

NATIONAL RESEARCH COUNCIL
DIVISION OF GEOLOGY AND GEOGRAPHY
WASHINGTON, D. C.

**An ecological cross-section of the lower part of Florida
based largely upon its molluscan fauna**

by

Paul Bartsch

Excerpt from the Report of the COMMITTEE ON PALEOECOLCOY
1936 - 1937, pp. 11 - 25

[Restored and transferred to electronic form by A. Y. Cantillo (NOAA) in 2000 as part of the Coastal and Estuarine Data/Document Archeology and Rescue (CEDAR) for South Florida. sponsored by the South Florida Ecosystem Restoration Prediction and Modeling Program. Original stored at the Library, Rosenstiel School of Marine and Atmospheric Science, University of Miami. Minor editorial changes were made.]

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Paleoecology, probably more than any other phase of earth history - or shall I say science - is an intriguing subject. It is not only that but fascinating, since it offers a challenge to all minds whether these be simple, complex or profound. Here each searcher can find a subject that will expand and keep pace with the growth, width and breath of his paleobiological knowledge. For this reason there is probably no field of human endeavor, unless it be theisms, in which more thobbing is indulged in than in Paleocology.

The factors that govern the distribution of existing life are not completely known. We have only the broader phases within our grasp. The infinite details which determine the to be or not to be of this or that vary frequently even with the extremes in the distributional range of a species and often very widely so when one considers the members of a single genus.

I have always felt that paleoecologists, before entering this specialized branch of science, should have a thorough basic training in Botany and Zoology, and in the latter field stress not the logical phase, but the field studies, Ecology, the adjustments of organisms to their fellow creatures as well as physical environment.

It would be interesting to know how many of America's paleoecologists would qualify under the above requirements, which to me appear as an absolutely necessary prerequisite to Paleocology.

To one so versed, a tray of Tertiary fossils, fresh from the field, unassorted, brings to mind visions of habitats where similar associations hold forth today, and his mind's eye quickly pictures conditions paralleling those in which he found the living forms. His assumption of a definite range of depth, temperature, salinity, bottom characteristics, turbidity, light, current or wave action, and food supply, will probably be almost correct, certainly more so than it would be if this yardstick had not been applied.

In sections of certain silt deposits of bygone lakes, it has been possible to pin out the annual increments as definitely and easily as the counting of tree rings. This, unfortunately, is never the case in shallow seas free from river freight of silt and teeming with life. Here there is a constant intermingling of the living with the dead; the quick seeking shelter among the bones of things gone by mix today's with yesterday's to an extent that forces us to abandon days, years, decades and centuries and employ geologic reckoning Recent, Pleistocene with the Glacial and Interglacial signposts - and these as ill defined as the Symptoms of most maladies.

I am hoping that when the Everglades National Park will have become a reality, which is soon to be, that some arrangement will be made for a summer course, parallel to the Woods Hole seasons, when qualified students under qualified guidance may have an opportunity to become acquainted with living marine organisms in their native habitat, and see the many wonderful peculiar, synchronous associations which this region affords. Such an ecologic study on the part of Paleontologists translated into their fossil assemblages, should, I believe, reduce the many

things assigned different vertical distributional positions on account of the diversity in faunal assemblages to a horizontal field, in which space rather than time constitutes the dominant factor.

Once again let me present a cross section of this region, let us say from the center of the Everglades eastward to the Florida Strait. In presenting this picture I shall people my field largely with the creatures that have been my favorite subject for study, the Mollusks; they will play a dominant role in paleoecology.

Everglades

The glades, immense stretches of shallow water with good stands of saw grass that makes wading from point to point a somewhat painful, or at all events, a not altogether delightful enterprise. The uninitiated can picture it by conceiving a partially submerged, luscious meadow, miles upon miles in extent, played upon by the varying breezes and the lights and shades of the passing clouds.

Here in season we may see in places, Sandhill Cranes, a dozen species of Herons, Ibises in flocks, the Limpkin, and tilting overhead, or combing the field, Turkey Buzzards, and in spots even now, Everglade and Swallow-tailed Kites.

Paleontologically considered, the glades proper with their feet of muck composed of vegetable detritus and such animal remains as can be preserved in such places, should prove of interest to the Paleontologist.

