THE FOSSILS OF THE LOWER SAN PEDRO FAUNA OF THE NOB HILL CUT, SAN PEDRO, CALIFORNIA

By T. S. Oldroyd,
Of Stanford University, California

INTRODUCTION

The cut through Nob Hill at San Pedro exposed a large deposit of the Lower San Pedro series of the Pleistocene. In July, 1918, the steam shovel had worked its way down to the bed, uncovering no shells of the upper series in the cut, except a few at the south end. This was especially good, as heretofore in most places where the lower series was exposed, the upper series had cropped out above it; as at Deadman's Island. This made collecting in the latter place from the lower series rather uncertain, as the upper would cave down in quantities from the action of the wind and rain, settle on the edge of the lower, and on becoming packed, looked as if it belonged there. This immense deposit, extending the whole length and breadth of the cut and an unknown distance further, was nearly 6 feet thick, and in the center of the cut, where it had not been graded down, was 20 feet below the surface and dipped to the northeast. The first layer commencing at the bottom was about 15 inches thick and sparsely filled with shells, mostly bivalves. Next above there was a bed of bivalves about 4 inches thick, composed mostly of *Macoma nasuta* Conrad, and *Macoma secta* Conrad; these were very plentiful and in a natural condition as they had lived, and had not been disturbed, but were covered up by about 17 inches of sand in which there were no shells. The next layer was about 4 inches thick, composed of *Ostrea lurida* Carpenter, and *Aletes squamigerus* Carpenter. While the life of the bed of *Macoma* was a short one, as none of them had reached a maximum growth, the bed of oysters had apparently lasted for a much longer period of time. This bed, like that of the *Macomas*, was not disturbed but covered up in a natural position. The next layer is a conglomerate mass two feet thick, very compact but not hardened; washed up by some storm, it contains a great many species from deep water. The next and last layer was about 17 inches thick,

composed of loose washed sand and small drift shells washed high on the beach. Judging from the species that lived here, in the two natural beds mentioned, this place must have been an estuary or flat in a protected place, though exposed to unusually severe storms; a place such as existed at Tims Point 30 or 40 years ago.

Of the 242 species of shells found in the Nob Hill cut, 115 are found in Puget Sound and north of there. In our four seasons' dredging and shore collecting near Friday Harbor, Wash., we have found a great many of them living. Our dredging has been mostly in the San Juan Channel, where I think more of the Nob Hill fossil species are found living, than anywhere else. The water in the channel is very cold, because the current comes in from the ocean through the Strait of Juan de Fuca. The water in Departure Bay about 75 miles north of there will average 10 degrees warmer the year round, according to Doctor Fraser who is in charge of the Dominion Marine Biological Station. After the Lower San Pedro time and the climate of California began to get warmer, many of the mollusks went north or sought the cold waters of a greater depth. There seems to be a streak of the northern mollusks in about 100 fathoms all along the coast as far south as Lower California. It is a fact that there are quite a few southern species in the lower San Pedro, and also some northern species in the upper; they all lived in the lower San Pedro during that epoch. They did not all go north, some accustomed themselves to the change in temperature, and are found living now near San Pedro. Some withstood the change for a long time and are found in the upper series, but finally died out, and are not now found living here except in very deep water.

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LIST OF SHELLS FROM THE LOWER SAN PEDRO PLEISTOCENE SERIES FROM THE NOB HILL CUT, SAN PEDRO, CALIFORNIA.

Family NUCULIDAE.

Genus NUCULA Lamarck, 1799.

Subgenus ACILA H. and A. Adams, 1858.

NUCULA CASTRENSIS Hinds, 1843, three small valves.
Living, Bering Sea–San Diego.

Family LEDIDAE.

Genus LEDA Schumacher, 1817.

LEDA TAPHRIA Dall, 1897, six valves.
Living, Bodega Bay, California–Lower California.

LEDA HAMATA Carpenter, 1864, one small valve.
Living, Puget Sound–Panama Bay.

LEDA CELLULITA Dall, 1896, one specimen.
Living, Puget Sound.

Family ARCIDAE.

Genus GLYCYMERIS Da Costa, 1778.

GLYCYMERIS SEPTENTRIONALIS Middendorff, 1849.
Living, Aleutian Islands, Alaska–Puget Sound.

? Family PHILOBRYIDAE.

Genus PHILOBRYA Carpenter, 1872.

PHILOBRYA SETOSA Carpenter, 1864, one valve.
Living, Forrester Island, Alaska–Gulf of California.

Family OSTREIDAE.

Genus OSTREA Linnaeus, 1758.

OSTREA LURIDA Carpenter, 1864, very plentiful.
Living, Sitka, Alaska–Cape San Lucas.

Family PECTINIDAE.

Genus PECTEN Muller, 1776.

Subgenus CHLAMYS Bolten, 1798.

PECTEN HASTATUS Sowerby, 1843, four small valves.
Living, Monterey–Newport, California, deep water.

PECTEN JORDANI Arnold, 1903, three valves.
Living, Puget Sound.

Section **PATINOPECTEN** Dall, 1898.

PECTEN CAURINUS Gould, 1850, two broken valves.
Living, Wrangell, Alaska–Oregon and Puget Sound.

Section **LEPTOPECTEN** Verrill, 1897.

PECTEN LATIAURITUS Conrad, 1837, not rare.
Living, Monterey, California–Lower California.

Family MYTILIDAE.

Genus MYTILUS Linnaeus, 1758.

MYTILUS CALIFORNIANUS Conrad, 1837, part of one valve.
Living, Aleutian Islands–Lower California.

Genus SEPTIFER Recluz, 1848.

SEPTIFER BIFURCATUS (Conrad) Reeve, 1837, ten valves.
Living, Crescent City, California–Gulf of California.

Genus MODIOLUS Lamarck, 1799.

MODIOLUS MODIOLUS Linnaeus, 1858, part of one valve.
Living on the west coast from the Arctic–San Pedro, California.

MODIOLUS CAPAX Conrad, 1837, one valve.
Living, Santa Barbara, California–Peru.

Genus BOTULA Mörch, 1853.

Subgenus ADULA H. and A. Adams, 1857.

BOTULA FALCATA Gould, 1851, three specimens.
Living, Coos Bay, Oregon–San Diego, California.

Genus CRENELLA Brown, 1827.

CRENELLA DECUSSATA Montagu, 1808, about 100 valves.
Living, Bering Sea–San Pedro, California.

Family THRACIIDAE.

Genus CYATHODONTA Conrad, 1848.

CYATHODONTA PEDROANA Dall, 1916, one valve and several pieces.
Living, San Pedro and Catalina Island, California.

Family LYONSIIDAE.

Genus LYONSIA Turton, 1822.

LYONSIA CALIFORNICA Conrad, 1837, plentiful.
Living, Puget Sound–Lower California.

Genus MYTILIMERIA Conrad, 1837.

MYTILIMERIA NUTTALLII Conrad, 1837, one valve.
Living, Vancouver Island–San Diego, California.

Family VERTICORDIIDAE.

Genus VERTICORDIA Wood, 1844.

VERTICORDIA ORNATA Orbigny, 1846, three valves.
Living, Catalina Island, California–Panama.

Family CARDITIDAE.

Genus CARDITA (Bruguière) Lamarck, 1799.

Section CARDITAMERA Conrad, 1838.

CARDITA SUBQUADRATA Carpenter, 1865, about thirty valves.
Living, Queen Charlotte Islands–Lower California.

Genus VENERICARDIA Lamarck, 1801.

VENERICARDIA VENTRICOSA Gould, 1850, thirteen valves.
Living, Alaska–Lower California.

Subgenus MIODONTISCUS Dall, 1903.

VENERICARDIA PROLONGATA Carpenter, 1864, four valves.
Living, Alaska–San Diego, California.

Family THYASIRIDAE.

Genus THYASIRA (Leach in) Lamarck, 1818.

THYASIRA GOULDII Philippi, 1845, one valve.
Living, Alaska–Lower California.

Family DIPLODONTIDAE.

Genus DIPLODONTA Bronn, 1831.

DIPLODONTA ORBELLA Gould, 1852, twelve valves.
Living, Bering Sea–Gulf of California.

Family LUCINIDAE.

Genus PHACOIDES Gray, 1847.

Subgenus LUCINISCA Dall, 1901.

PHACOIDES NUTTALLII Conrad, 1837, Plentiful.
Living, Santa Barbara, California–Mexico.

Subgenus LUCINOMA Dall, 1901.

PHACOIDES ANNULATUS, Reeve, 1850, var. densiliratus Dall, 1919.
Living, Sitka, Alaska–Esteros Bay, California.

Subgenus CALLUCINA Dall, 1901.

Section EPILUCINA Dall, 1901.

PHACOIDES CALIFORNICUS Conrad, 1837, plentiful.
Living, Crescent City, California–Lower California.

Subgenus PARVILUCINA Dall, 1901.

PHACOIDES TENUISCULPTUS Carpenter, 1864, six valves.
Living, Bering Sea—Coronado Islands.

PHACOIDES APPROXIMATUS Dall, 1901, about 100 valves.
Living, Monterey, California–Panama.

Family LEPTONIDAE.

Genus KELLIA Turton, 1822

KELLIA LAPEROUSII Deshayes, 1839, six valves.
Living, Bering Sea–San Diego, California

Family CARDIIDAE.

Genus CARDIUM Linnaeus, 1757.

Subgenus TRACHYCARDIUM Mörch, 1853.

CARDIUM QUADRAGENARIUM Conrad, 1837, valve, not reported before from the Lower San Pedro.
Living, Santa Barbara, California–Todos Santos Bay, Lower California.

Subgenus CERASTODERMA Mörch, 1853.

CARDIUM CORBIS Martyn, 1784, quite plentiful, but all shells thin, fragile, broken.
Living, Bering Sea–San Francisco, California.

Genus PROTOCARDIA Beyrich, 1845.

PROTOCARDIA CENTIFILOSA Carpenter, 1864, three valves.
Living, Departure Bay, British Columbia–Lower California.

Genus TIVELA Link, 1807.

Subgenus PACHYDESMA Conrad, 1854.

TIVELA STULTORUM Mawe, 1923, one valve.
Living, Santa Cruz–Lower California.

Genus TRANSENNELLA Dall, 1883.

TRANSENNELLA TANTILLA Gould, 1852, very plentiful.
Living, Sitka Harbor, Alaska–Lower California.

