

NOTES ON THE MOLLUSKS OF THE VICINITY OF SAN DIEGO, CAL.,
AND TODOS SANTOS BAY, LOWER CALIFORNIA.

By CHARLES R. ORCUTT,* with comments by W. H. DALL.

During the past few years I have made extensive collections, mainly of littoral shells, in this vicinity, and have had opportunity for making hasty notes and collections while botanizing on the shores of All Saints (Todos Santos) Bay, situated about 50 miles south of San Diego. From material collected, the marine fauna of San Diego appears to possess a larger number of the species of the Lower Californian coast than of the Californian province to the north, while few species can be considered as locally characteristic with our present knowledge of their distribution.

San Diego Bay is protected on the west by a high promontory, Point Loma, with a rocky ocean beach and a shingle beach by the entrance to the harbor. Inside of the entrance is an extensive bed of clay and boulders at what is known as La Playa, and this station forms the principal home of the pholads, rock pectens (*Hinnites gigantea* Gray), and other shells not elsewhere found abundantly. The bay is protected on the southwest by a low, narrow peninsula, with a hard, sandy ocean beach, and sand or mud on the bay side. North of San Diego Bay lies a large lagoon known as False Bay, which possesses extensive muddy flats and a narrow peninsula of sand dunes on the west. Inside of this bar is a stretch of rocky beach, famous as a clam bed, and to this reference is usually made when False Bay is mentioned. North of the ocean side of this peninsula the beach is similar to that on the west of Point Loma, rocky pools with irregular stretches of flat or broken boulders partially imbedded in shell sand, beneath which a rich harvest of small species may be anticipated.

Todos Santos (or All Saints) Bay is unprotected from the surf, and on the north and south possesses rocky beaches, between which on the east lies about 20 miles of hard, sandy beach, poor in living shells. The north beach is of a volcanic formation, while on the south it is largely composed of fossil shells, of which there is an immense deposit. When the station is not mentioned, the species has been found at both San Diego and on Todos Santos Bay. The determinations have largely been made or verified by George W. Tryon, jr., of Philadelphia, and William H. Dall, of Washington, to whom I am greatly indebted. Specimens of the more interesting species have been contributed to the United States National Museum and the Museum of the Academy of Natural Sciences at Philadelphia.

* The specific nomenclature of this paper has been revised by Mr. W. H. Dall at Mr. Orcutt's request; the rarer species have been examined, and several doubtful species have been determined by Mr. Dall from the types in the National Museum. Occasional notes in brackets have also been added by Mr. Dall.

CEPHALOPODA.

Octopus punctatus Gabb.

Common on rocky beaches.

GASTROPODA.

Murex trialatus Sby.

Rocky beaches, rare at San Diego, more common south. Varies in color from pure white to brown, often banded.

Cerostoma nuttallii Conr.

Rocky beaches, abundant and very variable in form and color. The pure white, olivaceous, banded and brown varieties are distinctly and prettily marked. Also at Todos Santos Bay.

Muricidea barbarentis Gabb.

A very large and old specimen of this was found on the ocean side of Point Loma, inhabited by a hermit crab.

Muricidea incisa Brod.

Rare, occasionally found near low-water mark.

Pteronotus festivus Hinds.

Abundant at False Bay, La Playa, and Todos Santos Bay, among small, angular boulders.

Ocenebra subangulata Stearns.

A live individual washed ashore on a piece of kelp, found on the ocean side of the San Diego peninsula, is now in the collection of the Phil.-Acad. Sci.

Ocenebra interfossa Cpr.

Under rocks partially imbedded in shell sand, rocky beaches, with the following species:

Ocenebra gracillima Stearns.

Under stones, on stony beaches. San Diego.

Ocenebra interlirata Stearns.

San Diego. Rare.

Ocenebra poulsonii Nutt.

Equally abundant and in similar situations with *Pteronotus festivus*, Hds. Also at Todos Santos Bay.

Purpura saxicola Val.

Abundant on a rocky beach just south of the boundary line, but not noticed on other ocean beaches either at San Diego or All Saints Bay.

Purpura biserialis Blainv.

A single living specimen from the beach north of False Bay, near La Hoya.

[This is the most northern locality known for this species. The specimen is large and fine. D.]

Monoceros lugubre Sby.

Abundant at Todos Santos Bay and north to near the United States line. Light-colored individuals were found of a shade of yellow ochre, merging to white.

Monoceros engonatum Conr.

Abundant on exposed shingle beaches.

Monoceros pauciliratum Stearns.

Exposed shingle beaches. Also at Todos Santos Bay.

[This species forms the link between the two preceding species. D.]

Monoceros engonatum var. **spiratum** Blainv.

More common on sheltered rocky beaches.

Chorus belcheri Hds.

Formerly abundant at San Diego (during the early whale fisheries), where it is now rare. Common at Todos Santos Bay.