Here we find a peculiar molluscan assemblage:

Stagnicola cubensis (Pfr.)
Helisoma trivolvis intertextum (Sby.)
Helisoma scalare (Jay)
Helisoma duryi seminole (Pils.)
Helisoma duryi intercelare (Pils.)
Helisoma duryi preglabratum (Marshall)
Helisoma duryi eudiscus (Pils.)
Menetus dilutatus (Gld.)
Gyraulus parvus (Say)
Physella heterostropha peninsulae (Pils.)
Ferrissia peninsulae (Pils.)
Misculium partumeium (Say)
Eupera cubensis (Prime)
Pisidium abditum (Hald.)

Leads and Channels in the Everglades

Should one fly over the region he would see an endless number of slender liquid threads, usually combining into larger leads, which eventually form channels of canoeable size, but the land is so flat that often as not they are mere slender openings in the shallow fields without current or flow. Where tidal influence is felt, as well as in the more elevated reaches of the area, we do have pulsating or more or less steadily flowing streams. The edges of these are particularly favorable habitats of the Apple Snail, *Pomacea depressa*, the sole food of the Everglades Kite and to a great extent that of the Limpkin. Here, too, we find fish of many kinds and sizes, which will at least contribute their scales, and bones, where those are not destroyed in the acid peat, to future paleontologic records.

Peopling these deeper reaches we may find the following freshwater mollusks:

Pomacea depressa (Say)
Stagnicola cubensis (Pfr.)
Helisoma trivolvis intertextum (Sby.)
Helisoma scalare (Jay)
Helisoma duryi seminole (Pils.)
Helisoma duryi intercelare (Pils.)
Unio merus obesus paludicolus (Gld.)
Micromya papyraceus (Gould)
Gyrenella floridana (Dall)

Lakes in the Everglades

Here and there in these large stretches of submerged meadows we find open bodies of water, lakes of shallow depth where the same molluscan association listed for the channels holds forth, but here also, the Manatee still maintains its precarious existence and so do alligators.

Cat-tail Association

In places, great stretches of these plants (*Typha angustifolia*) form almost pure dense stands, harboring an associated avian and batrachian fauna.

Cypress Swamps

Bordering the glades we may have immense stands of Bald Cypress. These are also wading in the shallow waters with their breathing knees lifted above the surface, shedding pollen, leaf and cone year by year, to form a field for the Paleobotanist. Nor is this all, for here the Crocodilians, the Turtles and Snakes, as well as a host of Batrachians find a suitable home in which they may enjoy life, little disturbed even by man. Bear, Panthers, and Raccoons aplenty, as well as many birds, make this their home, and in passing add their bones to the geologic contributions of today.

Flying over lower Florida brings plainly into view, how the land gradually slopes southward, how barring the hurricane rampart at the southern edge of the mainland, we see to the northward a continuation of the Keys that characterize the "Bay of Florida" but gradually lifting above the water. Once clear of water we cease to call them keys; they become "hammocks," which, botanically considered, must be separated into several associations.

Palmetto Association

This consists of dense stands of Palmetto with small shrubs and grasses as a ground cover. Here some forms of *Liguus* and *Chondropoma dentatum* may be found

Palmetto-Deciduous Association

In this the deciduous trees usually predominate, with only a sprinkling of the former. This will contain the mollusks common to the Deciduous Tree Association.

The Deciduous Tree Association

This frequently forms dense tangles interlaced with vines and shrubs to form almost impenetrable thickets. The branches of the trees are frequently covered with mats of Orchids, Bromeliads, or Ferns. Here on the trunks of the tall trees we may find some of the members of the 17 named forms of *Liguus fasciatus*, or of the 9 subspecies of *Liguus crenatus*, as well as *Oxystyla undata* (Bruguiere) or *Oxystyla floridensis* (Pilsbry), or *Drymaeus multilineatus* (Say), *Drymaeus dormani* (W.G.B.) or *Drymaeus dominicus* (Rue.). While occupying a less elevated position, we may see *Cepolis varians* (Menke), *Chondropoma dentatum* (Say) or *Helicina orbiculata clappi* (Pils) and still lower in the shrubbery *Bothriopupa variolosa* (Gld.) and *Pupisoma dioscoricola* (Ads.), while on the ground, tucked away among the rocky nooks and crannies, or when showers have moistened the ground, crawling over the vegetable detritus we may find a whole molluscan faunula as the following list will proclaim:

Chondropoma dentatum (Say)
Helicina orbiculata clappi (Pils.)
Polygyra uvulifera (Shuttl.)
Praticollega jejuna (Say)
Lobosculum pustula (Fér.)
Thysanophora plagioptycha granum (Streb.)
Thysanophora selenina (Gld.)
Opeas octonoides (Ad.)
Opeas gracillima (Pfr.)
Euglandina rosea minor (Pils.)
Holospira poeyana (Orb.)
Holospira jejuna (Gld.)
Macroceramus pontificus (Gld.)
Macroceramus floridanus (Pils.)
Gastrocopta contracta prninsularia (Pils.)
Gastrocopta pentodon (Say)
Gastrocopta rupicola (Say)
Gastrocopta pellucida hordeadella (Pils.)
Pupoides modfous (Gld.)
Sterkia rhosdei (Pils.)
Strobilops hubbardi (Brown)
Retinella dalliana (Simpson)
Retinella indentata peucilirata (Morelet)
Euconulus chersinus (Say)
Guppya gundlachi (Pfr.)'
Guppya miamiensis (Pils.)
Hawaiiia minuscula alachuana (Dall)
Zonitoides arboreus (Say)
Vaginilus floridanus (Binn.)
Carychium exiguum (Say)

Prairies

These are the low flat dry treeless reaches covered by short grass, the favorite haunts of the meadow lark, where at times we may find the ground fairly swarming with:

Succinea floridana (Pils.)
Polygyra septemvolva volvoxis (Pfr.)

Polygyra cereolus (Mühlf.)
Polygyra carpenteriana (Bld.)

Pines

To the east we find some of the wavelike north and south ridges covered with a stand of scattered pines, or pines and mixed deciduous trees and shrubs, and grass, but with pine dominance. This is poor picking ground for the mollusk student, for pines proclaim acid soil, which is not conducive to shell life. More *Cerion incanum* Binney may frequent the open spaces.

Mangrove Flats

To the southeast, the Everglades pass by imperceptible stages into the mangrove flats; here low bushes of scraggly mangroves try in vain to gain a foothold. Bayward they gradually grow more luxuriant and form large clumps, lifting their main trunks above the water by their outreaching roots or root stems that anchor them in the ground below the water. Here *Littorina angulifera* and *Ostrea floridensis* enjoy an airing with each ebbing tide, or the former may prefer the air for a longer period.

The Mainland Hurricane Rampart

At the southern end of the peninsula, stretching westward from Flamingo City through East, Middle and West Cape Sable, we have a huge sand dune varying in width from a dozen yards to the length of a city block. This represents the wave combines from the shallow floor of the Bay of Florida piled high and dry by Hurricanes and other winds. It consists of ground-up bits of the Bay's life embodying the skeletons of about everything that has withstood the wave-grinding process.

On the landward side of the hurricane rampart we are sure to find a depressed area filled with brackish water, usually in communication by narrow channels with the Bay. Places like these are usually bordered trees or shrubs, in which *Oxystyla* and *Liguus* hold forth, and in the button bushes at the water's edge, Florida Red-winged Blackbirds and Boattailed Grackles makes their nests, while among the decaying leaves in the pools *Haminoea elegans* Grey finds a favorable home.

Salt Pans

In the northern edge of the Bay of Florida are some keys struggling hard to rise from the sea, or more probably to return to it at present.

These frequently are barren rings, with a slight central depression. These pans are sufficiently submerged at each high tide to admit a new influx of salt water through narrow channels to the shallow basin. Warm breezes and the sun's rays evaporate a great part of the water during the emergence of the rim with the result that the contents of these pans become hypersaline, and not infrequently deposit layers of salt. In such salt pans we find a curious faunal assembly of Brine Shrimps and

Cerithidea scalariformis (Say)
Cerithium minimum (Gmel.)
Anomalocardia cuneimeris (Conr.)
Cyrenella floridana (Dall)
Mulinia lateralis (Say)
Pteria atlantica (Lam.)
Mytilus exustus (L.)

