whorls immersed, the last one only being visible. This is somewhat tilted and marked by three strong narrow spiral keels and many slender raised axial threads which cross the grooves between

the keels. Postnuclear whorls well rounded, slopingly shouldered at the summit and separated by constricted sutures, ornamented by almost equal and equally spaced spiral keels and axial ribs between the sutures on the spire. There are 4 spiral keels on the first, second, and third whorls, 6 on the fourth, and 7 upon the penultimate whorl. The first of these keels is on the shoulder of the whorl near the summit and is somewhat less developed than the rest. The axial ribs are best developed on the early whorls, where they extend equally strong from the summit to the periphery; on the antepenultimate and penultimate turns they become somewhat enfeebled from the middle of the whorl between the sutures to the periphery. There are about 16 of these ribs on the first, 18 on the third, 20 upon the fourth, and 22 upon the penultimate turn. The intersections of the ribs and spiral keels form low elongated tubercles, the long axis of which coincides with the spiral sculpture. The meshes inclosed by the keels and ribs are deeply impressed squarish pits. Periphery and base of the last whorl well rounded, the latter somewhat inflated and marked by 6 spiral cords which are successively closer spaced and a little less strongly developed from the periphery to the umbilical area. The channels between the cords are crossed by many very slender raised vertical threads. Aperture oval, slightly effuse anteriorly; outer lip thin; columella reenforced on its posterior two-thirds by the attenuated base, free and somewhat revolute anteriorly; parietal wall glazed by a thin callus.

The type has 6 postnuclear whorls and measures: Length 3.3 mm., diameter 1.2 mm. It and 9 additional specimens are Cat. No. 107690, U.S.N.M., and were collected by Dr. C. F. Newcombe at Cumshewa Inlet, Queen Charlotte Island, British Columbia, in 10 fathoms. Two other lots of one specimen each come from Monterey, Cat. No. 73998, U.S.N.M., in the Stearns collection, and Cat. No. 196283, U.S.N.M., collected by Mr. F. L. Button.

Subgenus **IVIDIA** Dall and Bartsch.

*Ividia* DALL and BARTSCH, Proc. Biol. Soc., Washington, 1904, XVII, p. 11.

Shell sculptured with lamellose axial ribs and spiral keels, their intersections not nodulose.

*Type*.—*Parthenia armata* Carpenter.

**ODOSTOMIA (IVIDIA) NAVISA**, new species.

Plate XLVI, figs. 2, 2a.

Shell of medium size, strongly sculptured, subdiaphanous to milk-white. Nuclear whorls at least 2, obliquely a little more than half immersed. Postnuclear whorls strongly shouldered, subtabulated, with a strong broad spiral keel limiting the anterior edge of the shoul-

der and an acute raised keel on the middle of the whorls between the sutures, while a third equally acute keel marks the periphery of the last whorl. Two other keels ornament the base, the anterior one of which is not quite as strong as its neighbor. The axial sculpture consists of narrow, more or less lamellar, almost vertical ribs, which render the intersection with the spiral keels somewhat thickened but not nodulose. These axial ribs extend over the periphery and base of the last whorl to the umbilical region, gradually growing weaker as they approach this point. There are about 18 on the second and 20 upon the penultimate whorl. The spaces between the ribs and keels appear as concave quadrangular depressions. Umbilicus narrowly perforated. Suture deeply channeled by the shouldered whorl. Aperture suboval, posterior angle decidedly obtuse; outer lip thick, marked by 5 projections, corresponding to the 5 keels; columella almost straight, strongly revolute with a conspicuous oblique fold near its insertion; parietal wall covered by a faint callus showing both basal keels, the anterior faint and just posterior to the insertion of the columella and the next on the middle of the wall.

The type has 5 postnuclear whorls and measures: Length 2.7 mm., diameter 1.3 mm. It and 3 additional specimens (Cat. No. 106502, U.S.N.M.) were collected by Mr. Henry Hemphill at Scammons Lagoon, Lower California. Three additional lots are in the U. S. National Museum collection: Cat. No. 129336, 30 specimens collected by Mrs. T. S. Oldroyd in the drift at San Pedro; Cat. No. 162843, 3 specimens also from San Pedro by the same donor; Cat. No. 62844, 1 specimen collected by Mr. Henry Hemphill at Ocean Beach, San Diego, California.

**ODOSTOMIA (IVIDIA) NAVISA DELMONTENSIS, new subspecies.**

Plate XLVI, figs. 3, 3a.

Shell similar to *O. (I.) navisa* but more elongate, and in every way more delicate with the lamellose sculpture reduced almost to raised cords and with stronger shouldered summits and more open umbilicus.

The type (Cat. No. 196297, U.S.N.M.) was collected by Mr. S. S. Berry in 12 fathoms, off Del Monte, Monterey Bay, California. It has 5 postnuclear whorls and measures: Length 3.2 mm., diameter 1.3 mm.

**Subgenus IOLAEA A. Adams.**

*Iolaea* A. ADAMS, Proc. Zool. Soc., 1867, p. 310.—*Iole* A. ADAMS, Ann. Mag. Nat. Hist., 3d ser., V, 1860, p. 300, not *Iole* BLYTH, Journ. Asiat. Soc. Beng., XIII, Pt. 1, 1844, p. 386.

Shell umbilicated, marked by spiral cords, and axial riblets which cross the grooves between them.

*Type*.—*Iole scitula* A. Adams.

ODOSTOMIA (IOLAEA) AMIANTA, new species.

Plate XLVI, figs. 9, 9a.

Shell broadly conic, yellowish-white. Nucleus small, of two whorls which increase extremely rapidly in size and are obliquely placed. Postnuclear whorls very strongly shouldered, marked by 3 very strong lamellar spiral keels on the first and second and 4 on the succeeding whorls between the sutures. The posterior keel marks the limit of the broad, sloping shoulder and is much the strongest. It is also placed a little farther apart from the next spiral keel than that is from its anterior neighbor. Base of the last whorl well rounded; ornamented by 8 spiral ridges, which are less elevated and much more closely and regularly spaced than those between the sutures. The peripheral groove is about equal in width to the one anterior to the posterior keel. The entire shell is marked by fine, sublammellar, regularly spaced, retractive axial ribs, which render the spiral keels somewhat crenulated at their meeting points and break the spaces between them into small squares or oblongs. These riblets extend from the sutures to the small umbilicus. Aperture subovate, posterior angle obtuse; outer lip thin, somewhat wavy, showing the external sculpture within; columella moderately stout, somewhat curved and strongly revolute, having an oblique fold near its insertion which is barely visible when the aperture is viewed squarely; parietal wall covered by a fairly thick callus.

The type and another specimen (Cat. No. 105483, U.S.N.M.) were collected at Point Abrejos, Lower California, by Mr. Henry Hemphill. It has 6 post-nuclear whorls and measures: Length 4.4 mm., diameter 2.3 mm.

