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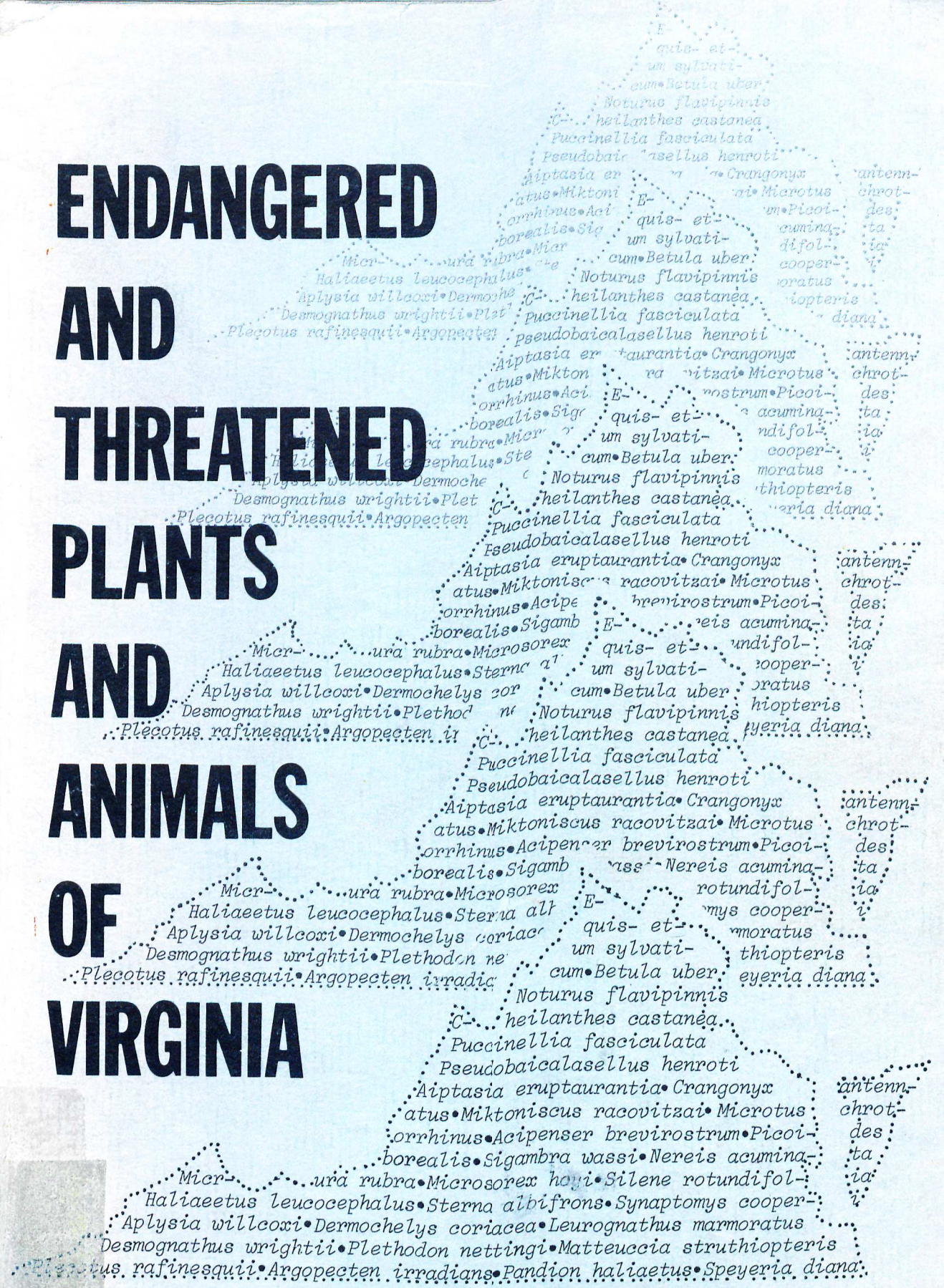
Marine Invertebrates