Tellina

Black Mangrove Association

Bordering the southern end of Biscayne Bay on the mainland, we have quite a stand of Black Mangrove trees, south of, and here and there among these, stretches of fine sharp and mixed with vegetable detritus and the combing of the waves; here under old decaying logs or boards when these are turned over, we are sure to find caches of thousands of specimens of the beautiful, small, *Truncatella caribeus* Rve. and *Truncatella bilabiatum* Pfr, and *Melampus floridanus* Shuttl. and *Melampus lineatus* Say.

Next we must consider the Bays, or lying off the mainland we have a series of shallow expanses of water known as Biscayne Bay, Barnes Sound, Card Sound and Little Card Sound, which occupy the trough between the mainland and the string of keys offshore. Later we shall speak of a second trough between these keys and the edge of the outlying reef known as Hawk Channel.

Brackish Water Channels

In the bays and sounds we have numerous flats and shoals, some laid bare at low tide, cleft by narrow or wider channels to give access to the pulsating sea.

Where these channels communicate with the rivers such, for example, as Miami River, we get mingling of salt and fresh water, producing a brackish condition where *Cerithidea scalariformis* Say and *Cerithidea iostoma* Pfr. are at home with *Cyrenella floridana* Drall and *Congerina (Mytilopsis) leucophaeata* Conr.

Pilings and Docks

On the piles in the harbor region and the stakes throughout the bays where these have not been protected by heavy creosoting, we may find a heavy encrusting with Barnacles, Ascidians, Bryozoa and *Modiolus demissus* (Dillwyn) and *Pinctada radiata* (Leach) while the wood where not protected or sufficiently protected, may be riddled with *Teredo floridana* Bartsch and *Bankia gouldi* Bartsch, or chewed away by *Sphaeroma destructor*.

Deep Channels Leading to Sea

These now are dredged places as straight as the configuration of the bay will permit but in the days gone by they were not laid out by rule and compass, but sinuous natural passages winding their way to sea through low flats, usually steep-sided. Here Oysters and Pholads found a desirable habitat.

Ostrea virginica Gmelin
Barba costata Linnaeus

Halimeda Association

Some of the shallow water flats are covered by an almost pure stand of the calcareous alga *Halimeda*, which crunches under foot as one walks across. The segments of this form dense patches of considerable thickness.

Porites Association

Under conditions apparently the same as those under which *Halimeda* occurs, frequently only separated by a lead of a few feet in width from this, other flats are characterized by a dominance of *Porites furcata*, the small branched coral easily held in the palm of the hand.

KEYS

The Mangrove Fringe of the Keys on the Bay Side, under water

On the bay side of the keys we usually have a moderately deep channel, fringed by mangroves whose sprawling, outreaching roots repel all approach to the key from this side. On these roots below low tide we find clusters of *Melina alata* (Gmel.), while a little higher in the inter-tidal reaches *Ostrea floridensis* Sby. forms dense masses that completely cover the roots and at low tide, when out of water, furnish plain proof the oysters here grow on trees. Here, too, we can find specimens of the beautiful Cowry, *Cypraea exanthema* L., under water.

The Mangrove Fringe of the Keys, out of water

On the mangrove roots, sometimes a yard or more above high tide level, *Littorina angulifera* Lam. is found abundantly, while on the beach among the drifted flotsam and jetsam *Melampus coffeus* (L.) and *Auricula leccucens* Mke. may be found in abundance, and *Strobilops hubbardi stevensoni* Pils. occurs under the bark of dead limbs.

Interior of Keys

Here where avaricious man has not destroyed the native forests we still find heavy stands of Gumbo limbo, Mahogany, Poison Tree, Wild Tamarind, West Indian Birch, Darling and Coco plums and many others freighted with epiphytic orchids, Ferns and Bromeliads. On their belles and branches a sprinkling of *Liguus* can be found, and not infrequently their center harbors a little prairie with an abundance of *Cerion incenum* Binney, *Polygyras* and *Succineas*.

Cuts, Ripraps

The harbor improvements of Miami have wrought many changes in Biscayne Bay; mud flats have been changed into islands by pumping the dredged material upon them, and in many places where *Halimeda* or *Porites* reefs held forth we now find luxurious homes surrounded by or buried in a mass of floral glory. Here the landscape architect has had an opportunity and he has used it in bringing here things beautiful from everywhere.