Ranella californica Hds.

Very abundant in January, when it comes into sheltered places for breeding. Its favorite ground is on the sandy beach inside of the False Bay peninsula, where it finds abundant food, preying on *Echinarachnius excentricus*, *Renilla amethystina*, etc. The dead shells of this, *Chorus Belcheri* and *Siphonalia Kellettii* are washed up in great numbers at Todos Santos Bay.

Fusus kobelti Dall, var. **unicolor**.

One specimen. San Diego.

[It differs from the type in being more slender and in the absence of the usual chocolate color on the larger ribs. D.]

Siphonalia kellettii Fbs.

Very rare at San Diego, apparently abundant at Todos Santos Bay, where large numbers of dead shells are washed ashore.

[Dredged alive in 16 fathoms off Catalina Island Harbor in 1873. D.]

Macron lividus A. Ad.

Not rare near low water; ocean beaches. Also Todos Santos Bay.

Nassa fossata Gould.

Dead shells of this and the following abundant, apparently common in deep water.

Nassa perpinguis, Hinds.

San Diego. Also at Todos Santos Bay.

[Not rare at Catalina in 16 fathoms. D.]

Nassa mendica var. **cooperi** Fbs.

Rare at low water at La Playa, also at Todos Santos Bay.

Nassa tegula Rve.

Abundant on muddy bay shores.

Mitra maura Swains.

Dead shells often washed ashore on the ocean beaches.

Erato vitellina Hds.

Not common.

Erato columbella Mke.

False Bay and La Playa. Rare.

Marginella regularis Cpr.

San Diego. Not rare.

Marginella subtrigona Cpr.

San Diego. Rare.

Volutella pyriformis Cpr.

On sea-grass, probably abundant, San Diego Bay.

Volvarina varia Sby.

Common beneath rocks partially imbedded in shell sand, ocean beaches.

Olivella buplicata Sby.

Abundant on sandy ocean beaches about May. Pure white and, more rarely, black individuals may be found.

Olivella bætica Cpr.

Abundant on sandy beaches at False Bay and elsewhere in May.

Columbella fuscata Sby.

One specimen found on sea-grass at San Diego.

Columbella (Astyris) carinata Hds., and var. *Hindsii* Rve.

Found abundantly on sea-grass during the spring. Very variable in form and coloring.

Columbella (Astyris) tuberosa Cpr.

Dead specimens abundant; not found alive.

Amphissa versicolor Dall.

Not rare, with *Volvarina varia*, Sby.

Anachis subturrita Cpr.

Found among oyster shells from an old pile below low-water mark.

Myurella simplex Cpr.

Abundant at low water on the sandy shores of San Diego Bay.

Surcula carpenteriana Gabb.

Todos Santos Bay, dead on beach.

Drillia moesta Cpr.

Abundant in the spring at La Playa and elsewhere. Also at Todos Santos Bay.

Drillia inermis Cpr.

Specimens occasionally found at low water, but apparently common in deeper water.

Mangilia angulata Cpr.

Not common; sandy beach at La Playa, with *Cylichna inculta* Gld.

Mitromorpha filosa Cpr.

Under boulders imbedded in shell sand, ocean beaches, near low-water mark; rare. Also at Todos Santos Bay.

Conus californicus Hds.

Abundant on sandy beaches at La Playa, False Bay, and elsewhere during the spring.

Cypræa spadicea Gray.

This beautiful shell was found abundant at False Bay during April and May at very low water, but elsewhere and at other times only dead specimens have been found. From beach-worn specimens it appears

more common south and to attain a larger size than those found living at San Diego.

[Very large dead specimens were found on beach at Catalina Island on the side of the isthmus opposite the harbor. D.]

Trivia californica Gray.

Dead specimens of this are not uncommon, but I have not found it living.

Trivia solandri Gray.

Rare; living specimens have been found at La Playa and False Bay during the spring tides. Dead specimens not rare at Todos Santos Bay.

Lunatia lewisii Gld.

Rare; apparently common in deep water and farther south.

Neverita reclusiana Petit.

Not rare on bay shores, at very low water, especially during the spring.

Sigaretus debilis Gld.

I have a single broken individual from San Diego, and another from Todos Santos Bay.

Lamellaria diegoënsis Dall, n. s., Pl. XXIV, figs. 1-3.

False Bay at low water, April and May; rare. When living the soft parts completely cover the shell and are, in part, of a vivid red color similar to that of *Doris sanguinea*.