Genus SAXIDOMUS Conrad, 1837.

SAXIDOMUS NUTTALLII Conrad, 1837, not rare.
Living, Humboldt Bay to San Diego, California.

Genus PAPHIA Bolten, 1798.

Subgenus PROTOTHACA Dall, 1902.

Section **PROTOTHACA** Dall, 1902, s. s.

PAPHIA STAMINEA Conrad, 1837, plentiful.
Living, Bering Sea–Lower California.

Family PETRICOLIDAE.

Genus PETRICOLA Lamarck, 1801.

PETRICOLA CARDITOIDES Conrad, 1837, plentiful.
Living, Vancouver Island–San Pedro, California.

Family TELLINIDAE.

Subgenus MOERELLA Fischer, 1887.

TELLINA SALMONEA Carpenter, 1864, not plentiful.
Living, Aleutian Islands–San Pedro, California.

Subgenus ANGULUS Megerle, 1811.

TELLINA CARPENTERI Dall, 1900, not plentiful.
Living, Bering Sea–Gulf of California.

Subgenus OUDARDIA Monterosato, 1884.

TELLINA BUTTONI Dall, 1900, eight valves.
Living, Alaska–Gulf of California.

Subgenus PERONIDIA Dall, 1900.

TELLINA BODEGENSIS Hinds, 1844, not plentiful.
Living, Queen Charlotte Islands, British Columbia–Gulf of California

Genus METIS H. and A. Adams, 1856.

METIS ALTA Conrad, 1837, one valve.
Living, Santa Barbara–San Diego, California.

Genus MACOMA Leach, 1819.

MACOMA NASUTA Conrad, 1837, very plentiful.
Living, Kodiak Island, Alaska–Lower California.
MACOMA INQUINATA Deshayes, 1854, four valves.
Living, Bering Sea–Monterey, California.

Section REXITHAERUS Conrad, 1869.

MACOMA INDENTATA Carpenter, 1864, five valves.
Living, San Pedro–San Diego, California.

Family SEMELIDAE.

Genus SEMELE Schumacher, 1817.

SEMELE RUBROPICTA Dall, 1871, one valve.
Living, Bering Sea–Lower California.
SEMELE INCONGRUA Carpenter, 1864, fifteen valves.
Living, Monterey–Coronado Islands.

Genus CUMINGIA Sowerby, 1833.

CUMINGIA LAMELLOSA Sowerby, 1833, plentiful.
Living, Crescent City, California–Peru.

Family DONACIDAE.

Genus DONAX Linnaeus, 1758.

DONAX CALIFORNICA Conrad, 1837, two valves.
Living, Santa Barbara–Lower California.

Family PSAMMOBIIDAE.

Genus PSAMMOBIA Lamarck, 1818.

Subgenus GOBRAEUS Leach, 1852.

PSAMMOBIA CALIFORNICA Conrad, 1848, not plentiful.
Living, Aleutian Islands–San Diego, California.

Genus SANGUINOLARIA Lamarck, 1799.

Section NUTTALLIA Dall, 1897.

SANGUINOLARIA NUTTALLII Conrad, 1837, not rare.
Living, San Pedro, California–Magdalena Bay, Lower California.

Family SOLENIDAE.

Genus SOLEN (Linnaeus) Scopoli, 1777.

SOLEN SICARIUS Gould, 1850, four valves.
Living, Vancouver Island–Lower California.

Family MACTRIDAE.

Genus SPISULA Gray, 1838.

Subgenus SYMMORPHOMACTRA Dall, 1894.

SPISULA PLANULATA Conrad, 1837, twelve valves.
Living, Monterey–Cape San Lucas, Lower California.

Genus SCHIZOTHAERUS Conrad, 1853.

SCHIZOTHAERUS NUTTALLII Conrad, 1837, rare.
Living, Alaska–San Diego, California.

Family MYACIDAE.

Genus CRYPTOMYA Conrad, 1849.

CRYPTOMYA CALIFORNICA Conrad, 1837, plentiful.
Living, Alaska–Mexico.

Family SAXICAVIDAE.

Genus SAXICAVA Fleuriau, 1802.

SAXICAVA ARCTICA Linnaeus, 1767, two valves.
Living, Alaska–Panama. Also Atlantic.

Family PHOLADIDAE.

Genus PHOLADIDEA Turton, 1848.

PHOLADIDEA PENITA Conrad, 1837, plentiful.
Living, Alaska–San Diego, California.

Family TEREDIDAE.

TEREDO TUBES, species indeterminable.

Family DENTALIIDAE.

Genus DENTALIUM Linnaeus, 1758.

DENTALIUM NEOHEXAGONUM Sharp and Pilsbry, 1897, not rare.
Living, Monterey, California–Central America.
DENTALIUM PRETIOSUM Sowerby, 1860, not rare.
Living, Forrester Island, Alaska–San Diego, Calif.

Genus CADULUS Philippi, 1844.

CADULUS HEPBURNI Dall, 1897, not rare.
Living, Victoria, British Columbia, to Monterey, California.

Family ACTEONIDAE.

Genus ACTEON Montfort, 1810.

Subgenus RICTAXIS Dall, 1871.

ACTEON PUNCTOCOELATUS Carpenter, 1864, one specimen.
Living, Vancouver Island, British Columbia–Magdalena Bay, Lower California.

Family ACTEOCINIDAE.

Genus ACTEOCINA Gray, 1847.

ACTEOCINA PEDROENSIS, new species, plentiful.

ACTEOCINA EXIMIA Baird, 1863, four specimens.
Living, Kodiak Island, Alaska–Puget Sound.

ACTEOCINA INFREQUENS C. B. Adams, 1852, not rare.
Living, Santa Monica, California–Panama.

ACTEOCINA CEREALIS Gould, 1853, not rare.
Living, Santa Barbara–San Diego, California.

ACTEOCINA TUMIDA T. S. Oldroyd, 1922.
Not found living.

Genus RETUSA Brown, 1837.

Section COLEOPHYSIS Fischer, 1883.

RETUSA HARPA Dall, 1871, not rare.
Living, Queen Charlotte Islands, British Columbia–San Diego, California.

Genus VOLVULELLA Newton, 1891.

VOLVULELLA COOPERI Dall, 1819, not rare.
Living, Catalina Island–Scammon Lagoon, Lower California.

Family SCAPHANDRIDAE.

Genus CYLICHNELLA Gabb, 1872.

CYLICHNELLA ALBA Brown, 1827, two specimens.
Living, Arctic Ocean–San Diego, California.

Family AKERIDAE.

Genus HAMINOEA Turton, 1830.

HAMINOEA DALLI Bartsch, new species, plentiful.
Living, Santa Barbara, California–Mexico.

HAMINOEA VESICULA Gould, 1855, not rare.
Living, Vancouver Island, British Columbia–Gulf of California.

Family SIPHONARIIDAE.

Genus WILLIAMIA Monterosato, 1884.

WILLIAMIA VERNALIS Dall, 1870, three specimens.
Living, Crescent City, California–San Diego.

Family CONIDAE.

Genus CONUS Linnaeus, 1758.

CONUS CALIFORNICUS Hinds, 1844, plentiful.
Living. Farallones Islands, California–Ballenas Lagoon, Lower California.

CONUS CALIFORNICUS FOSSILIS T. S. Oldroyd, 1921, not rare.
Not found living.

Family TURRITIDAE.

Genus MONILIOPSIS Conrad, 1865.

MONILIOPSIS INCISA OPHIODERMA Dall, 1908, not rare.
Living, Bolinas Bay, California–Ballenas Lagoon, Lower California.

Genus ANTIPLANES Dall, 1902.

ANTIPLANES PERVERSA Gabb, 1865.
Living, Forrester Island, Alaska–San Diego, California.

Genus BORSONELLA Dall, 1903.

BORSONELLA BARTSCHI Arnold, 1903, six specimens.
Living, San Pedro–San Diego.

Genus PHILBERTIA Monterosato, 1884.

PHILBERTIA CANFIELDI Dall, 1871, five specimens.
Living, Crescent City, California–Laguna Beach.

Genus GLYPHOSTOMA Gabb, 1873.

GLYPHOSTOMA CONRADIANA Gabb, 1869, one specimen.
Living, San Pedro, California.

Genus MANGILIA Risso, 1826.

MANGILIA ANGULATA Carpenter, 1865, plentiful.
Living, Puget Sound–Gulf of California.

MANGILIA (KURTZIELLA) ARTEAGA Dall and Bartsch, 1910, two specimens.
Living, Puget Sound.

Subgenus CLATHROMANGILIA Monterosato, 1884.

CLATHROMANGILIA RHYSSA Dall, 1919, one specimen.
Living, San Diego, California.

Genus CYTHARELLA Monterosato, 1875.

Section CYTHARELLA s.s.

CYTHARELLA BRANNERI Arnold, 1903, numerous.
Living, Panama.

Genus DAPHNELLA Hinds, 1844.

DAPHNELLA FUSCOLIGATA Dall, 1871, one specimen.
Living, Monterey–San Diego, California.

Family CANCELLARIIDAE.

Genus ADMETE Kroyer, 1842.

ADMETE RHYSSA Dall, 1919, one specimen.
Living, Santa Rosa Island, California–South Coronado Island.

Family OLIVELLIDAE.

Genus OLIVELLA Swainson, 1840.

OLIVELLA BIPLICATA Sowerby, 1825, typical, not rare.
Living, Monterey–Pismo Beach, California.

OLIVELLA BOETICA Carpenter, 1864, typical, plentiful.
Living, Vancouver Island and Puget Sound.

OLIVELLA PEDROANA Conrad, 1855, twelve specimens.
Living, Puget Sound–Cape San Lucas, Lower California.

Family MARGINELLIDAE.

Genus MARGINELLA Lamarck, 1799.

MARGINELLA JEWETTII Carpenter, 1857, new variety NANELLA; plentiful.
Living, Monterey, California—Lower California.

MARGINELLA SUBTRIGONA Carpenter, 1865; nine specimens.
Living, Monterey–San Diego, California.

Genus CYPRAEOLINA Cerulli-Irelli, 1911.

CYPRAEOLINA MARGARITULA Carpenter, 1865; not rare.
Living, Cape San Lucas–Mazatlan, Mexico.

Family MITRIDAE.

Genus MITROMORPHA A. Adams, 1865.

MITROMORPHA FILOSA Carpenter, 1865; one specimen.
Living, Monterey, California–Gulf of California.