The shallow cuts which in days of old made you wait for high tide to slip across the bar, even in a moderate draft boat, have been widened and deepened to admit shipping of all kinds, and that these channels may not be filled by the ever southward shifting sharp sands of the outer beaches, long, ripraps with stone facing have been placed on the north side of the cuts to shunt the sands eastward into deep waters.

These jetties or sea walls are not only favorite places for the disciples of Izaak Walton, but have made a paradise for certain mollusks, which in the past found it difficult to locate a suitable place of attachment. Here we now find abundantly:

Tectarius muricatus (L.)

Caratozona rugosa (Sby.)
Siphonaria lineolata (d'Orb.)
Nerita peloranta (L.)
Nerita versicolor (Gmelin)
Thais floridana (Conr.)
Fissurella alternata (Say)

The Sea Side of the Keys

This presents another hurricane rampart where wind and waves combing Hawk Channel pile the product of their labors high and dry. This may present long stretches of loose, more or less shifting sand *Cenchrus tribuloides*, the devilish sandspur, makes walking a misery, or equal reaches of loose sand held down by the long runners of the Goatsfoot Morning Glory, *Ipomaea pes-caprae* and *Ipomaea bona-nox* (L.). Still other places where the long stolons of the gracefully swaying Bermuda Grass are more or less successful in checking the wind-blown, sand. On the inner edges the funereal *Tournefortia* holds away, and forming the outer edge of the woods, the sea grape with its leathery, shining, kidney-shaped leaves and pendant racemes of fruit, makes a characteristic setting enjoyed by *Cerion incanum* Binney.

Shallow-water Sandy Stretches beyond the Keys

When these are present they enable the burrowing mollusks to dig in, while the predatory members of the phylum hunt them out and devour them. Where the wind-swept waves roll up on such beaches we frequently see myriads of the lively *Cochina* clams swept on the beach by each oncoming wave, right themselves, and dig in before the wave recedes. While small, they are so abundant that they furnish an element of commerce. To the knowing one, Coquina broth brings pleasant memories to the palate. Their abundance in the region in the past is vouchsafed by Coquina Rock, of which *Donax* contributes the chief element.

Here we also, we will find:

Donax variabilis (Say)
Olivella floralia (Duclos)
Olivella mutica (Say)
Marginella apicina (Menke)
Terebra dislocata (Say)
Terebra protexta (Conrad)
Epitonium angulatum (Say)
Laevicardium mortoni (Conrad)
Polinices duplicata (Say)
Tellina alternata (Say)
Dosinia discus (Reeve)
Busycon perversa (L.)
Alectrion vibex (Say)
Strigilla flexuosa (Say)

Shallow water (Hard pan) beyond the Keys

Off the keys on the sea side we have streaks of hard pan where Corallines, Foraminifera and Algae encrust the bottom. Here *Chama sarda* Reeve and *Glycimeris americana* DeFrance and the following find a suitable habitat:

Anachis avara (Say)

Cantharus tinctoria (Conr.)
Leucozonia conguilifera (Lam.)
Clathrodrillia ostrearum (Stearns)
Thais haemastoma (L.)
Fissurella alternata (Say)
Phos parvus (C. B. Ad.)
Tritonalia cellulosa (Conrad)
Ischnochiton limaciformis (Sby.)
Murex pomun (Gmelin)

Shallow waters (Mud flats) beyond the Keys

Here and there in Hawk Channel we find mud flats in shallow water where among other creatures the following mollusks are at home:

Acteocina canaliculatus (Say)
Mangelia cerina (K. & S.)
Epitonium lineatum (Say)
Cerithium ferrugineum (Say)
Cerithium muscarum (Say)
Tagelus gibbus (Spengler)
Cardita floridana (Conrad)
Pyramidella crenulata (Holmes)

Offshore, beyond Hawk Channel, which stretches outside of the keys from Miami south to Key West, is another submerged ridge, which at intervals bears a series of lighthouses. This ridge supports a thriving coral reef, which extends even farther south past the Marquesas and the Tortugas. Here we find walls of corals exposed to the surf, with leads between them, or at times just coral patches.