Marvin L. Wass
Virginia Institute of Marine Science

ENDANGERED AND THREATENED PLANTS AND ANIMALS OF VIRGINIA



Donald W. Linzey, Editor

Proceedings of the Symposium

on

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Marvin L. Wass

Introduction

Marvin L. Wass and Jay D. Andrews

Virginia and Maryland are favored with the largest estuary in the United States--the Chesapeake Bay. The Bay is 289 kilometers (173 miles) long and 47.6 kilometers (28.6 miles) wide near Smith Point. The estuary is relatively shallow, with an average depth of 8.05 meters (26.4 feet) and a maximum depth of 53 meters (174 feet) at Blood Point Light in Maryland. The greatest depth in Virginia is near Smith Point: 44 meters (144 feet)(Wolman, 1968). While this deep hole has probably never been sampled for benthos, many rare species have been collected in an area just south of Smith Point (Figure 1).

Several environmental parameters affect Bay species. Most of the freshwater input comes from montane and Piedmont areas to the north and west. The Susquehanna supplies 51% of the input, the Potomac 18%, the James 14%, the Rappahannock 4% and the York 2%, leaving 10% from lesser sources, such as the Piankatank, Patuxent and Eastern Shore. The rivers typically have a sill at the mouth, behind which anaerobic conditions often occur in summer. Fine sediments are deposited in the freshwater and oligohaline reaches of the rivers tributary to the Bay, except when catastrophic rains produce excess sediments, mainly along the western shore.

Chesapeake Bay lies in a temperate zone but has a severe continental climate. Seasonal water temperature fluctuate from very cold in winter (-1°C or 30°F) to very warm in summer (30°C or 90°F) in some years. Ice is formed in the upper sector of rivers during most years and sometimes freezes over the upper Bay and lower zones of rivers (*e.g.*, 1917-18 and 1976-77). Seasonal fluctuations in the Bay exceed the 20°C spread found in the ocean along the mid-Atlantic coast.

Average precipitation is well distributed seasonally with about 4 inches in each warm month and 3 inches in cold months. However, in reality it is frequently distributed irregularly to provide wet and dry seasons or years, and this situation is accentuated by tropical storms or hurricanes. River run-off is greatest in late winter and spring, with low flows in fall. Average annual freshwater inflows have ranged from rates of 49,000 cubic feet per second in 1965 to 132,800 cubic feet per second in 1972, the latter augmented by Tropical Storm Agnes.

Salinities follow run-off patterns with lowest values in spring (April-May) and highest in fall. An annual range of salinities from 10 to 15 parts per thousand and up to 5 parts per thousand daily in tidal cycles is typical of many areas of Chesapeake Bay waters (Andrews, 1973). These wide fluctuations of salinities at any one site tend to make values of 10 parts per thousand and 25 parts per thousand critical for survival of mesohaline and polyhaline species, respectively. In the authors' opinion the Venice System (Anonymous, 1958) does not fit observed distributions well in Chesapeake Bay. In dry years, for example, the salt wedge in the James River may reach Hopewell, with opportunistic species following the salty waters upriver in the warm season. The cold season brings fresh water downstream well below Jamestown to mile 20 or lower, and only very tolerant species or those tolerant of microaerophilic or anaerobic conditions survive. Tides and winds combine to mix waters of varying temperatures and salinities in the shallow rivers and to redistribute nutrients and silt. Much suspended material in the freshwater run-off is precipitated at the juncture with salty waters, necessitating regular dredging of channels.