*Specimens of Odostomia (Iolaea) amianta Dall and Bartsch.*

No. of specimens.	Locality.	Collector.	Catalogue No.
1	Monterey Bay .....	Rev. G. W. Taylor.....	No. 37253 U.S.N.M.
6	Monterey, off Del Monte (12 fathoms).	S. S. Berry.....	S. S. Berry's collection.
1	.....do .....	W. H. Dall.....	No. 168683 U.S.N.M.
1	San Pedro .....	Mrs. T. S. Oldroyd.....	No. 168684 U.S.N.M.
1	San Pedro, Long Beach .....	H. N. Lowe.....	No. 196298 U.S.N.M.
1	San Pedro, station 83 .....	University of California.....	University of California collection.
1	Off Catalina Island, station 28 .....	do .....	Do.
5	Off Catalina Island, station 30 .....	do .....	Do.
11	San Diego, station 47 .....	do .....	Do.
2	.....do .....	F. W. Kelsey.....	No. 160115 U.S.N.M.
1	.....do .....	Henry Hemphill .....	No. 105469 U.S.N.M.
1	Off Coronado Island, 20 fathoms; bottom temperature 58°.	U. S. F. C. station (2932).....	No. 168685 U.S.N.M.
2	Point Abrejos, Lower Cal ...	Henry Hemphill .....	No. 105483 U.S.N.M. (1=type).

Subgenus **MENESTHO** Möller.

*Menestho* MÖLLER, Ind. Moll. Greenl., 1842, p. 10.

Shell not umbilicated, marked by moderately well-developed and usually equally spaced spiral cords; axial sculpture reduced to mere lines of growth which frequently appear as *very slender* raised threads in the grooves between the cords.

*Type*.—*Turbo albulus* Fabricius.

## KEY TO SPECIES OF MENESTHO.

Spiral sculpture very regular and equally spaced.

Shell large, adult over 3.5 mm. in length.....*exara*.

Shell very small, adult under 2.5 mm. in length.....*pharcida*.

Spiral sculpture irregular, not equally spaced.....*harfordensis*.

**ODOSTOMIA (MENESTHO) PHARCIDA**, new name.

Plate XLVI, fig. 8.

*Mumiola tenuis* DALL, Bull. Nat. Soc. Brit. Col., 1897, p. 14, pl. I, fig. 10. *Not*  
*Odostomia tenuis* CARPENTER, 1856, *not* *Odostomia tenuis* JEFFREY, 1884.

Shell small, subcylindric, yellowish-white. Nuclear whorls deeply immersed, a portion of the last and the penultimate only appear when viewed from the side; this gives the shell a truncated appearance. Post-nuclear whorls moderately well-rounded, rather wide between the sutures, and somewhat shouldered at the summits; ornamented by strong, low, rounded spiral cords, which are separated by moderately deep, narrow, depressed channels. Six of these cords occur upon the first, 7 upon the second to the penultimate whorl between the sutures; the posterior cord is a little broader and less elevated than the rest, while some of those on the penultimate turn show a tendency to divide, that is, a faint spiral line is apparent on the middle of some of these cords. Sutures well impressed. Periphery and base of the last whorl well rounded, the latter ornamented by 8 rounded spiral cords similar to those between the sutures. The spaces between the spiral ridges on the base and between the sutures are marked by closely placed, exceedingly slender, raised axial threads. Aperture pyriform, somewhat effuse anteriorly, posterior angle acute; columella short, curved, reenforced by the attenuated base, free only at its extreme anterior end, with an oblique fold near its insertion; parietal wall covered by a thin callus.

The type (Cat. No. 107440, U.S.N.M.) was dredged by Dr. C. F. Newcombe, in 10-15 fathoms, at Cumshewa Inlet, Queen Charlotte Island, British Columbia. It has 4 postnuclear whorls, which measure: Length 2.2 mm., diameter 0.9 mm.

## ODOSTOMIA (MENESTHO) HARFORDENSIS, new species.

Plate XLVI, fig. 5.

Shellelongate-ovate, bluish-white. Nuclear whorls smooth, obliquely immersed in the first of the succeeding turns, only two-thirds of the last volution projects above them. Post-nuclear whorls well rounded, and somewhat inflated, marked by numerous incremental lines and 5 equally strong, but irregularly distributed, punctate, incised, spiral lines between the sutures. The two near the summit are placed closer to each other than any of the others, the space between the summits and the second line being about equal to the space inclosed between the first and second supra-peripheral lines. The third line falls on about the middle of the exposed portion of the whorls and is a little nearer to the second line than the one anterior to it. In addition to these 5 strongly incised lines there are numerous very fine and closely spaced spiral striae which cross all parts of the surface of the shell. Periphery and base of the last turn inflated, the latter marked by lines of growth and 8 strongly incised, punctate spiral lines, which are a little less strongly impressed and a little more closely spaced at the umbilical area than at the peripheral part of the base. These lines equal those of the spire in strength. Sutures constricted. Aperture very large, somewhat effuse anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within; columella curved, reinforced by the attenuated base and provided with a strong fold and its insertion; parietal wall covered by a thin callus.

The type (Cat. No. 196299, U.S.N.M.) was collected by Mrs. Merrihew, at Port Harford, California. It has 5 post-nuclear whorls and measures: Length 3.2 mm., diameter 1.8 mm.

## ODOSTOMIA (MENESTHO) EXARA, new species.

Plate XLVI, fig. 6.

Shell elongate-ovate, subdiaphanous. Nuclear whorls smooth, deeply immersed in the first of the succeeding turns, only a part of the last one appearing above it. Post-nuclear whorls somewhat inflated, well rounded, marked on the first whorl by 8, on the second by 12, on the third by 14, and on the penultimate between the sutures by 20 subequal and equally spaced, low, depressed spiral cords which are separated by narrower channels. Periphery and base of the last whorl inflated, sculptured like the spire by probably 20 spiral cords. In addition to the spiral sculpture the entire surface is marked by fine incremental lines which are best marked in the spaces between the cords. Aperture oval, somewhat effuse anteriorly; posterior angle acute; outer lip thin, showing the external sculpture within; columella

decidedly curved, reenforced by the attenuated base, free only at its anterior extremity, where it is somewhat revolute, provided with a prominent fold at its insertion which appears as the thickened inflection of the columella; parietal wall covered by a thin callus

The type (Cat. No. 196250, U.S.N.M.) comes from Pacific Grove, Monterey, California. It has 5 post-nuclear whorls and measures: Length 3.9 mm., diameter 2.1 mm.

Subgenus *EVALEA* A. Adams.