These massive builders, embracing *Orbicella annularis* (Dana), *Porites astreoides* Lamarck, *Siderastrea siderea*, *Meandria strigosa* (Dana) and *Meandria labyrinthiformis* Linnaeus produce veritable walls of coral limestone, which contain an endless number of grottoes, caves and caverns in and among which dozens of species of fish seek shelter, fish ranging from the huge Sea Bass weighing at times several hundred pounds to the tiny exquisite Iridio. Here brilliant leisurely Angel and Butterfly Fishes search for food, while schools of hundreds of Gray Snappers stay put and sway all day long under sheltering ledges, in the pulsating surge, waiting for the close of day to begin their foraging. Schools of hundreds of Yellow Tails and Carangids will pass in review as they cover their beat, while the Banded Schoolmasters play about the summit of the blocks, enjoying the varying lights and shades occasioned by the wave lens surface of the sea, or swift and dangerous Barracuda move leisurely about singly or in pairs. To here list the whole fish assemblage would take more space than is allotted to me, and to adequately record the scene requires not pen or pencil, but a diving helmet and water-tight moving picture camera, using color film to do justice to the view.

Tucked away here among the nooks and crannies, we find all the nestling and burrowing mollusks. Gorgeous *Lima scabra* Born tucked away in small crevices displays its bright tentacles, while somber *Chama congregata* Conrad and *Vermetus nigricans* Dell are fixed to the solid rock.

Sandy Stretches between the Coral Walls

Between the solid walls of coral are flat stretches of white sand, comminuted bits of coral and shell with small lumps of detached corals usually furnishing attachment for the purple and yellow fan coral and various other species of Gorgonians. Here the Hog fish and various species of garishly colored Parrot Fish and Slippery Dicks and the burrowing *Gnathops* and the *Stingaree* and sometimes *Manta birostris* find a suitable habitat, and the long-spined Black Sea Urchin, *Centrechinus antillarum* Phil., whose contact one should avoid, may live singly or in bunches of several dozens. At home here also are:

Dosinia elegans (Conrad)
Anodontia alba (Link)
Oliva sayans (Ravenel)
Polinices duplicata (Say)
Natica carens (L.)
Sinum perspectivum (Say)
Tonna galea (L.)

Stag-Horn Coral Association

Even among corals we have associations, as exemplified by the Staghorn coral, *Agropora cervicordis*, which in places forms dense stands covering considerable space. To a somewhat lesser extent this is also true of the Palmate Coral, *Acropora palmata*.

Gorgonian Field

In the flats inside of the outer reef we find extensive fields of Gorgonians, forming the so-called "Sea Gardens," composed chiefly of various species of Plexaura, Xiphigorgia, Gorgonia, Muricea, Eunicea and Pterogorgia. Museum specimens give little idea of the real beauty of these so-called "Sea Garden" denizens where the half-inch investment of slender zooids that characterizes them in life is shrunken into a thin animal film. Wading among them with a diving helmet, or viewing them through a water glass from above, certainly justifies the novices' name "Sea Garden" for they sway and bend to currents, and surge of wave or the pulsation of the sea as do plants on shore which their forms resemble.

These colonial animals contribute largely to the reef deposits by adding their spicules upon their demise. Among them, on the sea fans our molluscan friends, *Simmia uniplicata* (Sowerby) and *Cyphome gibbosa* (L.) find their favorite habitat.

Grassy Patches

Between the Coral walls and the Gorgonian fields we may have long stretches of grass covered sand bottom, composed of the Sea Grass, *Thalassia*, among which the trunklike Cowfish, Pipe Fishes, and the Sea Horses dwell. This, too, is the favorite habitat of the red Giant Star Fish, *Oreaster reticulata* L., and *Tripneustes esculentus* L., and the Giant Horse Conch, *Fasciolaria gigantea*, the largest Gastropod in the Atlantic, and *Fasciolaria tulipa* L., as well as the King and queen Conchs, *Cassis madagascarensis* Lam., *Cassis tuberosa* L., and above all the Pink Conch, *Strombus gigas* L., whose delicious flesh has gained the name "Conch" for those devoted to this fish. Mixed in with these are Holothurians, while among the lesser folk may be listed the soft Sea Hare, *Aplysia willcoxi* Heilprin, *Conus pealii* Green and *Nassarius ambiguus* Monts.