Family FASCIOLARIIDAE.

Genus FUSINUS Rafinesque, 1815.

Section HEILPRINIA Grabau, 1904.

FUSINUS MONKSAE Dall, 1915, ten specimens.
Living, British Columbia–Lower California.

Family ALECTRIONIDAE.

Genus ALECTRION Montfort, 1810.

Section SCHIZOPYGA Conrad, 1850.

ALECTRION FOSSATUS Gould, 1849; twelve specimens.
Living, Vancouver Island–Cerros Island, Lower California.

ALECTRION MENDICUS Gould, 1849; plentiful.
Living, Kodiak Island, Alaska–Magdalena Bay, Lower California.

ALECTRION COOPERI Forbes, 1850; plentiful.
Living, Puget Sound–San Diego, California.

ALECTRION COOPERI, var. INDISPUTABILIS I. S. Oldroyd, 1921; plentiful.
Living, Puget Sound–San Diego, Californa.

ALECTRION COOPERI, var. WOODWARDI Forbes, 1850; not rare.
Living, Puget Sound–San Pedro, California.

ALECTRION PERPINGUIS Hinds, 1844; plentiful.
Living, Vancouver Island, British Columbia–Cerros Island, Lower California.

Family COLUMBELLIDAE.

Genus COLUMBELLA Lamarck, 1799.

Subgenus ALIA H. and A. Adams, 1853.

COLUMBELLA TUBEROSA Carpenter, 1865; new variety MAJOR; plentiful.
Living, Forrester Island, Alaska–Gulf of California.

COLUMBELLA CALIFORNIANA Gaskoin, 1852; plentiful.
Living, Forrester Island, Alaska–Salina Cruz, Mexico.

COLUMBELLA CARINATA Hinds, 1844; plentiful.
Living, San Francisco Bay–Cape San Lucas, Lower California.

Genus ANACHIS Adams, 1853.

ANACHIS PENICILLATA Carpenter, 1865; ten specimens.
Living, San Pedro, California–Gulf of California.

Genus NITIDELLA Swainson, 1840.

NITIDELLA GOULDII Carpenter, 1857; twenty specimens.
Living, Kodiak Island, Alaska–San Diego, California.

Genus AESOPUS Gould, 1864.

AESOPUS IDAE Bartsch, 1918, one specimen, the type.

Not reported living.

Genus AMPHISSA H. and A. Adams, 1853.

AMPHISSA VERSICOLOR LINEATA Stearns, 1872; not rare.
Living, Monterey, California.

Family MURICIDAE.

Genus TRITONALIA Fleming, 1828.

TRITONALIA LURIDA Middendorff, 1849; two specimens.
Living, Forrester Island, Alaska–San Diego, California.

TRITONALIA INTERFOSSA Carpenter, 1864; three specimens.
Living, Alaska–San Diego, California.

TRITONALIA INTERFOSSA, var. BETA Carpenter, 1864; plentiful.
Living, Monterey, California.

TRITONALIA KEEPI Arnold, 1903; ten specimens.
Not reported living.

Genus TROPHON Montfort, 1810.

Subgenus NEPTUNEA (Bolten, part, 1798) Dall. 1902

TROPHON MULTICOSTATA Eschscholtz, 1829; not rare.
Living, Bering Sea–San Diego, California.

TROPHON STUARTI E. A. Smith, 1880; three specimens.
Living, Alaska–San Diego, California.

Family EPITONIIDAE.

Genus EPITONIUM Bolten, 1798.

Subgenus OPALIA H. Adams, 1858.

EPITONIUM WROBLEWSKII Mörch, 1876; not rare.

Living, Forrester Island, Alaska–San Diego, California.

Subgenus NITIDOSCALA De Boury, 1909.

EPITONIUM INDIANORUM Carpenter, 1856; not rare.
Living, Forrester Island, Alaska–Todos Santos Bay, Lower California.

EPITONIUM TINCTUM Carpenter, 1865; not rare.
Living, Monterey, California–Gulf of California.

EPITONIUM SUBCORONATUM Carpenter, 1866; eighteen specimens.
Living, Vancouver Island, British Columbia–San Diego, California.

EPITONIUM CREBRICOSTATUM Carpenter, 1866; two specimens.
Living, Vancouver Island–Gulf of California.

EPITONIUM CAAMANOI Dall and Bartsch, 1910; four specimens.
Living, Vancouver Island–San Pedro, California.

EPITONIUM CONTINUATUM, new species; two specimens.
Not known living.

Section CRISPOSCALA De Boury, 1909.

EPITONIUM ACROSTEPHANUM Dall, 1908; one specimen.
Living, Monterey, California–Coronado Islands.

Family MELANELLIDAE.

Genus MELANELLA Bowdich, 1822.

Section MELANELLA s. s.

MELANELLA THERSITES Carpenter, 1864; five specimens.
Living, Monterey, California–San Geronimo Island, Lower California.

MELANELLA PREFALCATA Bartsch, 1917; one specimen.
Not reported living.

MELANELLA FOSSILIS Bartsch, 1918; one specimen.
Not reported living.

Family PYRAMIDELLIDAE.

Genus TURBONILLA Risso, 1826.

TURBONILLA PECORA, new species. Five specimens.
Not known living.

Subgenus STRIOTURBONILLA Sacco, 1892.

TURBONILLA ASSER Dall and Bartsch, 1909; four specimens.
Living, Redondo Beach to San Diego, California.

TURBONILLA ARESTA Dall and Bartsch, 1909, one specimen.
Living, Santa Rosa Island to San Diego, California.

Subgenus CHEMNITZIA Orbigny, 1839.

TURBONILLA AEPYNOTA Dall and Bartsch, 1909; two specimens.
Living, San Pedro to San Martin Island, Lower California.

Subgenus PYRGOLAMPROS Sacco, 1892.

TURBONILLA COLLISELLAE, new species; numerous.
Not known living.

TURBONILLA IDAE, new species; abundant.
Not known living.

TURBONILLA RINELLA Dall and Bartsch, 1910; one specimen.
Living, Barkley Sound, Vancouver Island.

Subgenus PYRGISCUS Philippi, 1839.

TURBONILLA TENUICULA Gould, 1853; nine specimens.
Living, Monterey to Point Abreojos, Lower California.

TURBONILLA HIMERTA, new species; five specimens.
Not known living.

Subgenus MORMULA A. Adams, 1854.

TURBONILLA EPIPHANIA, new species; thirty specimens.
Not known living.

Subgenus BARTSCHELLA Iredale, 1917.

TURBONILLA LAMINATA Carpenter, 1856; numerous.
Living, San Pedro, California, to Point Abreojos, Lower California.

Genus ODOSTOMIA Fleming, 1817.

Subgenus CHRYSALLIDA Carpenter, 1856.

ODOSTOMIA GOMPHINA, new species; two specimens.
Not known living.

ODOSTOMIA SCELERA, new species; nine specimens.
Not known living.

Subgenus IVARA Dall and Bartsch, 1903.

ODOSTOMIA AMAVA, new species; one specimen.
Not known living.

Subgenus EVALEA A. Adams, 1860.

ODOSTOMIA TERSA, new species; six specimens.
Not known living.

ODOSTOMIA ITHEA, new species; two specimens.
Not known living.

ODOSTOMIA MANCA, new species; numerous.
Not known living.

ODOSTOMIA CIVITELLA, new species; sixteen specimens.
Not known living.

ODOSTOMIA FITELLA, new species.
Not known living.

Subgenus AMAURA Moller, 1842.

ODOSTOMIA MENZOLA, new species; sixteen specimens.
Not known living.

ODOSTOMIA TROCHILA, new species; two specimens.
Not known living.

ODOSTOMIA SANESIA, new species; two specimens.
Not known living.

ODOSTOMIA TIMESSA, new species; three specimens.
Not known living.

Family CYMATIIDAE.

Genus ARGOBUCCINUM Mörch, 1852.

Subgenus FUSITRITON Cossmann, 1903.

ARGOBUCCINUM OREGONENSIS Redfield, 1843; three specimens.
Living, Bering Sea–San Diego, California. Also Japan.

Family CERITHIOPSIDAE.

Genus CERITHIOPSIS Forbes and Hanley, 1849.

CERITHIOPSIS FOSSILIS Bartsch, 1911; one specimen.
Not known living.

CERITHIOPSIS FATUA Bartsch, 1911; three specimens.
Living, Santa Barbara and Coronado Islands.

Section CERITHIOPSIDA Bartsch, 1911.

CERITHIOPSIS DIEGENSIS Bartsch, 1911; two specimens.
Living, San Clemente and Coranado Islands, and San Diego.

Section CERITHIOPSINA Bartsch, 1911.

CERITHIOPSIS NECROPOLITANA Bartsch, 1911; three specimens.
Not known living.

Genus SEILA A. Adams, 1861.

SEILA MONTEREYENSIS Bartsch, 1907; seven specimens.

Genus METAXIA Monterosato, 1884.

METAXIA DIADEMA Bartsch, 1907; four specimens.
Living, Monterey–San Diego, California.

Family CERITHIIDAE.

Genus ALABINA Dall, 1902.

ALABINA CALIFORNICA Dall and Bartsch, 1901; seven specimens.
Not known living.

Genus BITTIUM Gray, 1847.

Subgenus SEMIBITTIUM Cossmann, 1896.

BITTIUM ATTENUATUM Carpenter, 1864; numerous.
Living, Forrester Island, Alaska–San Diego, California.

BITTIUM RUGATUM Carpenter, 1866; plentiful.
Living, San Pedro and Catalina Islands, California.

Subgenus LIROBITTIUM Bartsch, 1911.

BITTIUM CATALINENSE Bartsch, 1907; two specimens.
Living at Catalina Island and San Diego.

BITTIUM ORNATISSIMUM Bartsch, 1911; very plentiful.
Living at San Pedro.

BITTIUM ASPERUM Gabb, 1861; one specimen.
Living, Santa Barbara to San Diego, California.

Family CAECIDAE.

Genus CAECUM Fleming, 1817.

CAECUM CALIFORNICUM Dall, 1885; one specimen.
Living, Monterey, California–Lower California.

Genus MICRANELLUM Bartsch, 1920.

MICRANELLUM CREBRICINCTUM Carpenter, 1864; plentiful.
Living, Monterey, California–Todos Santos Bay, Lower California.

Genus FARTULUM Carpenter, 1858.

