

CHAPTER XVI
TUNICATES AND LANCELETS

THE TUNICATA OF THE GULF OF MEXICO

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The Tunicata or Urochorda are a widely distributed group of exclusively marine invertebrate animals mostly of small but not microscopic size, many being less than an inch and few exceeding 3 or 4 inches in their maximum dimensions. There are probably less than 900 valid species. Evidently they are the survivors of what was a much larger and more important group in past geological times, although, as they are soft-bodied creatures without a shell or hard skeletal parts, they have not left recognizable fossils.

Though of very minor economic importance they are of great scientific interest, as of all the invertebrates they show the closest relation to the vertebrates and are included with them in the phylum Chordata to which the higher animals, including man, belong. In modern classifications they are given the rank of a subphylum of the Chordata.

They are, however, a group that has undergone retrograde instead of progressive evolution. Though the adult tunicates are creatures with a rather low and simple type of organization so that the older zoologists considered them to be shell-less mollusks, yet in their larval stage they have so much resemblance (except for much smaller size) to the tadpoles of the amphibians (frogs and salamanders) in certain important structural characters that we cannot dismiss it as mere coincidence and must regard it as indicating common ancestry at some time in the remote past.

Three classes are included in the Tunicata, two of which, the Thaliacea and Larvacea, are free-swimming pelagic forms and are few in species. The third, the Ascidiacea (ascidians), is much the largest and best known class and will be considered first.

The ascidians are, except a few that embed themselves in the sand or mud of the sea bottom, permanently attached animals when adult and depend for food on the minute organisms that

the tides and currents bring to them. Their sac-like body of oval or more or less irregular shape is enclosed in a thick outer tunic called the test, which is sometimes gelatinous but more often of tough, leathery consistency.

In it there are only two openings to the outside, both of which are often extended into short tubes. One of the tubes serves as the mouth for the entrance of water for respiration and also brings in their food. The other is the excurrent aperture for the discharge of the water, the waste matter, and usually the eggs or larvae. All ascidians reproduce sexually by means of eggs and spermatozoa, but very many of them, especially those in which the individuals are of quite small size, also reproduce asexually by budding. The new individuals thus formed remain attached to and enclosed with the parent in a common mass of test so that what is termed a colony of many united individuals is formed. Such species are called compound ascidians; the small members that compose the colony, the zooids. Species that do not bud are distinguished as simple ascidians. Compound ascidians may be recognized by the many small apertures belonging to the numerous zooids and often have much superficial likeness to the sponges in association with which they very often grow.

ASCIDIAN FAUNA OF THE GULF OF MEXICO

As far as the ascidians are concerned the Gulf of Mexico is not a distinct faunal region but a part of that which is commonly called the West Indian region, though actually much larger, including all the eastern American tropical and subtropical waters from the Carolinas on the north, with an outpost at Bermuda, to far south on the coast of Brazil. Throughout this vast region there is considerable uniformity as far as many of the commoner species are concerned, and even rare and locally distributed species may appear in

widely separated places within it. In contrast to what is the case with the ascidians of the cold regions of the world, the ascidians of this area are generally found numerous in the shallow waters along the shores and in depths of not more than 5 to 20 fathoms and only rather exceptionally in more than 50 fathoms. In fact, only one species that can be called a really deep-water species (*Pyura antillarum*, obtained near the Lesser Antilles in 496 fathoms) is known from the West Indian region.

Leaving out of consideration a few uncertain forms and a few that are probably better regarded as merely subspecies, only about 81 apparently valid species of ascidians are known from the West Indian region, in the broad sense of that term explained above, which includes all the tropical and semitropical waters of the eastern or Atlantic side of the American continent. Of these, 64 are compound ascidians; the remaining 17 are simple ascidians.

It is remarkable that no less than 71 of these species have already been found in the Gulf of Mexico; 3 of them and 1 additional form as yet undescribed have not been found anywhere else, though future collecting will probably show their distribution to be wider. It is very evident that it is the shallow region that borders the eastern side of the Gulf along the west coast of Florida, and particularly the southern end of it, that has the richest ascidian fauna. Unquestionably, the maintenance, for many years, of the Marine Laboratory of the Carnegie Institution on the Dry Tortugas and the consequent, exceptionally thorough collecting that has been done in that vicinity has contributed much to give us a better knowledge of its fauna, yet that region, with its many shoals and coral reefs, its numerous small islands, and the currents that converge toward the Florida Straits to form the Gulf Stream, provides particularly favorable conditions for such animals as the ascidians; an environment better than we have yet found anywhere else in that region of the world.

In the northern part of the Gulf, ascidians are less numerous in species, though they may be abundant in individuals, except where the water is of reduced salinity near the mouths of rivers, a condition to which most ascidians are very sensitive. There are two northern species (*Molgula manhattensis* and *Bostrichobranchnus pilularis*), well-

known on the coasts of the Middle States, that occur on the Louisiana coast but have not been found in southern Florida. Possibly this interrupted distribution may be due to the comparatively recent elevation of southern Florida above the sea level.