The Continental Shelf, 5-100 fms.

Passing the reef area we come to a gradually sloping submarine plain of varying width, the so-called Continental Shelf, which we may say ranges down to 100 fathoms. This is a rich molluscan field; here among many others the following species hold forth:

Tellina lintea (Conrad)
Acteon punctostratus (C. S. Ad.)
Drillia ebur (Reeve)
Maculopoplum junonia (Brass.)
Xenophora conchyliophora (Born)
Polinices uberina (d'Orb.)
Epitomun hellenica (Forbes)
Eulima carolii (Dell)
Niso interrupta (Sby.)
Pyramidella candida (Mörch.)
Calliostoma euglyptum (A. Ad.)
Calliostoma jujubinum (Gmel.)
Cedulus quadridentatus (Dall)

Pourtales Plateau, 90-300 fathoms

By far the richest marine mollusk field is the Pourtales Plateau to the east of the Continental Shelf, whose varied bottom teems with all sorts of life.

As a modest representative selection of the fauna we may mention:

Arca glomerula (Dall)
Euciroa elegantissima (Dall)
Acteon exilis (Jeffreys)
Protocardia peremabilis (Dall)
Modiola Polita (Verrill & Smith)
Leucosyrinx verrillii (Dall)
Leucosyrinx subgrandifera (Dall)
Ancistrosyrinx elegans (Dall)
Ancistrosyrinx radiata (Dall)
Genota viabrunnea (Dall)
Mangilia derina (Dall)
Mangilia comatotropis (Dall)
Marginella succinea (Conrad)
Aurinia dubia (Brod.)
Aurinia gouldiana (Dall)
Fusinus benthalis (Dall)
Phos candei (d'Orb.)
Murex beau (Fisch. & Bern.)
Coralliophila deburghias (Rve.)
Pedicularia decussata (Gould)
Omalaxia nobilis (Verrill)
Amalthea benthophila (Dall)
Xenophore conchyliophore (Born)
Pyramidella candida (Mörch)
Microgaza rotella (Dall)

Calliostoma bairdii (Dall)
Solariella otto (Phil.)
Liotia bairdii (Dall)
Haliotis pourtalesii (Dall)
Dentalium antillerum (d'Orb)
Dentalium laqueatum (Varrill)

Bed of Florida Straits

Still further east than the Pourtales Plateau come the Florida Straits, ranging from 350 to 800 fathoms in depth, from which we may list:

Glyphostoma gratula (Dall)
Mangilia serge (Dall)
Pleurotomella chariessa (Dall)
Fusinus benthalis (Dall)
Laptothyra induta albida (Dall)
Margarita (Bathymophila) euspira (Dall)
Solariella otto (Dall)
Dentalium perlongum (Dall)
Dentalium callithrix (Dall)
Daphnella lunacina (Dall)

Plankton

This presents still another phase of life that we have so far completely ignored, but which is of immense importance to the marine animal world. The Phytoplankton, the microscopic free-swimming plants have been aptly called the grazing grounds of the sea. The large protozoan admixture, as well as eggs and larval stages of animals, and the pelagic creatures that prey upon them found in this liquid habitat, constitute an immense element of marine life. Among mollusks, we may mention the Squids, Spirula, the Pteropods and Heteropods. among the shelled Protozoa, Foraminifera on dying, drop enough skeletons to form an ooze known by this name, while others, like the Peridinae, at times are present in such countless numbers as to smother life in the region invested, requiring a restocking of the fauna of the place. This killing off occasionally is also due to the presence of *Pseudomonas*, likewise a flagellate protozoan whose contribution of ammonia to the sea causes enough disbalance to produce sufficient chemically precipitated ooze, suspended in the water and on the bottom also, to choke all life.

In this brief account I have purposely avoided mentioning the numerous minute species of the families Epitoniidae, Melanellidae, Pyramidellidae, Caecidae, Rissoidae, Tripheridae, Cerithiopsidae, Vitrinellidae and others, since these are not the obvious things of the fauna. I have selected those mollusks which force their attention upon the observer in each habitat; they, therefore, represent the striking element of each association.

In closing, may I express the hope that this brief account will arouse the interest of students of Ecology in this, the most marvelous field for such studies known to me.