FARTULUM HEMPHILLI Bartsch, 1920; not rare.
Living, San Pedro, California–Point Abreojos, Lower California.

Family VERMETIDAE.

Genus ALETES Carpenter, 1857.

ALETES SQUAMIGERUS Carpenter, 1856; very plentiful.
Living, Monterey, California–Payta, Peru, and the Galapagos Islands.

ALETES SQUAMIGERUS PENNATUS Mörch, 1862; plentiful.
Living, San Pedro, California, and north.

Family TURRITELLIDAE.

Genus TURRITELLA Lamarck, 1799.

TURRITELLA COOPERI Carpenter, 1866; twenty specimens.
Living, Monterey–San Diego, California.

Family LITTORINIDAE.

Genus LITTORINA Ferussac, 1822.

Section LITTORIVAGA Dall, 1918.

LITTORINA PLANAXIS Philippi, 1847; twenty specimens.
Living, Puget Sound–Magdalena Bay, and Socorro Islands.

Subgenus MELARHAPHE (Mühlfeldt) Menke, 1828.

LITTORINA SCUTULATA Gould, 1849; not rare.
Living, Kodiak Island, Alaska–Turtle Bay, Lower California.

Family LACUNIDAE.

Genus LACUNA Turton, 1827.

LACUNA SOLIDULA Lovèn, 1846; two specimens.
Living, Puget Sound–San Diego, California. Also Atlantic.
LACUNA UNIFASCIATA AURANTIACA Carpenter, 1856; not rare.
Living, Santa Barbara, California–Point Abreojos, Lower California.

Family FOSSARIDAE.

Genus ISELICA Dall, 1918.

ISELICA FENESTRATA Carpenter, 1864; very plentiful.
Living, Puget Sound–Gulf of California.

Family ?————————.

Genus DIALA A. Adams, 1861.

DIALA ACUTA Carpenter, 1864; not rare.
Living, Puget Sound–San Diego, California.

Family RISSOIDAE.

Genus ALVANIA (Leach) Risso, 1826.

ALVANIA MONTEREYENSIS Bartsch, 1911; about fifty specimens.
Living, Sitka, Alaska–Monterey, California.
ALVANIA AEQUISCULPTA Keep, 1887; one specimen.
Living, Catalina Island–Todos Santos Bay, Lower California.

Genus PALUDESTRINA Orbigny.

PALUDESTRINA CURTA Arnold, 1903; not rare.
Not reported living.
PALUDESTRINA cf. STOKESI Arnold, 1903; eight specimens.
Not reported living. Specimens too worn for identification.

Family RISSOINIDAE.

Genus RISSOINA Orbigny, 1840.

RISSOINA KELSEYI Dall and Bartsch, 1902; two specimens.
Living, San Pedro, California–Coronado Islands.

RISSOINA DALLI Bartsch, 1915; two specimens.
Living, San Pedro, California–South Coronado Island.

Family TRUNCATELLIDAE.

Genus TRUNCATELLA (Leach, 1818) Risso, 1826.

TRUNCATELLA CALIFORNICA Pfeiffer, 1857; five specimens.
Living, Santa Barbara–San Diego and San Martin Island, Lower California.

Family SYNCERATIDAE.

Genus SYNCERA Gray, 1821.

SYNCERA TRANSLUCENS Carpenter, 1864; eight specimens.
Living, Vancouver Island–Lower California.

Family HIPPONICIDAE.

Genus HIPPONIX Defrance, 1819.

HIPPONIX ANTIQUATUS Linnaeus, 1767; five specimens.
Living, Crescent City, California–Panama and the Galapagos Islands.

HIPPONIX ANTIQUATUS CRANIOIDES Carpenter, 1864; one specimen.
Living, Vancouver Island–San Pedro, California.

HIPPONIX TUMENS Carpenter, 1865; three specimens.
Living, Crescent City, California–San Diego, California.

Family CREPIDULIDAE.

Genus CREPIDULA Lamarck, 1801.

Section CREPIDULA s. s.

CREPIDULA ONYX Cowerby, 1825; four very small specimens.
Living, Monterey, California–Panama.

CREPIDULA EXCAVATA Broderip, 1834; six specimens.
Living, Monterey, California–Payta, Peru.

CREPIDULA ADUNCA Sowerby, 1825; quite plentiful.
Living, Vancouver Island-Cape San Lucas, Lower California.

CREPIDULA ACULEATA Gmelin, 1792; eight specimens.
Living, Santa Barbara, California–Valparaiso, Chile.

CREPIDULA DORSATA Broderip, 1834; six specimens.
Living, Puget Sound–Peru and South America.

Subgenus IANACUS Mörch, 1852.

CREPIDULA NUMMARIA Gould, 1846; plentiful.
Living, Bering Sea–Mazatlan, Mexico.

Family CALYPTRAEIDAE.

Genus CALYPTRAEA Lamarck, 1799.

CALYPTRAEA FASTIGIATA Gould, 1846; nine specimens.
Living, Port Etches, Alaska–Puget Sound.

Family NATICIDAE.

Genus POLINICES Montfort, 1810.

Subgenus EUSPIRA Agassiz, 1842.

POLINICES cf. LEWISII Gould, 1847; not rare, all specimens small and decorticated.
Living, the type form at Vancouver Island–Santa Barbara Islands, California.

Subgenus NEVERITA Risso, 1826.

POLINICES RECLUZIANA ALTA Dall, 1909; not rare.
Living, Monterey–Catalina Island.

Genus SINUM Bolten, 1798.

SINUM CALIFORNICUM I. S. Oldroyd, 1917; two specimens.
Living, Monterey, California–Lower California.

Family ACMAEIDAE.

Genus ACMAEA Eschscholtz, 1830.

Section COLLISELLA Dall, 1871.

ACMAEA SCUTUM PATINA Eschscholtz, 1833; not rare, all very small.
Living, Bering Sea–Gulf of California.

ACMAEA LIMATULA Carpenter, 1866; not rare, all quite small.
Living, British Columbia–Lower California.

ACMAEA SCABRA Gould, 1846; twelve specimens.
Living, San Francisco–Lower California.

ACMAEA INCESSA Hinds, 1842; quite plentiful.
Living, Trinidad, California–Magdalena Bay, Lower California.

ACMAEA ASMI Middendorff, 1849; not rare.
Living, Sitka, Alaska–San Diego, California. and Socorro Island.

ACMAEA DEPICTA Hinds, 1847; not rare.
Living, Santa Barbara–Lower California.

ACMAEA PALEACEA Gould, 1851; ten specimens.
Living, Trinidad, California–Lower California.

Genus LOTTIA Gray, 1834.

LOTTIA GIGANTEA Gray, 1834; five specimens, all very small.
Living, Washington–Guadelupe and Cerros Islands.

Family PHASIANELLIDAE.

Genus PHASIANELLA Lamarck, 1804.

Subgenus TRICOLIA Risso, 1826.

PHASIANELLA COMPTA Gould, 1856; very plentiful.
Living, Monterey–Gulf of California.

PHASIANELLA PULLOIDES ELATIOR Carpenter, 1865; ten specimens.
Living, Catalina Island–Panama.

Family TURBINIDAE.

Genus ASTRAEA Bolten, 1798.

Subgenus PACHYPOMA Gray, 1850.

ASTRAEA INAEQUALIS PACIFICA Dall, 1919; one specimen and sixteen opercula
Living, Off Santa Cruz Island, California, in 30 fathoms.

Genus LEPTOTHYRA (Carpenter) Pease, 1869.

LEPTOTHYRA CARPENTERI Pilsbry, 1888; twelve specimens.
Living, Sitka, Alaska–San Diego, California.

LEPTOTHYRA BACULA Carpenter, 1864; one specimen.
Living, Puget Sound–San Martin Islands, Lower California.

LEPTOTHYRA PAUCICOSTATA Dall, 1871; thirteen specimens.
Living Monterey–Coronado Islands.

Family TROCHIDAE.

Genus HALISTYLUS Dall, 1889.

HALISTYLUS SUBPUPOIDEUS Tryon, 1838; one specimen.
Living, Queen Charlotte Islands, British Columbia–Panama.

Genus TEGULA Lesson, 1832.

Section CHLOROSTOMA Swainson, 1840.

TEGULA FUNEBRALIS A. Adams, 1854; fifteen specimens.
Living, Vancouver Island–Cerros Islands, Lower California.

TEGULA MONTEREYI Kiener, 1850; seven specimens.
Living, Vancouver Island–Channel Islands, Lower California.

TEGULA LIGULATUS Menke, 1850; one specimen.
Living, Monterey, California–Acapulco, Mexico.

Genus CALLIOSTOMA Swainson, 1840.

CALIOSTOMA CANALICULATUM Martyn, 1784; ten specimens.
Living, Sitka, Alaska–San Diego, California.

CALLIOSTOMA CANALICULATUM Martyn, 1784; ten specimens.
Living, Sitka, Alaska–San Diego, California.

Genus MARGARITES Leach, 1847.

Subgenus LIRULARIA Dall, 1909.

MARGARITES PARCIPICTA PEDROANA Arnold, 1903; plentiful.
Not reported living.

MARGARITES MAGNA, new species; most plentiful.
Not known living.

MARGARITES LIRULATA Carpenter, 1864; two specimens.
Living, Alaska–San Diego, California.

MARGARITES OPTABILIS Carpenter, 1864; one specimen.
Living, Santa Barbara–San Pedro, California.

Family VITRINELLIDAE.

Genus VITRINELLA C. B. Adams, 1850.

VITRINELLA OLDROYDI Bartsch, 1907; one specimen.
Living, on mantle of Chitons, Monterey, California–Lower California.

VITRINELLA ESHNAURI Bartsch, 1907; two specimens.
Living, San Pedro, California.

VITRINELLA THOMASI Bartsch, 1913; two specimens.
Not reported living.

Section DOCOMPHALA Bartsch, 1907.

VITRINELLA STEARNSII Bartsch, 1907; five specimens.
Living, Monterey, California.

Genus TEINOSTOMA A. Adams, 1854.

TEINOSTOMA INVALLATUM Carpenter, 1864; twenty specimens.
Living, Monterey, California–Gulf of California.

Family FISSURELLIDAE.

Genus FISSURELLA Bruguière, 1791.

FISSURELLA VOLCANO Reeve, 1849; two specimens.
Living, Crescent City, California–Panama.