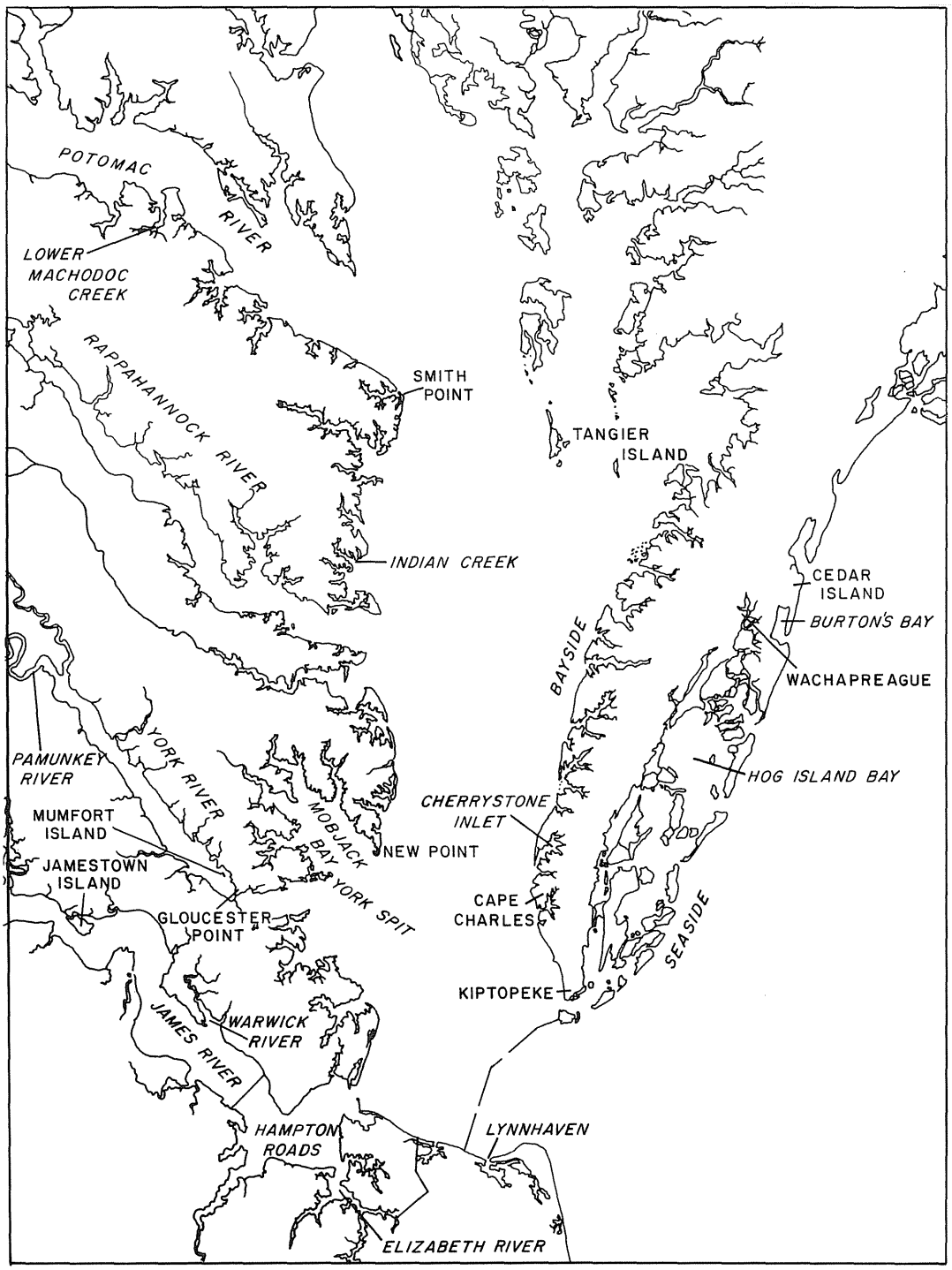

Figure 1. Areas mentioned in species accounts.

Invertebrate Strategies for Reproduction and Distribution

Benthic invertebrates populate estuaries, marshes and beaches by asexual and sexual means, with pelagic and non-pelagic larvae being produced. Roughly two-thirds of benthic temperate species have planktonic larvae (Carriker, 1967). Many of the macrobenthic estuarine species produce abundant larvae which spend one to several weeks in the plankton, depending on temperatures and finding suitable settling sites. This contrasts with lecithotrophic (high yolk content) larvae which remain in the oceanic plankton for up to four months and may thus be carried by currents for long distances before metamorphosing (Scheltema, 1968).

Eelgrass beds favor non-planktonic "crawl-away" larvae by having suitable substrates available, but some species may require years to recolonize habitats disturbed by catastrophes such as the "Agnes" disaster.