*Evalea* A. ADAMS, Ann. Mag. Nat. Hist., VI, 1860, p. 22; + *Ondina* DE FOLIN, Fonds de la Mer, 1870, p. 214; + *Auriculina* GRAY, Proc. Zool. Soc., 1847, p. 159; + *Ptychostomon* LOCARD, Prod. de les Moll. de France, 1886, p. 228.

Odostomias having the surface marked by fine incised spiral lines.

Type.—*Evalea elegans* A. Adams.

KEY TO SPECIES OF *EVALEA*.

- Shell umbilicated.....*tillamookensis*.  
 Shell not umbilicated.  
 Periphery of the last whorl decidedly angulated.....*angularis*.  
 Periphery of the last whorl subangulated.  
 Spiral sculpture uniform.....*jewetti*.  
 Spiral sculpture consisting of weak and strong lirations.....*inflata*.  
 Periphery of the last whorl well rounded.  
 Shell elongate-conic.  
 Adult shell more than 8 mm. long.....*columbiana*.  
 Adult shell less than 5 mm. long.....*deliciosa*.  
 Shell ovate.  
 Spiral sculpture uniform over the entire surface.  
 Diameter of adult shell 2.5 mm.....*tacomaensis*.  
 Diameter of adult shell 1.3 mm.....*raldezi*.  
 Spiral sculpture strongly developed on the early whorls, obsolete on the last.  
 Shell white, porcellanous.....*phanea*.  
 Shell straw-colored.....*tenuisculpta*.

*ODOSTOMIA (EVALEA) TILLAMOOKENSIS*, new species.

Plate XLVII, fig. 1.

Shell elongate-conic, thin, yellowish-white. Nuclear whorls sur rounded by the first of the succeeding turns and so immersed as to give the apex a broadly truncated appearance. Post-nuclear whorls inflated, evenly strongly rounded, very slightly shouldered at the summit, separated by well-marked sutures. Periphery and base of the last whorl well rounded, the latter inflated, narrowly openly umbilicated. Entire surface marked by numerous fine, wavy, subequal, weakly incised spiral lines, of which about 35 occur between the summit and the periphery of the last whorl and about an equal number on the base. Aperture oval; outer lip thin; columella slender, evenly gently curved, and slightly revolute, free, not reen-

forced at the base, provided with a slender fold at its insertion, which is not visible when the aperture is viewed squarely.

The type (Cat. No. 196244, U.S.N.M.) has four post-nuclear whorls, and measures: Length 4.1 mm., diameter 2.2 mm. It was dredged by the U. S. Fisheries steamer *Albatross*, at Station No. 3346, off Tillamook, Oregon, in 786 fathoms, green mud, bottom temperature 37°.3.

ODOSTOMIA (EVALEA) ANGULARIS, new species.

Plate XLVII, fig. 2.

Shell very regularly elongate-conic, subdiaphanous to milk-white. Nuclear whorls small, deeply obliquely immersed in the first of the succeeding turns above which the tilted edge of the last turn only is visible. Post-nuclear whorls slightly rounded, separated by constricted sutures, marked by numerous slender, wavy, subequal and subequally closely spaced spiral striations, of which about 33 occur upon the last turn between the summit and the periphery. Periphery of the last whorl marked by a slender raised keel, decidedly angulated. Base short, moderately rounded, narrowly attenuated anteriorly to reinforce the columella, sculptured like the posterior portion of the whorls. Aperture ovate, very broad, slightly effuse anteriorly; posterior angle acute; columella very slender, evenly curved, closely appressed to the attenuated base, with a strong fold at its insertion which is barely visible when the aperture is viewed squarely.

The type has 7 post-nuclear whorls and measures: Length 5.6 mm., diameter 2.8 mm. It and four additional specimens (Cat. No. 150565, U.S.N.M.) were collected by Rev. G. W. Taylor at Nanaimo, British Columbia.

Five other lots are in the collection of the U. S. National Museum; Cat. No. 159474, one, collected by Doctor Dall at Sitka Harbor, Alaska; Cat. No. 126664, three specimens collected by Dr. C. F. Newcombe at Victoria, Vancouver Island, British Columbia; Cat. No. 43384, one specimen from Puget Sound; Cat. No. 161624, four from Port Harford, California, collected by Mrs. Merrihew; Cat. No. 196300, one, dredged by the Bureau of Fisheries steamer *Albatross* at Station No. 3194, off the California coast, in 92 fathoms, gray sand, bottom temperature 45°.9; 18 specimens were determined for Mr. S. S. Berry from 12 fathoms off Del Monte, Monterey Bay, California.

ODOSTOMIA (EVALEA) JEWETTI, new species

Plate XLVII, fig. 3.

*Odostomia inflata* CARPENTER, part, Ann. Mag. Nat. Hist., XV, 1865, p. 394.

Shell elongate-ovate, white. Nuclear whorls very small, smooth, obliquely immersed in the first of the succeeding turns, above which only the last one is visible. Post-nuclear whorls well rounded, a little

more abruptly so on the posterior third between the sutures. Summits very narrowly flattened which renders the sutures well marked. Periphery of the last whorl slightly angulated. Base slightly contracted, moderately rounded between the periphery and umbilical area, narrowly produced to reinforce the columella. Entire surface marked by numerous somewhat wavy, subequal and subequally spaced minute slender spiral lirations, of which there are about 35 between the summit and the periphery and an equal number between the periphery and the base on the last turn. Aperture large, patulous anteriorly; posterior angle acute, outer lip thin at the edge, thick within; columella curved, somewhat reflected, reinforced by the attenuated base, and provided with a strong oblique fold at its insertion.

The two cotypes (Cat. No. 15521*a*, U.S.N.M.) were collected by Colonel Jewett at Santa Barbara, California. One is a young specimen consisting of the nucleus and three post-nuclear whorls; the other has lost the nucleus and probably the first two post-nuclear turns; the five which remain measure: Length 6.1 mm., diameter 3.3 mm.

ODOSTOMIA (EVALEA) INFLATA Carpenter.

Plate XLVII, fig. 8.

Shell ovate, white. Nuclear whorls decollated. Post-nuclear whorls inflated, gently curved over the anterior two-thirds of the whorl between the sutures and more strongly so on the posterior third, this portion forming an evenly curved shoulder. Extreme summit of the whorls slightly flattened and narrow, rendering the sutures well marked. Periphery of the last whorl subangulated. Base attenuated, rather suddenly contracted below the periphery, which gives the space between the periphery and the umbilical area a concave aspect. Entire surface marked by fine lines of growth and many fine, closely placed spiral lirations, five of which are a little stronger than the rest and divide the space between the sutures into subequal areas. There are about 30 of these threads upon the last turn between the summit and the periphery and about 60 on the base. Aperture very large, patulous anteriorly; outer lip thin at the edge but very thick within; columella decidedly curved, and revolute, reinforced to the very edge by the attenuated base, provided with a strong oblique fold at its insertion.