Genus MEGATEBENNUS Pilsbry, 1850.

MEGATEBENNUS BIMACULATUS Dall, 1871; nine specimens.
Living, Forrester Island Alaska Cape San Lucas, Lower California.

Genus DIADORA Gray, 1821.

DIADORA ASPERA Eschscholtz, 1833; ten specimens.
Living, Cook's Inlet Alaska–Magdalena Bay, Lower California.

DIADORA MURINA (Carpenter's MS.) Dall, 1885; two specimens.
Living, Crescent City, California–Magdalena Bay, Lower California.

Genus PUNCTURELLA Lowe, 1827.

PUNCTURELLA CUCULLATA Gould, 1846; two specimens.
Living, Kodiak Island, Alaska–La Paz, Lower California.

Family LEPIDOCHITONIDAE.

Genus LEPIDOCHITONA Gray, 1821.

Section LEPIDOCHITONA s. s.

LEPIDOCHITONA DENTIENS Gould, 1884; about thirty valves.
Living, Puget Sound–Lower California.

Genus NUTTALLINA Carpenter, 1873.

NUTTALLINA CALIFORNICA Reeve, 1847.
Living, Straits of Fuca–San Diego, California.

Family ISCHNOCHITONIDAE.

Genus ISCHNOCHITON Gray, 1847.

Subgenus STENOPLAX Carpenter, 1878.

ISCHNOCHITON FALLAX Carpenter, 1892; one valve.
Living, Vancouver Island–Todos Santos Bay, Lower California.

Section **LEPIDOZONA** Pilsbry, 1892.

ISCHNOCHITON COOPERI Carpenter, 1892; three valves.
Living, Mendocino County, California–Catalina Island.

Genus CALLISTOCHITON Carpenter, 1882.

CALLISTOCHITON PALMULATUS MIRABILIS Pilsbry, 1892; two valves.
Living, San Diego, California.

CALLISTOCHITON CRASSICOSTATUS Pilsbry, 1892; eleven valves.
Living, Forrester Island, Alaska–San Diego, California.

Family MOPALIIDAE.

Genus MOPALIA Gray, 1847.

MOPALIA MUSCOSA Gould, 1846; six valves.
Living, Shumagin Islands, Alaska–Rosario, Lower California.

MOPALIA MUSCOSA ACUTA Carpenter, 1855; twenty valves.
Living, Santa Barbara–San Diego, California.

Family CRYPTOCHITONIDAE.

Genus CRYPTOCHITON Middendorff, 1847.

CRYPTOCHITON STELLERI Middendorff, 1847; not rare.

Living, Bering Island, Aleutian Islands–San Miguel and San Nicolas Islands.

LAND AND FRESHWATER SPECIES.

Family ZONITIDAE.

Genus ZONITOIDES Lehmann, 1846.

ZONITOIDES ARBOREUS Say, 1817; two specimens.

Living Vancouver Island–Oregon.

Family HELICIDAE.

Genus PYRAMIDULA Fleming, 1833.

PYRAMIDULA CRONKHITEI Newcomb, 1865; one specimen.
Living, Alaska–Oregon.

Family LYMNAEIDAE.

Genus PLANORBIS Muller, 1774.

PLANORBIS TRIVOLVIS Say, 1817.
Living all along the coast.

PLANORBIS DEFLECTUS Say, 1824; one specimen.
With the last, living.

CRAB REMAINS IDENTIFIED BY MISS MARY J. RATHBUN.

Lophopanopeus leucomanus Lockington.
Twelve major and two minor dactyls, twenty-three immovable fingers.
Lophopanopeus diegensis Rathbun.
Sixty-three minor dactyls and seventy immovable fingers.
Lophopanopeus lockingtoni Rathbun.
Nine movable fingers.
Hemigrapsus oregonensis Dana.
One hundred and twenty movable and fourteen immovable fingers.
Hemigrapsus nudus Dana.
Nineteen movable and eleven immovable fingers.
Cancer productus Randall.
Seventeen movable and sixty-six immovable fingers.
Cancer gracilis Dana.
Two movable fingers.
Randallia ornata (Randall) and
Randallia, new species.
Fifteen arm joints.
Callianassa, new species.
Eight dactyls of ambulatory legs.
Mesorhoea, new species.
Two hands, one arm.

SPINES AND FRAGMENTS OF SEA URCHINS, EITHER OR BOTH OF THE FOLLOWING TWO SPECIES.

Strongylocentrotus franciscanus A. Agassiz.
Strongylocentrotus purpuratus Stimpson.
Dendraster excentricus Eschscholtz.
Plentiful.

OTHER INVERTEBRATA.

Foraminifera, three species.
Bryozoa, four species, two of which are very plentiful, and also plentiful, living in Puget Sound.

DESCRIPTIONS OF NEW FORMS.

ACTEOCINA PEDROENSIS, new species.

Plate 2, fig. 9.

Shell large, slightly pyriform, with a small prominent subcylindrical nucleus of about two whorls and five subsequent whorls; suture narrowly channeled; the external surface is decorticated in all the specimens, but appears to have been smooth, the surface remaining shows faint spiral feebly punctate striae with rather wide inter-

spaces, all of which sculpture may have been concealed in the perfect shell; aperture slightly shorter than the last whorl; outer lip sharp, very slightly protractively arcuate, receding anteriorly and deeply rounded into the pillar lip, which is thickened and provided with a prominent sharp plait; body with a smooth coat of enamel; length of shell, 20; of last whorl, 18.5; of aperture, 16; maximum diameter, 10 mm.

Type.—Cat. No. 352346, U.S.N.M.

This is larger than any other species of the coast and is less cylindrical than *A. culcitella* Gould, the most nearly allied species. A specimen which has lost the nucleus is 23 mm. long and 10.5 mm. in diameter.

MARGINELLA JEWETTII NANELLA, new subspecies.

Plate 2, fig. 8.

Shell much like typical *jewettii* but uniformly smaller, more slender proportionately, somewhat less wide at the shoulder, and while *jewettii* usually has five plaits, including that on the edge of the pillar, this variety when adult often has as many as eight. Relative dimensions are:

M. jewettii; length, 5.5; maximum diameter, 4.5 mm.

M. nanella; length, 5.0; maximum diameter, 3.7 mm.

Type.—Cat. No. 352361, U.S.N.M.

Many *M. jewettii* are larger than the average specimen above cited, but the size of specimens of the fossil variety is suprisingly uniform. Many specimens of the latter have been examined.

ALIA TUBEROSA MAJOR, new subspecies.

Plate 2, fig. 11.

Shell like the typical recent form, with the same number of whorls but uniformly much larger. Comparative measurements for specimens of eight whorls are:

A. tuberosa; length, 8; maximum diameter, 3.8 mm.

Var. *major;* length, 11; maximum diameter, 5.0 mm.

Type.—Cat. No. 352369, U.S.N.M.

TURBONILLA (STRIOTURBONILLA) PECORA, new species.

Plate 1, fig. 6.

Shell of medium size, elongate turrited, yellowish white. Nuclear whorls two and a half, forming a somewhat depressed helicoid spire, the axis of which is at right angles to that of the succeeding turns, in the first of which the tilted edge of the last whorl is one-fifth immersed. Postnuclear whorls almost flattened, almost tabulately shouldered at the summit, marked by strong, decidedly protractively

slanting axial ribs, of which 14 occur upon the first, second, and third, 16 upon the fourth, fifth, and sixth, 18 upon the seventh to eleventh, and 22 upon the penultimate turn. These ribs extend quite prominently to the summit of the whorls, which they render slightly crenulated. The intercostal spaces are about as wide as the ribs, terminating a little posterior to the suture, which leaves a narrow, smooth band immediately above the well-constricted suture. Periphery of the last whorl well rounded. Base short, well rounded, marked by the feeble continuations of the axial ribs, which evanesce shortly after passing the periphery. The entire surface of the shell is marked by fine, closely spaced spiral striations. Aperture broadly oval; posterior angle obtuse; outer lip thin; inner lip slightly curved, reflected over and appressed to the base for its anterior third, and provided with an obsolete fold a little anterior to its insertion.

Type.—Cat. No. 333506, U.S.N.M., has 12.5 whorls and measures: length, 8.2 mm.; diameter, 2 mm. Cat. No. 352503 U.S.N.M. contains another specimen showing the nucleus.

Three additional specimens are in the Oldroyd collection.

The present species belongs to the group of *Turbonilla* (*Strioturbonilla*) *dinora*, *panamensis*, *schmitti*, and *buttoni*. It is less robust than *T.* (*S.*) *dinora* and has more ribs than that species, and is more robust than any of the other members of the group. The fine spiral striations have been omitted in the figure.

TURBONILLA (PYRGOLAMPROS) COLLISELLA, new species.

Plate 1, fig. 11.

Shell moderately large, elongate conic, yellowish, with a brownish suffusion which probably indicates that when living it was brown. Nuclear whorls two and a fifth, forming a somewhat depressed helicoid spiral, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the tilted edge of the nuclear spiral is about one-fifth immersed. Early postnuclear whorls moderately rounded, the later ones almost flattened, slightly shouldered at the summit, marked by almost vertical axial ribs. Of these ribs, which are much less strong and more numerous and more closely spaced on the early whorls than on the later, where they become senescent on the last turn, 24 occur on the second, 30 upon the third, 26 upon the fourth, 24 upon the fifth and sixth, 21 upon the seventh, eighth, and ninth, 28 upon the tenth, while on the last whorl they are decidedly irregular and irregularly spaced. The intercostal spaces vary in width, being very narrow on the early turns, moderately wide on the median and again on the later very narrow. Suture moderately constricted. Periphery of the last whorl well rounded, Base short, marked by the feeble continuations of the axial ribs,

which extend to the umbilical chink. Aperture rather large, broadly oval; posterior angle obtuse; outer lip thin; inner lip slightly curved and reflected, with the posterior third reflected over and appressed to the base. There is an oblique feeble fold on the columella a little anterior to its insertion.

Type.—Cat. No. 333507, U.S.N.M., has lost the nucleus and first two postnuclear turns. The 9.5 whorls remaining measure: Length, 12 mm.; diameter, 3.3 mm.

The nucleus and the first two postnuclear turns were described from a young specimen, Cat. No. 352507, U.S.N.M., having nine postnuclear whorls, which measures: Length, 7.1 mm.; diameter, 2.2 mm.

Twenty-seven additional specimens are in the Oldroyd collection.