[Soft parts as contracted in alcohol about .65 inch in length, above smooth or nearly so, dull white or grayish, beneath lighter colored; form rounded oval, a well-marked notch in the mantle edge (notaeum) a little to the left of the middle line in front; foot rather large, rounded behind, nearly transversely truncate in front with rounded corners and the front margin deeply grooved or double; head dark gray above, flattened; tentacles obtusely tapering, somewhat flattened; eyes large and black, on tubercles outside of the bases of the tentacles; mouth hidden under the head, small; verge extremely large, broad, flattened extending forward beyond the head, curved to the left in a broad ascending spiral; smooth below, granulous above with a short line of elevated papillæ inside the edge of the outer part; beyond the curve is an indentation on the left side behind which is a stout conical papilla from the apex of which extends upward a slowly tapering cylindro-conic tubular portion; the nuchal cavity is prolonged backward under the anterior edge of the immersed shell; shell calcareous except the immediate margins of the aperture, grayish waxen white, slightly iridescent with a mucilaginous polish like dry glue inside and out, somewhat malleated, with indications of the lines of growth by obscure slightly elevated transverse waves and faint irregular spiral tracings; three-whorled, very much inflated, though the form varies slightly between individuals and probably between the sexes; nucleus small, smooth: suture deep, not channeled; spire pervious from below; columella less

calcareous than the shell in general, without callus or any thickening, twisted into an open spiral, continuous with the outer lip in front only; aperture very oblique, subquadrate. Alt. 15; max. lat., 17; long. of aperture, 12; lat. of aperture, 10^{mm}.

This shell was first received from Mr. Henry Hemphill at San Diego; subsequently other specimens came to hand from Cape St. Lucas. As will be seen from the characters of the soft parts, it is a true *Lamellaria* (*Marsenia*, Leach, is a later and synonymous name). It is more inflated and elevated than any European or West American form known to me.

Lamellaria stearnsii Dall (1871) is a depressed and much more calcareous species, which has the soft parts translucent white, and the shell distinctly finely striated. *Lamellaria rhombica* Dall proves to be a *Marsenina*, though the shell does not greatly differ from that of *L. stearnsii*, and should take the name of *Marsenina rhombica*. The two forms of *L. stearnsii*, one of which was described as a variety *orbiculata*, may turn out to be only sexually distinct, as the differences are such as mark the two sexes of the common British species according to Jeffreys. Both the just mentioned forms, as well as *Marsenina rhombica*, were collected at Monterey; while *L. diegoensis* seems to belong to the southern fauna. D.]

Crucibulum spinosum Sby.

Common rocks and shells along bay shores.

Crepidula adunca Sby.

Not rare on *Norrisia Norrisii*.

Crepidula rugosa Nutt.

Abundant on *Pecten æquisulcatus* and other shells and stones in San Diego Bay, Todos Santos Bay and elsewhere.

Crepidula navicelloides Nutt.

Abundant in the interior of dead univalves, varying in size according to the shell occupied.

In dead bivalves assuming the form *nummaria* Gould.

Crepidula dorsata var *lingulata* Gld.

Abundant on rocks at La Playa and elsewhere. Very variable in form, but well marked by the form of the deck.

Hipponyx tumens Cpr.

Abundant with the next species.

Hipponyx antiquatus L., var. *serratus* Cpr.

Abundant under stones or shelving rocks, ocean beaches.

Scalaria hindsii Cpr. and var. *subcoronata*.

Not common.

Scalaria indianorum Cpr.

Not rare; San Diego.

Scalaria bellastrata Cpr.

Very rare. San Diego.

Opalia crenatoides Cpr.

San Diego; not common. Also Todos Santos Bay.

Ianthina bifida Totten.

Specimens often washed ashore at San Diego.

Odostomia nuciformis Cpr. var. *avellana* Cpr.

San Diego.

Odostomia inflata Cpr.

San Diego; not rare. Also a variety (?) more slender and elevated proportionally, but otherwise similar.

Odostomia æquisculpta Cpr.

Abundant on the shells of *Haliotis*.

[San Diego to Cape St. Lucas. D.]

Turbonilla torquata Gld.

Abundant on the shells of *Haliotis*.

Turbonilla aurantia Cpr.

San Diego.

Chrysallida pumila Cpr.

[Rare. Todos Santos. D.]

Obeliscus variegatus Cpr.

San Diego Bay; dead specimen; rare.

Litorina planaxis Phil.

Abundant.

Litorina scutulata Gld.

More abundant than the above in sheltered places.

[Also var. *L. plena* Gld. very large and fine. D.]

Lacuna variegata Cpr.

On sea-grass; abundant in the spring.

Lacuna unifasciata Cpr.

San Diego. Not common.

Rissoina interfossa Cpr.

[Todos Santos. D.]

Isapis fenestrata Cpr.

Specimens from among oyster shells below low water, off an old pile from San Diego Bay. Also Todos Santos Bay.

Mesalia tenuisculpta Cpr.

San Diego.

Bittium quadrifilatum Cpr.

San Diego.

Bittium armillatum Cpr.

Abundant on sponges found during the spring on muddy flats, San Diego Bay, at low water; dead ones abundant among worn shells.

Cerithiopsis assimilata C. B. Adams.