The type and a young individual (Cat. No. 15521*b*) were collected by J. G. Swan at Neah Bay, Washington. It has the last four whorls (the nucleus and probably the first post-nuclear turn being lost) and measures: Length 6.2 mm., diameter 3.8 mm.

## ODOSTOMIA (EVALEA) COLUMBIANA, new species.

Plate XLVII, fig. 9.

Shell large, elongate-conic, white. Nuclear whorls small, vitreous, planorboid, deeply obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution is visible. Post-nuclear whorls increasing regularly in size, well rounded, very narrowly roundly shouldered at the summits, which renders the sutures well marked. Periphery of the last whorl somewhat inflated. Base well rounded, attenuated anteriorly to reenforce the columella. Entire surface covered by numerous somewhat wavy, subequal and subequally closely placed spiral lirations, of which about 40 occur between the summit and the periphery and about an equal number on the base of the last whorl. Aperture large, decidedly patulous anteriorly; posterior angle acute; outer lip thin at the edge, very thick within; columella curved and strongly reflected, free only at its anterior extremity, provided with a strong oblique fold at its insertion.

The type and 5 specimens (Cat. No. 126658, U.S.N.M.) were collected by Dr. C. F. Newcombe at Victoria, Vancouver Island, British Columbia. It has 6 post-nuclear whorls and measures: Length 8.3 mm., diameter 4.2 mm. Three other specimens (Cat. No. 196245, U.S.N.M.) were dredged by the Bureau of Fisheries steamer *Albatross* at Station No. 4213, off Port Townsend, Washington, in 23 to 25 fathoms, gray sand and broken shell, bottom temperature 51°. Another (Cat. No. 196246, U.S.N.M.) at Station No. 4203, at Fort Rupert, Vancouver Island, British Columbia, in 25 to 30 fathoms, volcanic sand and gravel and broken shell and sponge, bottom temperature 49.1°.

## ODOSTOMIA (EVALEA) DELICIOSA, new species.

Plate XLVII, fig. 5.

Shell small, elongate-conic, translucent to milk-white. Nuclear whorls small, deeply immersed in the first of the succeeding turns above which only a portion of the last turn is visible. Post-nuclear whorls moderately rounded, very weakly roundly shouldered at the summit, separated by strongly marked sutures; a narrow band appears about the summit showing its junction with the preceding turn. Periphery and base of the last whorl inflated and well rounded. Entire surface of base and spire marked by very fine lines of growth and numerous microscopic wavy spiral striations. Aperture rather large, somewhat effuse anteriorly; posterior angle acute; outer lip thin; columella rather stout, strongly curved, and revolute, reenforced by the attenuated base, and covered with a strong fold at its insertion. This fold can be seen through the transparent shell as a quite strong lamella on the pillar of the turns.

The type (Cat. No. 46492, U.S.N.M.) is from Monterey, has  $6\frac{1}{2}$  post-nuclear whorls and measures, length 4 mm., diameter 1.9 mm. Another specimen (Cat. No. 196301, U.S.N.M.) also comes from Monterey, California.

*ODOSTOMIA (EVALEA) TACOMAENSIS*, new species.

Plate XLVII, fig. 10.

Shell ovate, yellowish. Nuclear whorls small, deeply immersed in the first of the succeeding turns. Post-nuclear whorls well rounded, faintly roundly shouldered at the extreme summits. Periphery of the last whorl rounded. Base inflated, well rounded, somewhat attenuated anteriorly. Surface covered by numerous equal and equally closely spaced slender wavy spiral striations of which there are about 40 between the summit and the periphery of the last whorl. Base marked like the space posterior to it. In addition to the spiral sculpture the entire surface of the shell is crossed by numerous fine lines of growth. Aperture moderately large, oval, well rounded anteriorly; posterior angle acute; outer lip thin; columella curved, slightly reflected, reenforced, except at its extreme anterior end, by the attenuated base and provided with a strongly oblique fold at its insertion.

The type (Cat. No. 159267, U.S.N.M.) has 5 post-nuclear whorls, and measures: length 4.3 mm., diameter 2.5 mm. It was collected by Mr. Fisher at Tacoma, Washington.

*ODOSTOMIA (EVALEA) VALDEZI*, new species.

Plate XLVIII, fig. 2.

Shell small, thin, very elongate-oval, subdiaphanous to milk-white, having the entire surface marked by rather strong lines of growth and numerous microscopic spiral striations. Nuclear whorls deeply obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last turn is visible. Post-nuclear turns rather high between the sutures, well rounded, with narrowly roundly shouldered summits. Periphery and base of the last turn inflated and well rounded, the latter with a very narrow umbilical chink. Aperture moderately large, oval; posterior angle acute; columella strongly curved, reenforced by the attenuated base and provided with a moderately strong fold opposite the umbilical chink.

The type has 5 post-nuclear whorls, and measures: length 3 mm., diameter 1.3 mm. It and another specimen (Cat. No. 196249, U.S.N.M.) were collected by Mr. S. S. Berry in 12 fathoms, off Del Monte, Monterey, California. Two additional specimens from the same station are in Mr. Berry's collection.

ODOSTOMIA (EVALEA) TENUISCUPTA Carpenter.

Plate XLVII, fig. 6.

*Odostomia tenuisculpta* CARPENTER, 2nd Rept. Brit. Assoc. Adv. Sci., 1864, p. 659; Ann. Mag. Nat. Hist., XV, 1865, p. 30.

Shell elongate-ovate, yellowish, with the early whorls spirally lirate and the later ones only obsoletely so. Nuclear whorls small, smooth, obliquely almost completely immersed in the first of the succeeding turns. Post-nuclear whorls evenly well-rounded with appressed summits. The first three marked between the sutures by many subequal liræ of which there are about 15 on the second turn. On the last two turns these lirations become quite obsolete. Periphery and base of the last whorl inflated and well-rounded, marked by very feeble spiral striation and lines of growth. Aperture moderately large, oval; somewhat effuse anteriorly; posterior angle acute; outer lip thin; columella strongly curved, reinforced partly by the attenuated base, moderately reflected anteriorly bearing a strong fold at its insertion which appears as if it were the inflected termination of the columella.

Doctor Carpenter's type (Cat. No. 15520, U.S.N.M.) is a young individual. It was collected by J. G. Swan at Neah Bay, Washington, has 3 post-nuclear whorls, and measures: length 2.3 mm., diameter 1.7 mm. The adult characters were described from two specimens (Cat. No. 46483, U.S.N.M.), collected by J. G. Swan at Neah Bay, Washington. One of these, the one figured, has 6 post-nuclear whorls and measures: length 5.3 mm., diameter 2.9 mm. A specimen collected by Merrihew (Cat. No. 196247, U.S.N.M.), at Port Harford, California, bears a slender raised cord on the periphery of the whorl.

The large series of specimens in the U. S. National Museum proves conclusively that *O. straminea* Carpenter is the smooth southern representative of the species.