This species belongs near *Turbonilla* (*Pyrgolampros*) *hannibali*, Bartsch.

TURBONILLA (PYRGOLAMPROS) IDAE, new species.

Plate 1, fig. 9.

Shell of medium size, elongate conic, pale brown. Nuclear whorls two and a half, forming a very small, slightly elevated helicoid spiral, the axis of which is at right angles to that of the succeeding turns, in the first of which the tilted edge of the nuclear spiral is about one-fourth immersed. The first two or three postnuclear whorls well rounded, the succeeding turns almost flattened, or sometimes evenly slightly concave. All the whorls very narrowly shouldered at the summit. The first postnuclear whorl smooth, the second one showing mere indications of axial riblets, while on the succeeding turns they become increasingly stronger, well rounded, and somewhat protractively slanting. Of these riblets, 20 occur upon the third, 18 upon the fourth to sixth, 20 upon the seventh, 22 upon the eighth, 24 upon the ninth, and 34 upon the last turn. On this they become less conspicuous. Intercostal spaces mere lines on the first turns, while on the median whorls they are about half as wide as the axial ribs, and on the last turn they are again materially reduced. Suture slightly constricted. Periphery of the last whorl somewhat inflated, well rounded. Base short, somewhat inflated, well rounded, marked by the feeble continuations of the axial riblets, which extend to the umbilical chink. The entire surface of the spire and base crossed by numerous, closely spaced spiral striations. Aperture broadly oval; posterior angle acute; outer lip thin; inner lip curved, rather strongly reflected, almost free throughout its entire length, posteriorly covering the greater portion of the umbilical chink. A feeble twist is present on the columella at its insertion.

Type.—Cat No. 333509, U.S.N.M., has lost the nucleus and the first nuclear turn. The nine remaining measure: Length, 7.9 mm.; diameter, 2.3 mm.

The nuclear turns were described from a young specimen, Cat. No. 352508, U.S.N.M.; 38 additional specimens are entered as Cat. No. 352533, U.S.N.M.; 150 are in the Oldroyd collection.

This specimen is related to *Turbonilla (Pyrgolampros) taylori*, Dall and Bartsch, but is much smaller than that species, and has more ribs. The fine spiral striations have been omitted in the figure.

TURBONILLA (PYRGISCUS) HIMERTA, new species.

Plate 1, fig. 1.

Shell moderately large, pale yellow. Nuclear whorls two and a half, well rounded, forming a decidedly repressed helicoid spiral, the axis of which is almost at right angles to that of the succeeding turns, in the first of which the tilted edge of the nuclear spiral is about one-fourth immersed. Postnuclear whorls narrowly shouldered at the summit, almost flattened in the middle, marked by 20 weak, slightly retractively curved, axial ribs on the first turn. On the second turn and the succeeding turns there are strong axial ribs, which have a protractive slant. Of these ribs, 18 occur upon the second to fifth, 20 upon the sixth, 24 upon the seventh, where they begin to have a slight retractive curve, while on the last turn there are 38, which have a decided retractive curve. The spaces separating these ribs are narrow on the first turn, about as wide as the ribs on the succeeding two, and a little wider than the ribs on the next two, while on the last they are a little narrower than the ribs. The spiral sculpture consists of a series of incised lines and pits. The widest pits are the line at the periphery, where the diameter equals the height. Another series of pits is about half the width of the peripheral, and occupies a space halfway between the summit and the periphery, while a third series of about equal width occupies the space a little nearer to the peripheral than the median line of pits. The two series of pits posterior to the median pits follow next in strength and are equal. In addition to this, there are incised spiral lines, of which the first is about half as far removed from the summit as it is from its neighbor anteriorly, the space between the first and second being equal to about one-sixth of the width between the summit and the periphery. The second, third, and fourth incised lines are equal and rather closely spaced. These are followed by the two medium-sized pits already referred to, posterior to the median pits, then by the median pits. The space between the median pit and the medium-sized pit anterior to it is crossed by two incised spiral lines, of which the first is a little

farther removed from the median pit than from its neighbor, while the second is closely approximated to the second pit. The space between the medium-sized pit and the peripheral pit is crossed by two lines, of which the first divides the space between the two, while the last is separated from the peripheral pit by a mere hair line. Periphery of the last whorl well rounded. Base marked by the feeble continuations of the axial ribs, which evanesce before reaching the umbilical chink, and 18 incised spiral lines of varying strength and spacing. Suture moderately constricted. Aperture broadly ovate; posterior angle acute; outer lip thin; inner lip concave, reflected over and appressed for half its length to the preceding turn, bearing a weak fold a little anterior to its insertion.

Type.—Cat. No. 333508, U.S.N.M., has lost the nucleus. The 8.75 whorls remaining measure: 6.4 mm.; diameter, 2 mm. The nuclear whorls were described from specimen, Cat. No. 352509 U.S.N.M.

Three additional specimens are in the Oldroyd collection.

This species belongs to the group of *Turbonilla* (*Pyrgiscus*) *auricoma* Dall and Bartsch and *T.* (*P.*) *castanea* Keep.

TURBONILLA (MORMULA) EPIPHANEA, new species.

Plate 1, fig. 12.

Shell very large. (Nuclear whorls decollated in all the specimens seen.) Postnuclear whorls almost appressed at the summit, well rounded, marked by rather strong, almost vertical axial ribs, of which 14 occur upon the first of the remaining turns, 16 upon the second, 18 upon the third and fourth, 20 upon the fifth to seventh, 22 upon the eighth to tenth, 24 upon the eleventh, while on the succeeding turns they become enfeebled and finally obsolete. In addition to the axial ribs, low rounded varices, the result of the fusion of several ribs, occur at regular intervals. Intercostal spaces about twice as wide as the ribs, crossed by 8 almost equal, incised spiral lines, which, however, do not enclose equal spaces. The space between the first and second, second and third and sixth and seventh is about twice as wide as the space between the summit and the first, and those between the third and fourth and fourth and fifth, while the space between the fifth and sixth and seventh and eighth stand halfway between these in width. In addition to this, there are very finely incised lines in the spaces between the coarse incised lines. On the last turn, where the axial sculpture becomes obsolete, the spiral sculpture is also very irregular and many more incised lines are apparent. Periphery of the last whorl well rounded. Base short, well rounded, marked by the feeble continuations of the irregular axial ribs, which form mere threads, and in that fashion extend to the umbilical chink, and numerous closely spaced spiral striations.

Aperture subquadrate; posterior angle obtuse; outer lip thin, bearing three spiral lirae within; inner lip somewhat twisted, almost vertical, its edge reflected and appressed to the preceding whorl for one-third of its length.

Type.—Cat. No. 333510, U.S.N.M., has 14.5 whorls and measures: Length, 20.8 mm.; diameter, 4.9 mm.

Five additional specimens, Cat. No. 352510, U.S.N.M., are also in the National Museum collection, and 20 are in the Oldroyd collection.

This species is related to *Turbonilla* (*Mormula*) *tridentata* Carpenter, but is much larger than that species.

ODOSTOMIA (IVARA) AMAVA, new species.

Plate 1, fig. 7.

Shell elongate ovate, yellowish white. Nuclear whorls deeply immersed in the first of the postnuclear turns, above which the outer edge of the last whorl only projects. Postnuclear whorls very broadly flatly tabulated at the summit, with a sharp angle at the shoulder of the summit, the portion anterior to the shoulder moderately well rounded and crossed by feeble, almost vertical, axial ribs, of which 32 occur upon the third, while upon the last whorl they become decidedly irregular in strength and spacing. On the third whorl the spaces that separate the ribs are almost as wide as the ribs. In addition to the axial sculpture, the whorls are marked by spiral striations, which cause the spaces between them to appear as raised flattened cords. These are poorly defined on the first two turns in the type, while on the third there are eight between the summit and the suture and nine on the last whorl. Periphery of the last whorl well rounded. Base rather long, well rounded, marked by the feeble continuations of the axial ribs, and eight incised spiral lines, the combinations of the two forming a sculpture corresponding with that on the spire. Aperture elongate ovate; posterior angle rendered decidedly obtuse by the tabulated summit; outer lip thin; inner lip strongly curved, with a conspicuous fold at its insertion; parietal wall covered by a thin callus.

Type.—Cat. No. 352514, U.S.N.M., has 4.5 postnuclear whorls and measures: length, 3.8 mm.; diameter, 1.8 mm.

Compared with *Odostomia* (*Ivara*) *turricula* Dall and Bartsch, the present species is differentiated by its much more robust form and coarser sculpture.

ODOSTOMIA (CHRYSALLIDA) GOMPHINA, new species.

Plate 1, fig. 3.

Shell very elongate ovate, yellowish white. Nuclear whorls deeply, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects, which appears well

rounded and smooth. Postnuclear whorls well rounded, narrowly shouldered at the summit, marked by strong, decidedly retractively slanting axial ribs, of which 18 occur upon the first, 20 upon the second, 22 upon the third, and 26 upon the last turn. In addition to the axial ribs, the whorls are crossed by 4 equal and equally spaced spiral cords, which are about as wide as the spaces that separate them. The first of these is at the summit. The intersection of the axial ribs and spiral cords forms strong, rounded tubercles which have their long axes, which are only slightly greater than the shorter, parallel with the spiral sculpture. Periphery of the last whorl marked by a spiral cord, which falls partly in the suture on the last two turns. Suture not channeled. Base moderately long, well rounded, with a narrow umbilical chink, marked by 10 spiral cords, which become successively narrower and closer spaced from the periphery to the umbilical chink. Aperture ovate; posterior angle acute; outer lip thin; inner lip strongly curved and decidedly reflected and appressed to the base, provided with a rather strong fold at the insertion of the columella; parietal wall covered with a rather thick callus, which alone renders the peritreme complete.

Type—Cat. No. 352515, U.S.N.M., has 5 postnuclear whorls and measures: Length, 3.2 mm.; diameter, 1.4 mm.

The present species is related to the recent group of which *Odostomia* (*Chrysallida*) *benthina* and *O.* (*C.*) *promeces* are members.

An additional specimen is in the Oldroyd collection.

ODOSTOMIA (CHRYSALLIDA) SCELERA, new species.

Plate 1, fig. 4.