San Diego. Not found alive.

Cerithidea sacrata Gld.

Abundant in salt marshes and on muddy flats.

Cæcum californicum Dall.*Cæcum Cooperi* Cpr. Suppl. Rep. Br. As. 1864, p. 655, *not**Cæcum Cooperi* Smith, Ann. Lyc. Nat. Hist. N. Y., pp. 154, 163. 1862.

San Diego. Cooper.

[The above synonymy shows that of the two species named *C. Cooperi*, that of Mr. Sanderson Smith has priority, and consequently the Californian species is the one which must take a new name instead of the New York form. Through a failure to observe this Dr. Cooper fell into the error of renaming *C. Cooperi* (New York) as *C. Smithii* (Proc. Phil. Acad. Nat. Sci. 1872, p. 154). D.]

Cæcum orcutti Dall, n. s.

[Shell small, stout, smooth, but not polished, light warm brown in color and without sculpture, except very slight lines of growth. Shell slightly curved, the anterior aperture very oblique, about at right angles to the plane of the diameter of the plug, the superior margin being the anterior; plug glandiform, smooth, rounded without mucro; operculum brown, thin, smooth. Lon. of shell, 2.00; diameter 0.75^{mm}.

San Diego, Orcutt, abundantly, under stones.

This is the smallest and the only smooth Californian species of the genus. D.]

Jeffreysia translucens Cpr.

One specimen, San Diego.

Barleeia subtenuis Cpr.Very abundant in the spring on sea-grass; also var. *rimata*, Cpr.

[Very frequently with a small *Spirorbis* growing on it larger than the shell. D.]

Barleeia haliotiphila Cpr.

San Diego. Rare.

Bithinella binneyi Tryon.

Freshwater springs at Campo, San Diego County, California.

Bithinella intermedia Tryon.

Freshwater springs on Cuyamaca Mountain, at a higher altitude than the last.

Truncatella californica Pfr.

Abundant.

Truncatella stimpsonii Stearns.

Found this species in considerable numbers in company with *Pedipes unisulcatus*, on and under smoothly-worn boulders in caves on the ocean beach north of False Bay, near high-water mark.

Phasianella compta Gld.

Thousands found in sea-grass on the inside of San Diego peninsula in November, 1881. Usually incrustated with a small polyzoan (*Defrancia intricata*).

[The operculum is white, prettily clouded with dark green. D.]

Eucosmia substriata Cpr.

[Rare, San Diego, Dall. Catalina Island, rare, Cooper.]

Pomaulax undosus Wood.

Common.

Liotia acuticostata Cpr.

San Diego. Rare.

Omphalius fuscescens Phil.

Abundant on rocky beaches. Also Todos Santos Bay.

Omphalius aureotinctus Fbs.

Rocky ocean beaches. Not rare.

Chlorostoma funebre A. Ad.

Common on shingle beaches.

Chlorostoma gallina Fbs.

Rocky ocean beaches; abundant. Also Todos Santos Bay. The young are sometimes of a brick-red color.

Chlorostoma brunnea Phil.

One from a shingle beach at Todos Santos Bay.

Chlorostoma pfeifferi Phil.

One dead specimen from San Diego.

Norrisia norrisii Sby.

Abundant on kelp along the coast.

Calliostoma canaliculatum Mart.

On kelp, specimens are rarely washed ashore.

Calliostoma annulatum Mart.

I have one specimen from from a San Diego beach.

Calliostoma costatum Mart.

Not often washed ashore.

Calliostoma gemmulatum Cpr.

Often washed ashore at San Diego and Todos Santos Bay.

Leptothyra bacula Cpr.

Abundant under rocks along the ocean beaches.

Leptothyra paucilirata Dall.

Rare.

[Specimens sent were of a magnificent crimson color. D.]

Leptothyra sanguinea var. *lurida* Dall.

Less common than the last.

[This form has a dull olivaceous cast sometimes mottled with whitish. The sculpture is more compact and closer, the nacre less brilliant than that of Monterey specimens; they are also smaller on the average. D.]

Haliotis assimilis Dall.

Numerous dead specimens are washed ashore at the boundary beach from deep water.

Haliotis cracherodii Leach.

Abundant at common low water on rocky beaches; very variable. Also Todos Santos Bay.

Haliotis splendens Rve.

Numerous at very low water on ocean beaches beneath boulders. Collected extensively by the Indians on Todos Santos Bay during the spring.

Haliotis corrugata Gray.

Apparently a deeper water species; not common.

Ethalia supravallata Cpr.

San Diego. Not rare.

Fissurella volcano Rve.

This is found larger and more numerous at Todos Santos Bay than in the vicinity of San Diego, where it is also abundant.

Fissurella (Glyphis) aspera Esch.

Not common. San Diego.

Fissurella (Glyphis) murina Cpr.

Not common. San Diego.