The U. S. National Museum has the following material:

*Specimens of Odostomia (Evalea) tenuisculpta Carpenter.*

No. of specimens.	Locality.	Collector.	Catalogue No.
1	Neah Bay, Washington.....	J. G. Swan.....	15520 U.S.N.M.
2	.....do.....	.....do.....	46483 U.S.N.M.
75	Little River, Mendocino County, California.....	G. W. Harford.....	46486 U.S.N.M.
6	Gualala, Mendocino County, California.....	Stearns collection.....	101945 U.S.N.M.
2	San Francisco Bay, California.....	Doctor Hewston.....	74006 U.S.N.M.
30	Monterey, California.....	Stearns collection.....	46482 U.S.N.M.
30	.....do.....	.....do.....	46485 U.S.N.M.
30	.....do.....	.....do.....	46493 U.S.N.M.
21	.....do.....	.....do.....	46489 U.S.N.M.
2	.....do.....	.....do.....	46491 U.S.N.M.
4	.....do.....	P. P. Carpenter.....	46476 U.S.N.M.
1	.....do.....	W. H. Dall.....	159475 U.S.N.M.
17	.....do.....	.....do.....	159477 U.S.N.M.
5	.....do.....	.....do.....	159478 U.S.N.M.
13	.....do.....	.....do.....	159479 U.S.N.M.
1	.....do.....	.....do.....	159480 U.S.N.M.

## ODOSTOMIA (EVALEA) PHANEA, new species.

Plate XLVIII, fig. 7.

*Odostomia (Evalea) gouldi* DALL and BARTSCH, Mem. Cala. Acad., 1903, p. 282, pl. 1, fig. 15, not *Odostomia* (? var.) *gouldii* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 30 (= *Odostomia (Amaura) gouldi* CARPENTER, of the present paper).

Shell elongate-ovate, subdiaphanous to milk-white, stout and shining. Nuclear whorls small, deeply immersed in the first of the succeeding turns. Post-nuclear whorls rather high between the sutures, well rounded with scarcely an indication of a shoulder at the summit, separated by well-marked sutures. Periphery and the rather long base of the last whorl well rounded. The first two whorls are regularly closely spirally striated, in the third the striation becomes enfeebled and on the penultimate decidedly obsolete, while the base is smooth. About 18 of the striae are visible on the third turn. Aperture large, oval, somewhat effuse anteriorly; columella decidedly curved and reflected, reenforced by the attenuated base, provided with a strong oblique fold at its insertion.

The type has 5 post-nuclear whorls and measures: Length 4.8; diameter 2.6 mm. It and another specimen (Cat. No. 46408, U.S.N.M.) belong to the Stearns collection and come from Monterey, California.

There are 4 other lots in the collection of the U. S. National Museum, all from Monterey. Cat. No. 46496, one specimen belongs to the Stearns collection; Cat. Nos. 46474 and 46479, one specimen each collected by Doctor Canfield, and Cat. No. 159459, two collected by Doctor Dall.

## Subgenus AMAURA Möller.

*Amaura* MÖLLER, Index Moll. Groenlandica, 1842, p. 7.

Very large, usually inflated *Odostomias*, the sculpture of which consists of very fine lines of growth and still finer wavy closely placed spiral striations.

*Type.*—*Amaura candida* Möller.

## KEY TO SPECIES OF AMAURA.

Shell umbilicated:

Adult shell large, 10 mm. long ..... *kennerleyi*.

Adult shell medium size, 7 mm. or less long ..... *satara*.

Shell not umbilicated:

Whorls with the summit appressed—

Shell shortly ovate ..... *nuciformis*.

Shell elongate-ovate ..... *arellana*.

Whorls with the summits shouldered—

Adult shell more than 9 mm. long ..... *montereyensis*.

Adult shell less than 7 mm. long ..... *gouldii*.

## ODOSTOMIA (AMAURA) KENNERLEYI, new species.

Plate XLVIII, figs. 8, 8a.

Shell large, very thin, broadly conic, umbilicated, yellowish-white; marked by subobsolete, subequal, and subequally spaced spiral wrinkles, about 15 of which may be seen on the body and base of the last whorl. In addition to these wrinkles, many faint, closely-placed spiral and vertical striae are present. Nuclear whorls small, about  $2\frac{1}{2}$  forming a depressed spire which is deeply immersed, the axis of which is almost at right angles to the axis of the latter whorls. Post-nuclear whorls very wide, inflated, well rounded, faintly shouldered at the summit. Sutures well marked, simple. Periphery and base of the last whorl inflated, well rounded, the latter decidedly contracted and narrowly umbilicated. Aperture large, suboval, somewhat effuse anteriorly; posterior angle obtuse; outer lip thin; columella straight, obliquely inserted, revolute, not reenforced by the base, with an oblique weak fold near its insertion; parietal wall apparently without a callus.

The type (Cat. No. 150564, U.S.N.M.) was collected by Rev. G. W. Taylor at Nanaimo, British Columbia. It has 6 post-nuclear whorls which measure: Length 10.2 mm., diameter 6 mm.

Two other specimens (Cat. No. 44933, U.S.N.M.) were collected by Doctor Kennerley at Puget Sound, Washington, and another (Cat. No. 129121) by Prof. O. B. Johnson, at Seattle, Washington.

## ODOSTOMIA (AMAURA) SATURA Carpenter.

Plate XLVIII, figs. 5, 5a.

= *Odostomia satura* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 29.

+ var. *pupiformis* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 29.

Shell of medium size, broadly conic, white. Nuclear whorls at least two, forming a depressed spire, the axis of which is almost at a right angle to the axis of the later whorls, and which is deeply, somewhat obliquely immersed in the first post-nuclear turn. Post-nuclear whorls moderately well rounded, faintly shouldered at the summit, marked all over by irregular rough, low, tumescences, which simulate obsolete vertical ribs. Sutures simple, well marked. Periphery of the last whorl well rounded. Base quite short, decidedly rounded, and umbilicated. Umbilicus partly covered by the revolute columella. Aperture large, very broadly oval, somewhat effuse anteriorly; posterior angle obtuse; outer lip thick; columella moderately strong, oblique, decidedly curved, with a decided oblique fold, situated considerably anterior to its insertion; parietal wall covered by a fairly thick callus.

The type (Cat. No. 15520, U.S.N.M.) was collected by J. G. Swan at Neah Bay, Washington. It has  $5\frac{1}{2}$  whorls which measure: Length 6.4 mm., diameter 3.5 mm.

The specimen upon which Doctor Carpenter fixed the name *pupiformis* (Cat. No. 15520a, U.S.N.M.) collected by J. G. Swan at Neah Bay, Washington, is not worthy of a varietal name. It is a freak, having the spire less elevated, which is, perhaps, due to some injury received at an early date, evidence of which seems present. It agrees perfectly in every detail with the type of *satura* excepting the shape of the spire.