Shell elongate conic, yellowish white. Nuclear whorls small, deeply, obliquely immersed in the first of the postnuclear turns, above which the tilted edge of the last volution only projects. Postnuclear whorls strongly shouldered at the summit, marked by very strong, retractively slanting axial ribs, of which 14 occur upon the second and third, 16 upon the fourth, and 20 upon the last turn. In addition to the axial ribs, the whorls are marked by 4 strong spiral cords, which are not quite equal to the axial ribs in strength, and which render the junction with the axial ribs strongly nodulose, the nodules being a little longer than wide. The spaces inclosed between the axial ribs and spiral cords are rectangular pits. Periphery of the last whorl marked by a strong cord, separated from the last cord on the spire by a channel as wide as that separating the other cords of the spire, and crossed by the continuations of the axial ribs which terminate at the posterior border of the peripheral cord. Suture strongly channeled. Base feebly rounded, marked by four spiral

cords, which are successively closer spaced and weaker from the posterior anteriorly, the fourth being really a broad, tumid area, surrounding the umbilical chink. The broad channels separating these cords are crossed by numerous slender axial threads. Aperture oval; posterior angle acute; outer lip thin at the edge, thick within; inner lip curved, reflected over and appressed to the preceding turn, provided with a strong, oblique fold at its insertion; parietal wall covered by a thick callus.

Type.—Cat. No. 352516, U.S.N.M., has 5 whorls and measures: Length, 3.2 mm.; diameter, 1.5 mm.

This is most nearly related to *Odostomia* (*Chrysallida*) *heterocincta* Bartsch, from which it is at once distinguished by its more robust size and less acutely tuberculated sculpture.

Cat. No. 352517, U.S.N.M., contains 2 more specimens from the type locality, and 6 additional specimens are in the Oldroyd collection.

ODOSTOMIA (EVALEA) TERSA, new species.

Plate 1, fig. 10.

Shell elongate conic, yellowish white. Nuclear whorls deeply, obliquely immersed in the first of the postnuclear whorls, above which only the tilted edge of the last volution projects. Postnuclear whorls rather high between summit and suture, slightly rounded, narrowly shouldered at the summit and marked only by lines of growth and very fine spiral striations. Suture slightly constricted. Periphery of the last whorl well rounded. Base slightly inflated, rather long, narrowly umbilicated, marked like the spire. Aperture long, oval; posterior angle acute; outer lip thin at the edge, thick within; inner lip oblique, slightly sinuous, provided with a strong fold opposite the umbilical chink; parietal wall covered by a moderately thick callus.

Type.—Cat. No. 352518, U.S.N.M., has 5 postnuclear whorls remaining, having lost probably the first half of the postnuclear turn, and measures: Length, 5 mm.; diameter, 2 mm.

Cat. No. 352519, U.S.N.M., contains 2 specimens from the type locality, one of which served for description of the nucleus. Four additional specimens are in the Oldroyd collection.

The present species recalls *Odostomia* (*Evalea*) *valdezi* Dall and Bartsch, but is more than double the size of that species in every way. The fine spiral striations have been omitted in the figure.

ODOSTOMIA (EVALEA) ITHEA, new species.

Plate 1, fig. 2.

Shell regularly broadly conic, yellowish white. Nuclear whorls small, obliquely immersed in the first postnuclear turn, above which

only the tilted edge of the last turn projects. Postnuclear whorls slightly rounded, narrowly shouldered at the summit, marked by fine lines of growth and rather coarse spiral striations. Suture slightly constricted. Periphery of the last whorl rounded. Base short, well rounded, somewhat inflated, narrowly umbilicated, and marked like the spire. Aperture moderately long, oval; posterior angle acute; outer lip thin at the edge, thick within; inner lip strongly curved, with a strong fold opposite the umbilical chink; parietal wall covered by a thin callus.

Type.—Cat. No. 352520, U.S.N.M., has 6.5 postnuclear whorls and measures: Length, 5.6 mm.; diameter, 2.4 mm.

An additional specimen is in the Oldroyd collection.

This species suggests *Odostomia (Evalea) youngi* Dall and Bartsch, but is distinguished from this at once by its more broadly conic outline.

ODOSTOMIA (EVALEA) MANCA, new species.

Plate 1, fig. 5.

Shell very elongate ovate, yellowish white. Nuclear whorls small, deeply, obliquely immersed in the first of the postnuclear whorls, above which only the tilted edge of the last volution projects. Postnuclear whorls slightly rounded, very narrowly shouldered at the summit, marked by fine lines of growth and moderately strong spiral striations. Suture slightly constricted. Periphery of the last whorl slightly inflated, well rounded. Base short, well rounded, not umbilicated, marked like the spire. Aperture elongate oval; posterior angle acute; outer lip thin; inner lip slightly curved, reflected, and appressed for half its length to the base, provided with a strong fold at its insertion; parietal wall covered by a moderately thick callus.

Type.—Cat. No. 352521, U.S.N.M., has 6 postnuclear whorls and measures: Length, 5.5 mm; diameter, 2.3 mm.

Cat. No. 352522, U.S.N.M., contains 10 additional specimens from the type locality, and there are 49 in the Oldroyd collection.

The present species recalls *Odostomia (Evalea) resina* Dall and Bartsch, which is fully four times as large.

ODOSTOMIA (EVALEA) CIVITELLA, new species.

Plate 2, fig. 7.

Shell rather large, milk white. Nuclear whorls small, deeply immersed in the first of the succeeding turns, above which the tilted edge of the last volution alone projects. Postnuclear whorls moderately well rounded, narrowly shouldered at the summit, marked by numerous rather regular lines of growth and rather coarse spiral striations, which cause the space between these striations to appear

like slender lirations, and lend to the surface a reticulated appearance. Suture well constricted. Periphery slightly angulated at the early whorls, but rounded on the last. Base very narrowly umbilicated, slightly inflated, well rounded, and marked like the spire. Aperture broadly oval; posterior angle acute; outer lip thin at the edge, thick within; inner lip strongly curved, reflected over but not appressed to the base, provided with a strong, oblique fold opposite the umbilical chink; parietal wall covered with a thin callus.

Type.—Cat. No. 352523, U.S.N.M., has almost 6 postnuclear whorls and measures: Length, 6 mm.; diameter, 2.7 mm.

Cat. No. 352524, U.S.N.M., contains 5 additional specimens from the type locality, and there are 10 in the Oldroyd collection.

This species, while it belongs to the coarsely sculptured group of *Evalea*, does not seem to be very closely related to any of the described forms.

ODOSTOMIA (EVALEA) FITELLA, new species.

Plate 1, fig. 8.

Shell very regularly elongate conic, yellowish white. Nuclear whorls rather large, deeply, obliquely immersed in the first of the succeeding turns, above which only the tilted edge of the last volution projects. Postnuclear whorls well rounded, very narrowly shouldered at the summit, marked by fine lines of growth and fine spiral striations. Suture slightly constricted. Periphery of the last whorl slightly angulated. Base short, well rounded, somewhat inflated, broadly umbilicated, marked like the spire. Aperture elongate ovate; posterior angle acute; outer lip thin at the edge; inner lip almost straight, reflected but not appressed to the base; parietal wall covered by a thick callus, which renders the peritreme complete.

Type.—Cat. No. 352525, U.S.N.M., has 6.5 postnuclear whorls and measures: Length, 5.9 mm.; diameter, 2.5 mm.

Cat. No. 352526, U.S.N.M., contains 2 specimens from the type locality, and there are 4 additional in the Oldroyd collection.

The present species has no near relatives among the recent shells so far described.

ODOSTOMIA (AMAURA) MENZOLA, new species.

Plate 2, fig. 6.

Shell small, elongate ovate. Nuclear whorls obliquely immersed in the first of the postnuclear turns, above which only the tilted edge of the last volution projects. Postnuclear whorls slightly rounded, narrowly shouldered at the summit, marked by retractively slanting lines of growth and microscopic spiral striations. Suture well

marked, slightly constricted. Periphery of the last whorl and the short base well rounded and inflated, the latter narrowly umbilicated and marked like the spire. Aperture very broadly ovate; posterior angle obtuse; outer lip thin at the edge; inner lip somewhat sinuous, reflected over but not appressed to the base, provided with a strong oblique fold; parietal wall glazed with a thin callus.

Type.—Cat. No. 352527, N.S.N.M., has 6 postnuclear whorls and measures: Length, 6.2 mm.; diameter, 3 mm.

Cat. No. 352528, U.S.N.M., contains 5 specimens from the type locality and there are 10 additional specimens in the Oldroyd collection.

This form is related to *Odostomia* (*Amaura*) *helena* Bartsch, but is about double the size of that species. The fine spiral striations have been omitted in the figure.

ODOSTOMIA (AMAURA) TROCHILIA, new species.

Plate 2, fig. 1.

Shell broadly ovate, yellowish white. Nuclear whorls deeply, obliquely immersed in the first of the postnuclear turns, above which the tilted edge of the last volution alone projects. Postnuclear whorls well rounded, narrowly tabulately shouldered at the summit, marked only by lines of growth and microscopic spiral striations. Suture constricted. Periphery of the last whorl and the short, narrowly umbilicated base well rounded, marked like the spire. Aperture large, ovate; posterior angle acute; outer lip thin at the edge, thick within; inner lip somewhat sinuous, reflected over but not appressed to the base, provided with a strong oblique fold a little anterior to the insertion of the columella; parietal wall glazed by a thin callus.

Type.—Cat. No. 352529, U.S.N.M., has 5.5 postnuclear whorls and measures: Length, 6.6 mm.; diameter, 3.2 mm.

The present form is nearest related to *Odostomia* (*Amaura*) *engbergi* Bartsch, from which it differs by its less rounded whorls and little more acutely tabulated shoulder.

An additional specimen, Cat. No. 352530, U.S.N.M., is likewise in the collection. The fine spiral striations have been omitted in the figure.

ODOSTOMIA (AMAURA) SANESIA, new species.

Plate 1, fig. 13.

Shell moderately large, elongate conic, yellowish white. Nuclear whorls deeply, obliquely immersed in the first of the succeeding turns. Postnuclear whorls well rounded, narrowly shouldered at the summit, marked by coarse lines of growth and microscopic spiral striations. Suture moderately constricted. Base short, inflated, with an

umbilical chink, but not openly umbilicated, marked like the spire. Aperture short, broadly oval; posterior angle acute; outer lip thin at the edge; inner lip strongly curved, slightly sinuous, provided with a very strong oblique fold a little anterior to the insertion of the columella; parietal wall covered by a thin callus.