[This is the *Glyphis densiclathrata* of Californian conchologists, and for a time of Carpenter, but not of Reeve. D.]

Lucapina crenulata Sby.

This great species is not rarely found on the rocky ocean beaches, in pools, or among the sea-grass with *Aplysia Californica* Cp.

[Very young specimens are of a lurid pink. D.]

Fissurellidæa bimaculata Dall.

San Diego. Rare.

Clypidella (?) callomarginata Cpr.

Not common.

[It is not certain that this is a *Clypidella*. D.]

Acmæa mitra Esch.

Deep water; dead shells frequent.

Acmæa insessa Hinds.

On algæ.

Acmæa persona Esch.

Abundant and very variable in form and color.

Acmæa pelta Esch. var.

A small elevated form is found beneath small stones imbedded in sand near high-water mark on the shores of San Diego Bay. It is found in company with *Chiton dentiens*, Gld. and is not rare.

Acmæa asmi Midd.

This very elevated little shell is found abundant on the shells of *Chlorostoma funebrale*, which it closely resembles in color.

Acmæa spectrum Nutt.

An abundant species, very variable in form.

Acmæa patina var. *cumingii* Rve.

Less abundant than the other species.

[This is nearly the southern limit of this form. D.]

Acmæa scabra Nutt.

The more common species at San Diego, also found at Todos Santos Bay.

[Sometimes beautifully mottled like *pintadina* Gld. D.]

Acmaea paleacea Gld.

Common on sea-grass outside the harbor at San Diego, and also found at Todos Santos Bay.

Acmaea depicta Hds.

On sea-grass; not rare.

CHITONIDÆ

Chiton (Leptochiton) nexus Cpr.

San Diego.

Chiton (Trachydermon) dentiens Gld.

With *Acmaea pelta*, var.

San Diego. [*T. pseudodentiens* Cpr. D.]

Chiton (Callochiton) fimbriatus Cpr.

San Diego, Catalina Island.

Chiton (Chætopleura) hartwegii Cpr.

This with the two following are the more common species.

Chiton (Maugerella) conspicua Cpr.

Abundant beneath boulders on shingle beaches.

Chiton (Stenoradsia) magdalenensis Hds.

Beneath boulders at False Bay; not rare.

Chiton (Pallochiton) lanuginosa (Cpr.) Dall, 1878.

[*Hemphillia lanuginosa* Cpr. MSS. The generic name was already preoccupied in *Limacidae*. D.]

Chiton (Lepidopleurus ?) pectinulatus Cpr.

San Diego.

Chiton (Callistochiton) decoratus Cpr.

San Diego.

Chiton (Nuttallina) scabra Reeve.

San Diego.

Chiton (Mopalia) ciliata H. & A. Ad.*Chiton (Mopalia) lignosa* Gld. var. *acuta* Cpr.

OPISTHOBRANCHIA.

Philine, species indet.

Flats on shores of San Diego Bay, with *Haminea vesicula*.

Alys nonscripta A. Ad.

Rare at San Diego.

Tornatella punctocæolata Cpr.

Not common.

Cylichna inculta Gld.

Abundant on the sandy shores of San Diego Bay.

Tornatina eximia Baird.

San Diego Bay.

[Described from Vancouver. D.]

Bulla nebulosa Gld.

Plentiful on muddy flats in spring.

Oct. 26

Vol. VIII, No. 35. Washington, D. C. Sept. 30, 1885.**Haminea** (hydatis ? var.) vesicula Gld.

Sandy bay shores, common, transparent. Also at La Playa, among rocks, a beautiful pink form.

Haminea virescens Sby.

In crevices of rocks and interior of rock pools, abundant.

Aplysia californica Cooper.

Ocean beaches among sea-grass or in rock pools.

Doris sanguinea Cooper.

Under rocks, San Diego; rare.

[NOTE.—The identifications of these nudibranchs are partly provisional in the absence of typically named specimens or figures. D.]

Doris (*Archidoris*) *montereyensis* (Cooper) Bergh.

San Diego; common.

Doris alabastrina Cooper.

San Diego.

Doris albopunctata Cooper.

San Diego.

Doris (*Diaulula*) *sandiegensis* (Cp.) Bergh.

Common, under rocks.

Chromodoris californiensis Bergh.

San Diego; rare. [D.]

PULMONATA.**Melampus olivaceus** Cpr.

Abundant in salt marshes.

Pedipes liratus Binney.

San Diego; rare. [D.]

Pedipes unisulcatus Cpr.With *Truncatella Stimpsonii*, Stearns (alive) and at Todos Santos Bay.**Gadinia reticulata** Sby.

Common beneath shelving rocks on ocean beaches.

ACEPHALA.**Zirphæa crispata** Linné.

La Playa; not abundant.

Netastomella darwini Sby.

Numerous in small bowlders, La Playa.