**ODOSTOMIA (AMAURA) NUCIFORMIS Carpenter.**

Plate XLVIII, figs. 3, 3a.

*Odostomia nuciformis* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 30.

Shell large, shortly ovate, yellowish to milk-white. Nuclear whorls deeply immersed; only half of the last turn is seen in tilted position when viewed from above. Post-nuclear whorls increasing rapidly in size, well rounded, having their summits closely appressed to the preceding whorl. Sutures moderately well impressed. Periphery and base of the last whorl well rounded. Aperture rather large, ovate, white within; posterior angle acute; outer lip moderately thin at the edge, thicker within; columella short, strongly curved, with a strong oblique fold at its insertion; reenforced by the attenuated base; parietal wall covered by a weak callus.

The type (Cat. No. 15517a, U.S.N.M.) comes from Neah Bay, Washington. It has 5 post-nuclear whorls which measure: Length 7.7 mm., diameter 4.4 mm.

*Odostomia (Amaura) nuciformis* Carpenter differs from its subspecies in having the spire more depressed than either of them. It is a short, stubby inflated, ovoid shell, having the summit of the whorls closely appressed.

**ODOSTOMIA (AMAURA) NUCIFORMIS AVELLANA Carpenter.**

Plate XLVIII, figs. 1, 1a.

*Odostomia* (? var.) *avellana* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 30.

Shell large, elongate-ovate, yellowish to milk-white. Nuclear whorls deeply vertically immersed; only part of the last volution is visible when viewed from above, their axis evidently being at a right angle to the axis of the later whorls. Post-nuclear whorls increasing rapidly in size, early ones well rounded, later ones less so, their summits being closely appressed to the preceding whorl. Sutures well impressed, simple. Periphery and base of the last whorl well rounded, the latter

somewhat elongated. Aperture large, ovate, somewhat effuse anteriorly, milk-white within; posterior angle acute; outer lip thin at the edge, thick within; columella short curved, reinforced partly by the attenuated base, having a strong oblique fold at its insertion; parietal wall covered by a moderately strong callus.

The type (Cat. No. 15517*b*, U.S.N.M.) comes from Neah Bay, Washington. It has 5 post-nuclear whorls and measures: Length 8.3 mm., diameter 4.3 mm.

The present subspecies differs from *O. (A.) nuciformis* Carpenter chiefly in having the spire much more elongated.

ODOSTOMIA (AMAURA) MONTEREYENSIS, new species.

Plate XLVIII, figs. 6, 6*a*.

Shell large, similar in form to *O. (A.) n. ardlana*; white, shining. Nuclear whorls 3, helicoid, quite elevated, deeply immersed in the first of the succeeding whorls, having their axis at a right angle to the axis of the later whorls. Post-nuclear whorls well rounded, with a beveled shoulder at the summits. Sutures well marked, simple. Periphery and base of the last whorl well rounded and inflated, the latter somewhat elongated. Aperture subovate, somewhat effuse anteriorly; posterior angle acute; outer lip thin at the edge, thick within; columella curved and somewhat revolute, having a prominent oblique fold near its insertion; parietal wall covered by a thin callus.

The type (Cat. No. 46473, U.S.N.M.) is from Monterey, California. It has 6 post-nuclear whorls which measure: Length 9.6 mm., diameter 5.1 mm.

In addition to these others have been named for the University of California from Monterey; for Mr. S. S. Berry from 12 fathoms off Del Monte, Monterey Bay; for Mrs. Oldroyd from San Pedro, and for Mr. Kelsey from San Diego, California.

This species resembles *O. (A.) n. ardlana* Carpenter, but differs markedly from that form by having the summits of the whorls shouldered.

ODOSTOMIA (AMAURA) GOULDII Carpenter.

Plate XLVIII, fig. 4.

*Odostomia* (? var.) *gouldii* CARPENTER, Ann. Mag. Nat. Hist., 3d ser., XV, 1865, p. 29.

Shell of medium size, elongate-conic, yellowish-white, the exterior surface marked by irregular tumescences, giving it a much worn appearance. Nuclear whorls three, deeply immersed, having their axis at about a right angle to the axis of the succeeding turns. Post-nuclear whorls moderately well rounded, faintly shouldered at the

summit. Sutures simple, well marked. Periphery and base of the last whorl well rounded, the latter somewhat elongated. Umbilicus faint. Aperture quite large, pyriform, posterior angle obtuse, outer lip moderately thick; columella very oblique, fairly strong, revolute, with a strong fold somewhat anterior to its insertion; parietal wall covered with a fairly strong callus.

The type (Cat. No. 22821, U.S.N.M.) comes from Neah Bay, Washington. It has 6 post-nuclear whorls and measures: Length 6.1 mm., diameter 3.1 mm.

## EXPLANATION OF PLATES.

In some instances the very fine, closely crowded striation has been omitted, while in other cases where shown it has been exaggerated by the artist. Attention is called to this under the explanation of the figures. The measurements cited after the names refer to the axial length of the specimen.

### PLATE XLIV.

- FIG. 1. *Turbonilla (Strioturbonilla) cancouverensis* Baird; 6.2 mm.; p. 495. The fine spiral markings have been omitted in this figure.
2. *Turbonilla (Chemnitzia) muricatoides*, new species; type; 3 mm.; p. 495. The fine spiral markings have been omitted in this figure.
- 2a. Nucleus of same, lateral view, much enlarged.
3. *Turbonilla (Pyrgolampros) valdezi*, new species; type; 5.6 mm.; p. 502. The fine spiral markings have been omitted in this figure.
- 3a. Nucleus of same, seen from above, much enlarged.
4. *Turbonilla (Pyrgolampros) lyalli*, new species; type; 5.7 mm.; p. 500. The fine spiral markings have been omitted in this figure.
- 4a. Nucleus of same, lateral view, much enlarged.
5. *Turbonilla (Turbonilla) gilli*, new species; type; 3.6 mm.; p. 493.
6. *Turbonilla (Pyrgolampros) victoriana*, new species; type; 7 mm.; p. 501. The fine spiral markings have been omitted in this figure.
7. *Turbonilla (Turbonilla) gilli delmontensis*, new subspecies; type; 3.4 mm.; p. 494.
8. *Turbonilla (Strioturbonilla) serrae*, new species; type; 7.7 mm.; p. 497. The fine spiral markings have been omitted in this figure.
- 8a. Nucleus of same, lateral view, much enlarged.
9. *Turbonilla (Pyrgolampros) taylori*, new species; type; 11.5 mm.; p. 499. The fine spiral markings have been omitted in this figure.
- 9a. Nucleus of same, lateral view, much enlarged.
10. *Turbonilla (Pyrgolampros) berryi*, new species; type; 8 mm.; p. 500.
- 10a. Nucleus of same, lateral view, much enlarged.
11. *Turbonilla (Strioturbonilla) stylina* Carpenter; 6.5 mm.; p. 497. The fine spiral markings have been omitted in this figure.
- 11a. Nucleus of same, lateral view, much enlarged.