Larvae of Chesapeake Bay species may derive from two general sources, the ocean and the Bay. From the ocean, two prominent boreal species -- the barnacle, *Balanus balanoides*, and the blue mussel, *Mytilus edulis* -- set sparsely in lower Chesapeake Bay, and have reached Beaufort, North Carolina in winter but rarely produce significant populations. *Mytilus* occasionally reaches Gloucester Point when cool temperatures and high salinities prevail. Occasionally, it sets heavily on oysters and blue crabs at the Bay mouth. Among warm-water species, Chanley (1969) showed that the coquina clam, *Donax variabilis*, repopulates the Eastern Shore beaches from Virginia Beach to Long Island every summer.

Regular visitors to Chesapeake Bay waters include several species of decapod crustaceans in autumn: four penaeid shrimps enter the Bay and two portunid crabs explore seaside bays. These are warm temperate strays. Two cancroid boreal crabs (genus *Cancer)* move south and inshore to the Bay mouth in winter in high-salinity waters. The Portuguese man-o-war occasionally reaches the Virginia coast in autumn, along with *Glaucus atlantica*, a striking, blue-striped nudibranch. Many pelagic species occur seasonally in the Bay, particularly cladocerans and chaetognaths. Over 90% of the fishes known from Chesapeake Bay are seasonal and mostly of southern origin.

Eelgrass Beds

Most vulnerable and fascinating of Bay ecosystems is that of the eelgrass *(Zostera)* community (Marsh, 1976). Eelgrass is boreal, beginning its annual growth in spring and reaching a vegetative peak in June, after which the grass soon exfoliates, leaving the turions to produce a new crop.

Although faunistically poor by comparison with coral reefs, the eelgrass system has many more species than can be found in any comparable area elsewhere in the Bay. A few dominant species comprise most of the individuals, but these vary greatly in abundance with water depth and season.

Zostera has exhibited several periods of general or localized declines. Many scientists believe that the circumboreal die-off of *Zostera* in the early 1930's was due to a plant disease (Renn, 1936). Some investigators now think climatic warming may have been a more important cause. There appears to be some correlation with sunspot activity that produces warm periods (Rasmussen, 1973). The demise of the grass following "Agnes" in June, 1972, was certainly due in part to lowered salinity and oxygen levels. Subsequent die-backs in 1973-76, however, presumably were due to another cause. The sudden return of colder winters in 1976-1977 has not permitted increases of *Zostera* in Chesapeake Bay. An immediate return cannot be expected -- it took over 15 years after the 1932 die-off for eelgrass to start increasing (Figure 2).