Parapholas californica Conr.

La Playa; abundant.

Penitella penita Conr.

La Playa.

Martesia intercalata Cpr.Todos Santos Bay imbedded in shells of *Haliotis*.**Solen rosaceus** Gld.

Somewhat abundant at San Diego; also at Todos Santos Bay.

Solecortus californianus Conr.

Abundant, with the less common variety *subteres*.

[Very close to the eastern species. D.]

Siliqua lucida Conr.

Several examples have been found on the sandy ocean beaches at San Diego and Todos Santos Bay.

[This seems to be a valid species, though closely allied to *S. patula*. D.]

Platyodon cancellata Conr.

Abundant at La Playa where they have been collected for food, but the animal is bitter. Also Todos Santos Bay, but not found alive.

Saxicava rugosa Linn.

Young specimens not rarely found among the roots of kelp when washed ashore by a storm.

Corbula luteola Cpr.

Common beneath stones on the ocean beaches that are partially imbedded in shell sand.

Corbula sp. indet.

San Diego and Todos Santos Bay.

[A very thin species, resembling a *Eucharis*; perhaps from Southern fauna. D.]

Cryptomya californica Conr.

Not rare.

Schizothaerus nuttallii Conr.

San Diego; Todos Santos Bay.

Pandora (Clidiophora) punctata Cpr.

Single valves often washed ashore on sandy beaches.

Thracia curta Conr.

Not rarely found imbedded in rocks; San Diego.

Thracia plicata ? Desh.

Numerous dead shells of this are washed up on the shores of San Diego Bay, with *Lyonsia Californica* and other bivalves.

[Described from Southern fauna, but in absence of a larger series the identification is not dogmatic. D.]

Periploma argentaria Conr.

Single valves only found; not common.

Lyonsia californica Conr.

Often washed ashore in great numbers on the bay shores.

Entodesma scammonii Dall.

One example found with the above species.

Mactra planulata Conr.

Ocean beaches; not found abundantly. Also Todos Santos Bay.

Mactra falcata Gld.

Not found abundantly.

[Belongs to Northern fauna. D.]

Semele decisa Conr.

This species, with *Psammobia rubroradiata*, *Saxidomus aratus* and *nuttallii*, *Tapes staminea*, and other bivalves are collected commonly at

False Bay, where they are found imbedded in a coarse deposit of gravel, boulders, and shells that forms a rich ground for marine life. These species are also found, in less quantity, at La Playa, and dead examples indicate their existence at Todos Santos Bay.

Semele rupium Sby.

This abounds on the rocky ocean beaches, but rarely collected alive.

Lutricola alta Conr.

Not plentiful.

Ædalina subdiaphana Cpr.

Bay shores; abundant.

Cooperella scintillæformis Cpr.

With the last; rarer.

Cumingia californica Conr.

La Playa; abundant in dead bivalves or in holes. Todos Santos Bay.

Psammobia rubroradiata Nutt.

Common at False Bay; apparently rare elsewhere.

[Also found at Avatcha Bay, Kamchatka, by me. D.]

Sanguinolaria Nuttallii Conr.

Seemingly plentiful by the quantity of dead examples found on bay shores.

Tellina Bodegensis Hds.

Not plentiful; San Diego.

Tellina Gouldii Hanl.

Abundant; San Diego Bay. Also Todos Santos Bay.

Tellina (Moera) variegata Cpr.

San Diego Bay; fine.

Tellina (Heterodonax) bimaculata Linné.

Abundant along the whole coast.

Macoma secta Conr.

Plentiful at times, as also the two following:

Macoma indentata Cpr.

Macoma inquinata Desh.

Donax californicus Conr.

Abundant on sandy ocean beaches.

Donax flexuosus Gld.

Rarely collected; San Diego.

Petricola carditoides Conr.

San Diego; not numerous; burrows in soft rock the length of its shell.

Saxidomus nuttallii Conr.

Collected for food and rather abundant in places.

[The distinction between this and the following form is often hardly specific. D.]

Saxidomus aratus Gld.

Found with the above and about equally plentiful.

Venus (Chione) fluctifraga Sby.

The common cockle; often collected for food, and excellent quality. This and the two following species, which are less abundant, are often pearl-bearers:

Venus (Chione) succincta Val.

San Diego.

Venus (Chione) simillima Sby.

San Diego.

Tivela crassatelloides Conr.

A market clam but not in very plentiful supply. This is sometimes pearl-bearing.

Cytherea undato-striata Cpr.

Dead valves only have been found of this; San Diego Bay.

Cytherea (Amiantis) callosa Conr.

This beautiful species is rarely found at San Diego, but is abundant on Todos Santos Bay, where it burrows in the hard, sandy beach to a depth of about a foot near very low-water mark, where it is easily obtained for the market by Indians whenever it may be in demand.

Tapes staminea Conr.