### PLATE XLV.

- FIG. 1. *Turbonilla (Pyrgiscus) morchi*, new species; type, 6.4 mm.; p. 505.
- 1a. Nucleus of same, lateral view, much enlarged.
2. *Turbonilla (Pyrgolampros) oregonensis*, new species; type; 8.5 mm.; p. 503. The fine spiral markings have been omitted in this figure.
3. *Turbonilla (Pyrgiscus) tenuicula* Gould; 6.1 mm.; p. 508.
- 3a. Nucleus of same, lateral view, much enlarged.
4. *Turbonilla (Pyrgiscus) antestriata*, new species; type; 9.7 mm.; p. 506.
- 4a. Nucleus of same, lateral view, much enlarged.
5. *Turbonilla (Pyrgolampros) aurantia* Carpenter; type; 6.2 mm.; p. 502. The spiral markings have been exaggerated in this figure.
6. *Turbonilla (Pyrgolampros) newcombei*, new species; type; 5.4 mm.; p. 503.
7. *Turbonilla (Mormula) lordi* Smith; 21 mm.; p. 510.
- 7a. Nucleus of same, lateral view, much enlarged.
8. *Turbonilla (Pyrgiscus) eucosmobasis*, new species; type; 11.2 mm.; p. 507.
- 8a. Nucleus of same, lateral view, much enlarged.
9. *Turbonilla (Mormula) tridentata* Carpenter; 12.8 mm.; p. 511.
10. *Turbonilla (Mormula) eschscholtzi*, new species; type; 13.3 mm.; p. 513.

## PLATE XLVI.

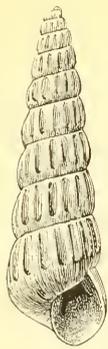
- FIG. 1. *Odostomia* (*Chrysallida*) *astricta*, new species; type; 2.9 mm.; p. 515.  
 2. *Odostomia* (*Iridia*) *navisa*, new species; type; 2.9 mm.; p. 517.  
 2a. Nucleus of same, lateral view, much enlarged.  
 3. *Odostomia* (*Iridia*) *navisa delmontensis*, new subspecies; type; 3.2 mm.; p. 518.  
 3a. Nucleus of same, lateral view, much enlarged.  
 4. *Odostomia* (*Chrysallida*) *montereyensis*, new species; type; 3 mm.; p. 516.  
 5. *Odostomia* (*Menestho*) *hayfordensis*, new species; type; 3.2 mm.; p. 521.  
 6. *Odostomia* (*Menestho*) *exura*, new species; type; 3.9 mm.; p. 521.  
 7. *Odostomia* (*Chrysallida*) *cooperi*, new species; type; 3.1 mm.; p. 514.  
 8. *Odostomia* (*Menestho*) *pluarcida*, new name; type; 2.2 mm.; p. 520.  
 9. *Odostomia* (*Iolaea*) *amianta*, new species; type; 4.5 mm.; p. 519.  
 9a. Nucleus of same, seen from above, much enlarged.  
 10. *Odostomia* (*Chrysallida*) *oregonensis*, new species; type; 3.3 mm.; p. 516.  
 10a. Nucleus of same, lateral view, much enlarged.

## PLATE XLVII.

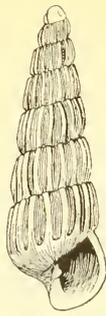
- FIG. 1. *Odostomia* (*Evalea*) *tillamookensis*, new species; type; 4.1 mm.; p. 522. The spiral sculpture is somewhat exaggerated in this figure.  
 2. *Odostomia* (*Evalea*) *angularis*, new species; type; 5.6 mm.; p. 523. The spiral sculpture is somewhat exaggerated in this figure.  
 3. *Odostomia* (*Evalea*) *jewetti*, new species; type; 6.1 mm.; p. 523. The spiral sculpture is somewhat exaggerated in this figure.  
 4. *Tarbonilla* (*Pyrgiscus*) *canfieldi*, new species; type; 6.3 mm.; p. 504.  
 4a. Nucleus of same, lateral view, much enlarged.  
 5. *Odostomia* (*Evalea*) *deliciosa*, new species; type; 4 mm.; p. 525. The fine spiral markings have been omitted in this figure.  
 6. *Odostomia* (*Evalea*) *tenuisculpta* Carpenter; 5.3 mm.; p. 527. The fine spiral markings have been omitted in this figure.  
 7. *Tarbonilla* (*Pyrgiscus*) *castanea*, new species; type; 13.5 mm.; p. 509.  
 8. *Odostomia* (*Evalea*) *inflata* Carpenter; type; 6.2 mm.; p. 524. The fine spiral sculpture has been somewhat exaggerated in this figure.  
 9. *Odostomia* (*Evalea*) *columbiana*, new species; type; 8.3 mm.; p. 525. The fine spiral sculpture has been somewhat exaggerated in this figure.  
 10. *Odostomia* (*Evalea*) *tacomensis*, new species; type; 4.3 mm.; p. 526. The fine spiral sculpture has been somewhat exaggerated in this figure.

## PLATE XLVIII.

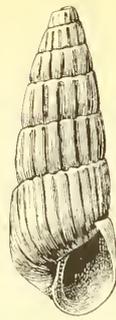
- FIG. 1. *Odostomia* (*Amaura*) *nuciformis avellana* Carpenter; type; 9.1 mm.; p. 530.  
 1a. Nucleus of same, seen from above, much enlarged.  
 2. *Odostomia* (*Evalea*) *valdezi*, new species; type; 3 mm.; p. 526. The fine spiral sculpture has been omitted in this figure.  
 3. *Odostomia* (*Amaura*) *nuciformis* Carpenter; type; 7.7 mm.; p. 530.  
 3a. Nucleus of same, seen from above, much enlarged.  
 4. *Odostomia* (*Amaura*) *gouldii* Carpenter; type; 6.1 mm.; p. 531.  
 5. *Odostomia* (*Amaura*) *satura* Carpenter; type; 6.5 mm.; p. 529.  
 5a. Nucleus of same, seen from above, much enlarged.  
 6. *Odostomia* (*Amaura*) *montereyensis*, new species; type; 9.6 mm.; p. 531. The fine spiral sculpture is somewhat exaggerated in this figure.  
 6a. Nucleus of same, seen from above, much enlarged.  
 7. *Odostomia* (*Evalea*) *pluarea*, new species; type; 4.8 mm.; p. 528.  
 8. *Odostomia* (*Amaura*) *komerleyi*, new species; type; 10.2 mm.; p. 529.  
 8a. Nucleus of same, seen from above, much enlarged.