Type.—Cat. No. 352531, U.S.N.M., has 6.3 postnuclear whorls and measures: Length, 8.7 mm.; diameter, 4 mm.

An additional specimen is in the Oldroyd collection.

The present form is related to *Odostomia* (*Amaura*) *sanjuanensis* Dall and Bartsch, but differs from it by its larger size and a little less sloping shoulder, as well as minor sculptural characters. The fine spiral striations have been omitted in the figure.

ODOSTOMIA (AMAURA) TIMESSA, new species.

Plate 2, fig. 4.

Shell large, elongate conic, broadly umbilicated, yellowish white. Nuclear whorls deeply, very obliquely immersed in the first postnuclear turn, above which only the tilted edge of the last volution projects. Postnuclear whorls well rounded, narrowly shouldered at the summit, marked by numerous lines of growth and very fine spiral striations. Suture somewhat constricted. Periphery of the last whorl inflated, well rounded. Base strongly inflated, well rounded, marked like the spire. Aperture large; posterior angle acute; outer lip thick within; inner lip curved and provided with a strong oblique fold a little anterior to its insertion; parietal wall covered by a thin callus.

Type.—Cat. No. 352532, U.S.N.M., has almost 7 postnuclear whorls and measures: Length, 7.4 mm.; diameter, 3.2 mm.

Two additional specimens are in the Oldroyd collection.

This species is related to *Odostomia* (*Amaura*) *washingtona* Bartsch, but is in every way smaller than that species. The fine spiral striations have been omitted in the figure.

EPITONIUM CONTINUATUM, new species.

Plate 2, fig. 10.

Shell small, acute, with a smooth nucleus of two, and six and a half subsequent well rounded whorls; suture deep but not solute; with twelve vertical sharp varices continuous over the suture and making nearly a complete circuit around the spire; there is no angle on the varices at the shoulder and no spiral sculpture or basal disk; the aperture is subovate and the base imperforate; length of shell, 8; of last whorl, 3.6; maximum diameter, 3.5 mm.

Type.—Cat. No. 352383, U.S.N.M.

One specimen was obtained.

LIRULARIA MAGNA, new species.

Plate 2, figs. 2, 3, and 5.

Shell large for the group, trochiform, originally mottled on the prominences with dark and light articulation, with a small smooth nucleus and about five whorls; suture distinct, very narrow; whorls very slightly convex; periphery rounded; spiral sculpture of (on the last whorl behind the periphery four or five, and on the base as many more) rather prominent threads with much wider interspaces: there is also more or less fine spiral striation; axial sculpture of fine regular silky retractively oblique incremental lines; the spiral threads, especially on the earlier whorls, are sometimes obscurely beaded; the base is moderately convex with a small funicular umbilicus, axially striate; aperture rounded, oblique, the margins simple, with no internal lirae; height of shell, 10; of last whorl, 6; maximum diameter, 8 mm.

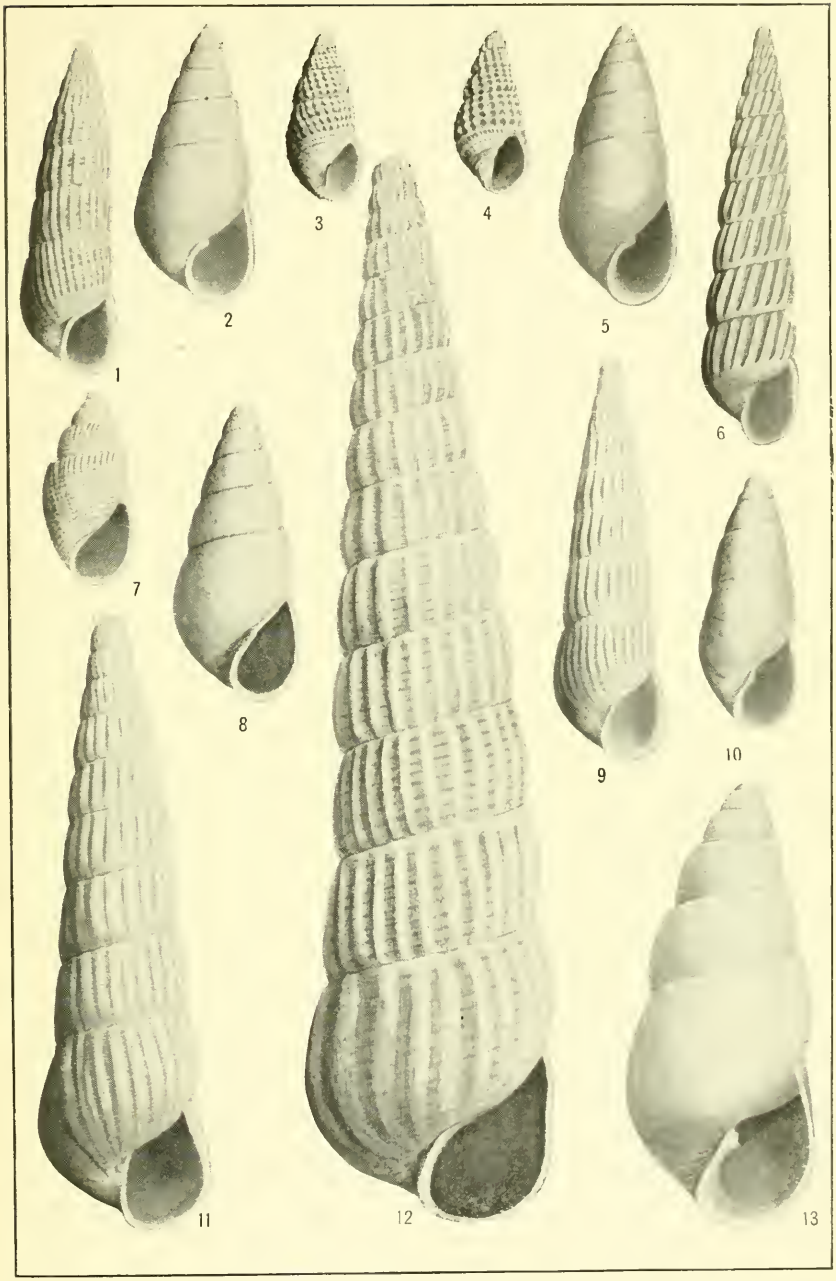
Type.—Cat. No. 352410, U.S.N.M.

There is some variation in the height of the specimens, some being slightly more elevated than others in proportion to their diameter. The species is the largest of the group yet known.

EXPLANATION OF PLATES.

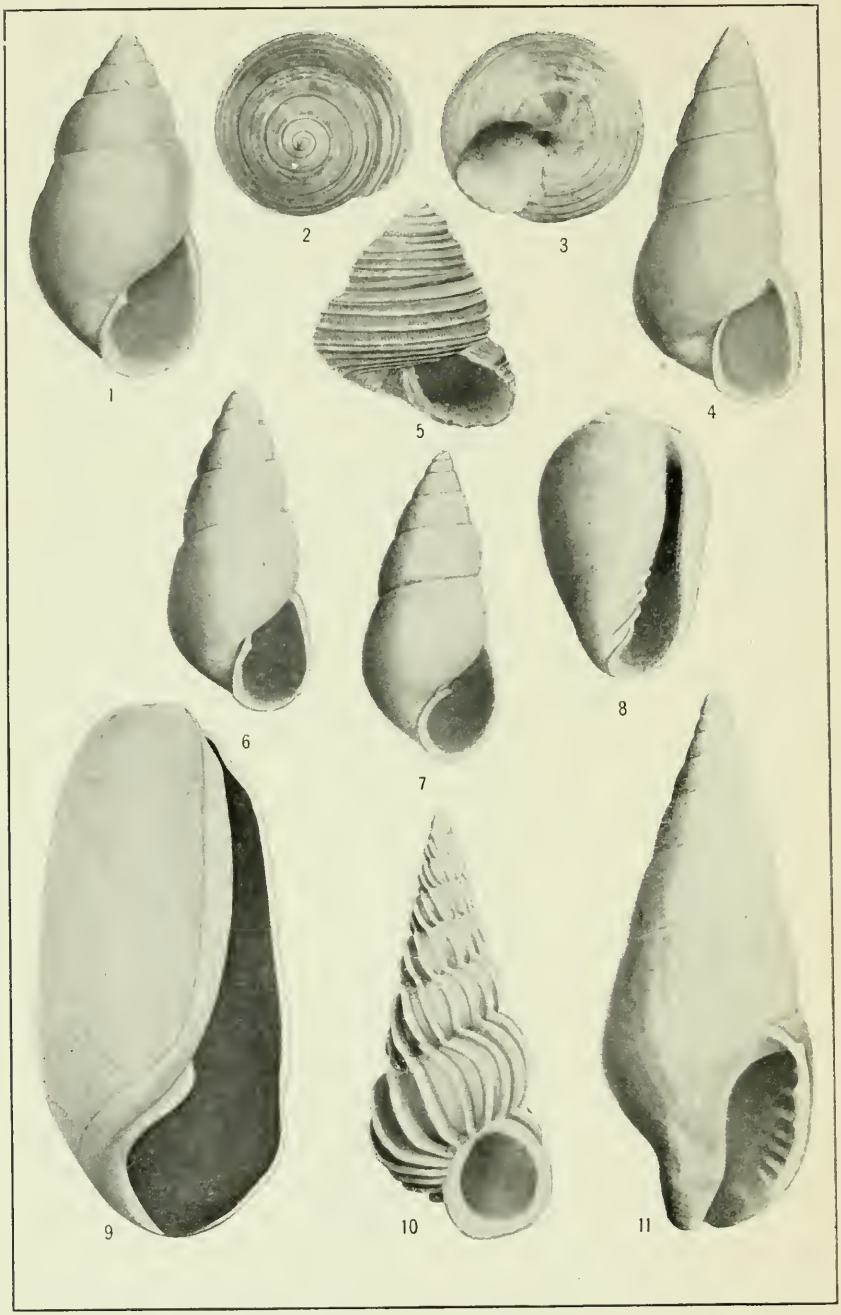
All figures are photographs of the types.

PLATE 1.



LOWER SAN PEDRO PYRAMIDELLIDS

FOR DESCRIPTION OF PLATE SEE PAGE 38



LOWER SAN PEDRO FOSSIL SHELLS

FOR DESCRIPTION OF PLATE SEE PAGE 39

PLATE 2.

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