Tapes staminea Conr. var. *tumida* Sby.

San Diego.

Tapes staminea Conr. var. *diversa* Sby.

San Diego and Todos Santos Bay.

Tapes laciniata Cpr.

San Diego and Todos Santos Bay.

Cardium quadragenarium Conr.

La Playa; rare. Odd valves abundant at Todos Santos Bay.

Liocardium elatum Sby.

Not rare, below low-water mark on the muddy flats of San Diego and False Bays. Also Todos Santos Bay.

Liocardium substriatum Conr.

Abundant with the last.

Chama exogyra Conr.

Abundant on all rocky beaches at low water.

Chama spinosa Sby.

Less abundant, frequenting deeper water.

Lucina nuttallii Conr.

San Diego.

Lucina californica Conr.

San Diego.

Diplodonta orbella Gld.

Found in holes in rocks or in dead bivalves at La Playa; not rare. Also Todos Santos Bay. A single example of a much flatter species was found at San Diego, which is now in the collection of the Philadelphia Academy of Sciences.

Tellimya tumida Cpr.

San Diego; not found abundantly.

Lasea rubra Mont.

Found in great numbers near high-water mark attached to the byssus of *Mytilus*, in crevices, dead barnacles, and shells, or among small stones. Also at Todos Santos Bay.

Kellia laperousii Desh.

In dead shells or among rocks; not rare.

Chlamydoconcha orcutti Dall.

False Bay, under stones.

[I had intended to have subjoined a complete account, with figures, of this singular form, but have been obliged to defer it on account of the pressure of official duties. See *Science*, vol. iv, p. 50, July 18, 1884. D.]

Leda cælata Hds.

Odd valves occasionally washed ashore.

Yoldia cooperi Gabb.

A single valve found on the ocean beach north of False Bay.

Arca (Barbatia) gradata Sby.

Abundant under stones at low water.

Cardita (Carditamera) subquadrata Cpr.

With the above, but not common.

Milneria minima Dall. Pl. XXIV, figs. 5-7.

Ceropsis minima Dall, Am. Journ. Conch., vii, p. 152, pl. 16, figs. 5, 6, 1871.

(Generic name preoccupied.)

Milneria minima Dall, Am. Naturalist, Sept., 1881, p. 718.

[This curious little member of the *Carditidae* was discovered in 1866 by the writer and found nestling on the backs of *Haliotis*, which afford a shelter for many small mollusks. The first specimens came from Monterey; it was afterward found at Catalina Island, and Mr. Orcutt now sends it from San Diego and Todos Santos Bay; some specimens from the last locality reach 7.50^{mm} in length and 6.00 in greatest breadth.

While examining some dry specimens sent by Mr. Henry Hemphill from San Diego some years since a very interesting feature was discovered which may be briefly described as follows:

Milneria is dioecious like most lamellibranchs, and there is quite a difference in average size and proportional breadth, the male shell being always a little smaller and narrower than a female specimen of the same length. Both attach themselves to surrounding objects by a small byssus, for the passage of which a very slight gape exists between the ventral edges of the valves. The ventral surface when the valves are closed is nearly flat, an arrangement which has been brought about by the needs of the creature settling like some *Arcas* on a plane surface like a flat stone or *Haliotis* back. The male has the base or ventral surface a little striated. In the female, however, a much more elaborate arrangement is found. We have in fact a proper marsupium.

The center of the base behind the byssal fissure is pushed upward into a little dome nearly equally participated in by each valve. The edges of the valves in the arch of the dome do not quite come together, so that the mantle is produced on each side, lining the dome and closing in below it, thus forming an approximately hemispherical membranous sac, which separates into two halves when the valves open, is protected by the shelly dome above and by the flat surface of the stone (or shell upon which the parent rests) below. In this snug retreat it is probable the eggs are retained until hatched and the young for an indefinite period. The marsupium in all the specimens examined was well filled with young fry which had passed the embryonic stages.

A matter of interest connected with this discovery is the evidence it shows of the process by which the more complicated marsupium of *Thecalia concamerata* Ad. (see pl. xxiv, fig. 8) was formed. Hitherto the latter, as far as I recall at present, has been the only lamellibranch known in which the outer shell has been folded in to form a marsupium. In *Milneria* the outer layers of the shell within the dome remain, and even the epidermis seems to persist, indicating that after the young have left their shelter the enfolding processes of the mantle may be withdrawn into the body of the shell. In *Thecalia*, on the contrary, the base of the dome has become closed by the fusing of the outer layers of the shell, the interior of the dome, which has become altered in the process to a double funnel (one in each valve) is permanently covered by the mantle and secreted by those parts which produce only the inner layer of the valves, neither the outer nor the epidermal layers any longer taking part in its formation. The line of fusion from the two sides is plainly marked on the outside of the shell of the female *Thecalia*, the male, as in *Milneria*, being of the ordinary form. Both genera belong to the *Carditidae*, and it is difficult not to conclude that in the two forms we have the early and the completed stages of a process which has for its end the safety of the immature individuals of the species.