1



2



3



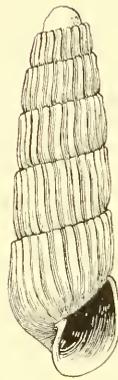
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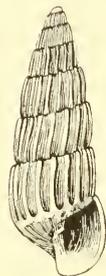
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7



4a



8a



9a



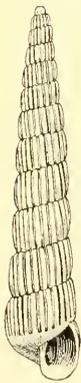
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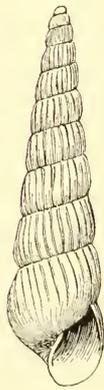
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3a



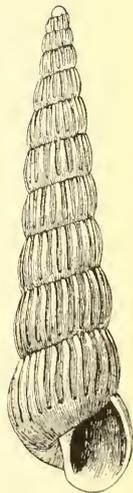
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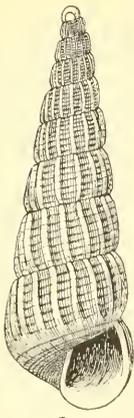


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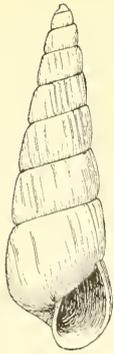
WEST AMERICAN TURBONILLA.

FOR EXPLANATION OF PLATE SEE PAGE 533.

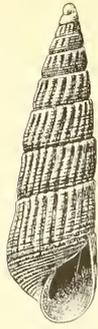




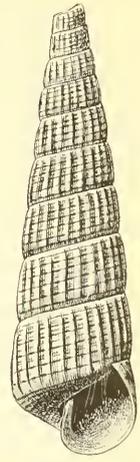
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2



3



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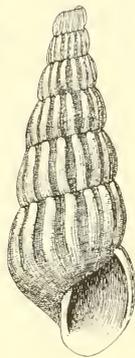
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3a



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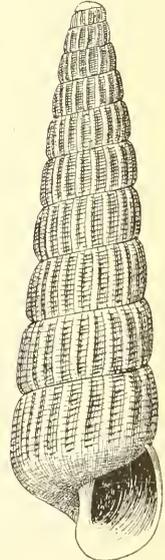
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8a

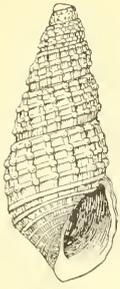


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WEST AMERICAN TURBONILLA.

FOR EXPLANATION OF PLATE SEE PAGE 533.





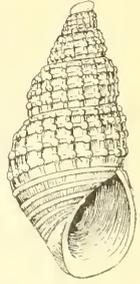
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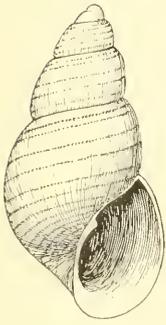
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4



5



3a



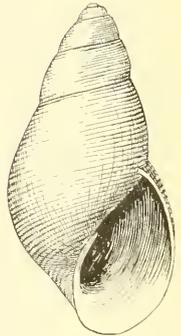
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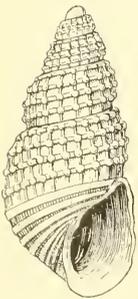
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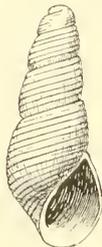
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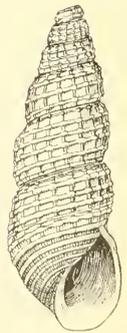
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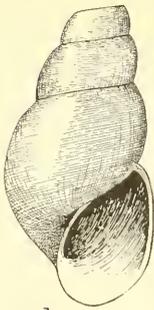


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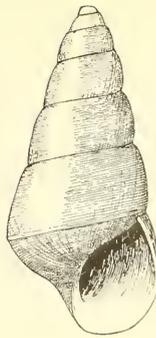
WEST AMERICAN ODOSTOMIA.

FOR EXPLANATION OF PLATE SEE PAGE 534.

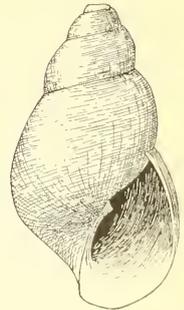




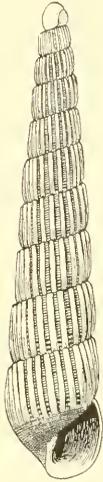
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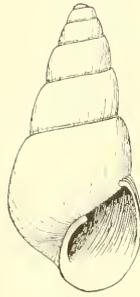
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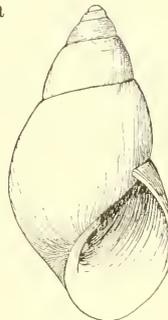
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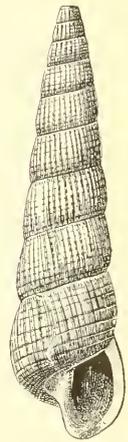
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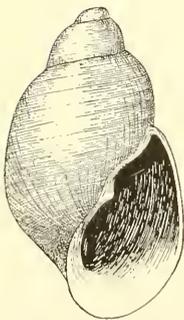
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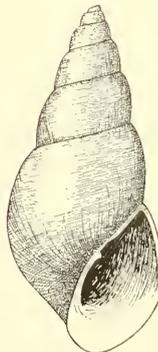
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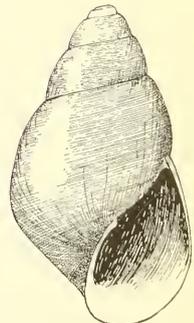
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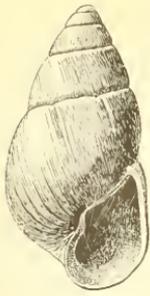


10

WEST AMERICAN PYRAMIDELLIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 534.

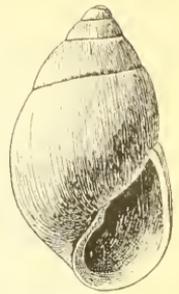




1



2



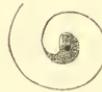
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6a



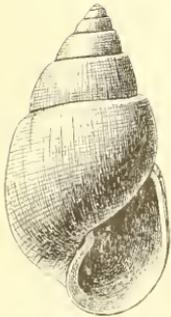
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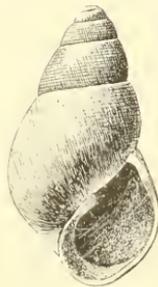
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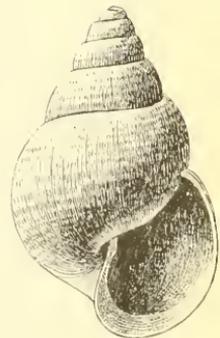
5a



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FOR EXPLANATION OF PLATE SEE PAGE 534.