There are still long stretches of the coasts of the Gulf, including most of the Texan and Mexican parts, that have been very little or not at all investigated, though we can scarcely expect that much that is new will be found there. No ascidians have been recorded from the deep, central part of the Gulf.

Among the commoner and conspicuous ascidians of the Gulf are: Compound ascidians: *Amaroucium stellatum*, *A. constellatum*, *Polyclinum constellatum*, *Didemnum candidum*, *Eudistoma capsulatum*, *E. tarponense*, *Clavelina picta*, *C. gigantea*, *Distaplia bermudensis*, *Perophora viridis*, *Ecteinascidia turbinata*, *Botryllus schlosseri*, *B. planus*, *Botrylloides nigrum*. Simple ascidians: *Ascidia nigra*, *A. interrupta*, *Polycarpa obtecta*, *Styela partita*, *S. plicata*, *Pyura vittata*, *Microcosmus exasperatus*, *Molgula occidentalis*. For descriptions and illustrations see Van Name 1930, 1945.

None of the ascidians or other tunicates of the Gulf appear to have any economic importance, though when small and young they furnish some food for crabs, fishes, and other animals, but the larger ascidians, whether simple or compound, do not seem to be attractive to such predators, owing chiefly to the toughness or unpalatability of the test which forms so much of the bulk of the body or to its lack of enough food value to make it worth eating. None of the Gulf species are used as an article of human diet as a few large species are in some foreign countries. Neither are they known to be harmful, though they sometimes are a component of the growth that fouls the bottoms of vessels, but rarely to any important extent.

THE PELAGIC TUNICATA

These require only brief mention in the present work. Those of one class (Larvacea) are too small to attract notice. One of them (*Oikopleura tortugensis*) was described from and reported abundant near the Dry Tortugas (Brooks and Kellner 1908).

Those of the other class (Thaliacea) are larger and much better known, especially the salpas

which formed the genus *Salpa* in old classifications but are now commonly divided into several genera or subgenera. They are transparent jelly-like creatures of more or less ovate form, having transverse muscle bands which contract and enable them to swim slowly. They are found in the open sea as well as along the coasts. Some of them appear at intervals in immense swarms. The salpas afford a striking instance of alternation of generations; one of solitary individuals alternates with one of aggregated individuals budded off in a chain in which they may remain connected together for a time. Because of the watery, unsubstantial character of their tissues, including the test, they are of small value as food for other animals.

Among the species found in the Gulf of Mexico are: *Salpa (Thalia) democratica*, a small but often abundant species, *S. (Pegea) confoederata*, *S. (Salpa) cylindrica*, *S. (Salpa) fusiformis*, *Cyclosalpa floridana*. See Metcalf 1918.

Another pelagic genus occurs in the Gulf, *Pyrosoma*, a compound form in some respects intermediate between the Ascidiacea and the Thaliacea and sometimes included in the former group. It forms gelatinous tubular colonies closed at one end which are very luminous at night. See Metcalf and Hopkins 1919.

No monograph dealing exclusively with the Tunicata of the Gulf of Mexico has ever been published. The information about them is widely scattered, much of it in works dealing chiefly with those of other regions or mainly with animals of other groups, often in foreign language or in back volumes of scientific periodicals that few libraries have available. Most tunicates are animals of wide distribution; many occur in both the Old and New World and were originally described in European works, and the insufficient descriptions and obsolete nomenclature used in the older books

will often be a cause of confusion. However, a nearly complete bibliography of the systematic literature on the American ascidians, including those of the Gulf of Mexico, will be found in the work by Van Name (1945) listed below. Since that date little of importance has (1950) been published.

The following works will probably be found the most useful to consult for recent information on the Gulf of Mexico Tunicata and references to other literature on them. Several important general works are also listed.

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THE LANCELETS

BRANCHIOSTOMIDAE

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There are a number of sporadic records for *Amphioxus* along the Gulf coast indicating the occurrence of one or more species of lancelets throughout the area in favorable localities. According to Bigelow and Farfante (1948) the species occurring on the coast of western and northwestern Florida (as far as Pensacola), sometimes in very large numbers, is *Branchiostoma caribaeum* Sundevall. These authors consider *Branchiostoma floridae* Hubbs (1922), to which specimens from this area were previously assigned, a synonym of *B. caribaeum* and give the range of this species as from Chesapeake Bay to the West Indies. A small collection of lancelets made by T. E. Pulley in Lydia Ann Channel, Aransas Bay, Texas, was determined by Gunter as *Branchiostoma caribaeum* (Gunter and Knapp, 1951). Re-

cently, lancelets have been collected from the Chandeleur Islands and from various places on the Mississippi coast but have not been positively identified (Hefley and Shoemaker 1952).

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