I have written as if the function of the marsupium in *Thecalia* was certain; and indeed I was informed by the late Dr. William Stimpson that during his dredgings at the Cape of Good Hope he had discovered the eggs in the internal funnels of the female shell. This has always been surmised, but the fact of its having been actually observed has, I believe, not hitherto been made public in print. The specimen figured is one received from Dr. Stimpson in 1865. The interest attaching to the study of the reproductive stages in either species can hardly be overestimated, and the attention of observers at the Cape and in California is hereby respectfully called to the matter. Either species would probably do well in an aquarium. D.]

Mytilus californianus Conr.

Abundant.

Mytilus edulis Linné.

San Diego Bay; not numerous, probably introduced.

Mytilus bifurcatus Stearns.

Abundant near high-water mark all along the coast.

Modiola capax Conr.

Abundant, especially at False Bay and similar locations.

Modiola recta Conr.

False Bay; rare.

Modiolaria denticulata Dall.

San Diego (young).

Adula falcata Gld.

La Playa and elsewhere in rocks.

Adula styliua Cpr.

In rocks on ocean beaches; not rare.

Septifer bifurcatus Rve.

Larger and coarser than *Mytilus bifurcatus*; abundant.

Lithophagus plumula Hanley.

La Playa, with pholads; rare.

Lima dehiscens Conr.

Under stones, living near high-water mark, False Bay, April, 1882. Also Todos Santos Bay, but not found alive.

Pecten monotimeris Conr.

Not often collected.

Pecten æquisulcatus Cpr.

Abundant at seasons in San Diego Bay. Todos Santos Bay. Often collected for food.

Hinnites giganteus Gray.

This fine species we find abundant at La Playa, but elsewhere on the coast it appears rare, though not absent.

Anomia lampe Gray.

Todos Santos Bay.

Placunanomia macroschisma Desh.

Usually inhabiting deep water, attached to stones or bones of whales. Rarely collected.

Ostrea lurida Cpr.

Abundant and very variable in size and form.

BRACHIOPODA.

Platidia anomioides (Scacchi) Costa. var?

Terebratula anomioides Scacchi, Phil. Moll. Sicil., ii, p. 69, pl. xviii, fig. 9, 1844.

[Mediterranean; North Atlantic; Florida Strait; San Diego, Cal., and Todos Santos Bay, Orcutt.

The shells which I refer to the above species are in general like

those from the Mediterranean. The differences are such as might result from the habitat or place of attachment of the shells. All the Californian specimens have the larger valve flat, with faint ridges radiating from the umbo and becoming obsolete before reaching the margin. The hæmal (or dorsal) valve is convex, and the foramen is often anteriorly angulated, though sometimes round. In all the specimens the part of the foramen included in the hæmal valve is larger than that included in the neural valve. The apophyses are similar to those of Mediterranean specimens. I have from the Caribbean Sea a specimen similarly radiated, and for this form perhaps we may apply the varietal name *radiata*.

The special interest attaching to these little brachiopods arises from the fact that this is the first time they have been reported from the Pacific. The San Diego specimens were evidently from the beach; though perfect, they were a little bleached. The single specimen from Todos Santos Bay, though dry, contained the remains of the soft parts. D.]

NOTES ON A COLLECTION OF FISHES FROM FLORIDA, WITH DESCRIPTIONS OF NEW OR LITTLE KNOWN SPECIES.

By O. P. HAY.

The fishes forming the subject of the present paper were contained in a small collection made in Florida and sent to me by Messrs. H. T. Mann and D. M. Davison. A part of the collection was made in Western Florida, at Chaffin, on the Yellow Water River, and at Westville, near the Choctawhatchee River; but the greater part in the eastern portion of the State, principally at Saint Augustine. The work was done during the month of April of the present year and under very unfavorable circumstances. However, in this paper I describe *Gobionellus smaragdus* (C. & V.) Grd., obtained for the first time on our coast; *Zygonectes notti* Ag., not before identified since it was originally described; *Z. auroguttatus*, and *Etheostoma (Uloccntra) davisoni*, which are believed to be new species. Notes on *Mugil albula* L. and *Labidesthes sicculus* Cope are incorporated.

1. *Gobionellus smaragdus* (C. & V.) Grd.

Among the fishes collected at Saint Augustine there occurs a species of Goby that must be placed under Girard's genus *Gobionellus*. The single specimen which was captured having been submitted to Prof. D. S. Jordan's inspection, has been identified by him as the *Gobius smaragdus* of Cuvier and Valenciennes. Dr. Gunther in his "Catalogue of the Fishes of the British Museum" gives the name of this species without any description except that it is related to *Gobius lanceolatus*. As it