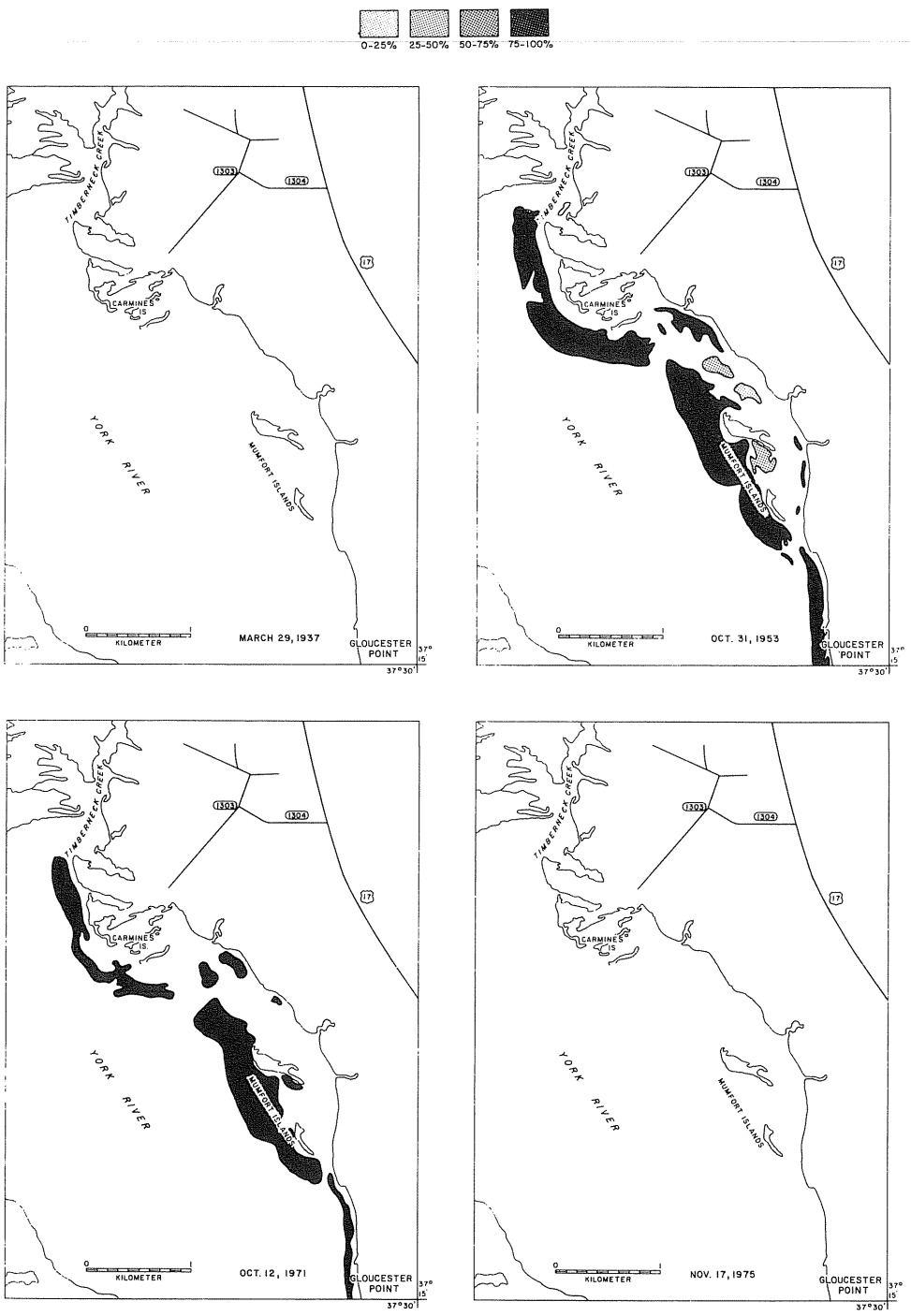

Figure 2. Changes in eelgrass distribution in the York River, 1937-1975.

Marsh (1973) did his classic study of eelgrass epifauna at Mumfort Island (Figure 1), one mile above the York River Bridge. This study covered a 14-month period during 1969-70. Marsh found 112 species, 100 of which resided on the grass without consuming it. Eelgrass beds likely serve invertebrates by acting as current traps to catch larvae and food organisms, thus providing a dense "forest" habitat for survival of early stage invertebrates. By 1973, the eelgrass had disappeared from this site (Orth, pers. comm.), and Marsh (pers. comm.) found none in 1978.

The 1932-33 eelgrass decline decimated the scallop industry in Chesapeake Bay and in the Eastern Shore seaside bays. The scallop depended on eelgrass for setting of larvae and protection. Scallops have been planted in these areas, but without the grass beds, to little avail.

Marsh (1973) and Orth (1973) speculated that three genera, in addition to the scallops, were largely or obligatorily associated with eelgrass: *Diastoma (Bittium)*, *Crepidula* and *Paracerceis*. These evaluations are supported by the near obliteration of these species during the early 1970's in areas where eelgrass disappeared, such as the York River, Virginia (Orth, 1976). Recruitment of these species into new eelgrass beds is hampered by limited dispersal mechanisms from populations in remote grass beds, since they produce benthic "crawl-away" larvae.

Various motile species, including juvenile fish, depend on eelgrass for protection during part of their life cycle. *Zostera* also provides cover for many small fishes such as seahorses, pipefish and sticklebacks, as well as large invertebrates including blue crabs that shed and mate there.

Problems other than temperature, disease and low salinity confront the eelgrass beds. Beginning in 1973, cownosed rays invaded the remaining *Zostera* beds to feed on the soft clam, *Mya*, and caused significant destruction of the beds. The resident oyster toadfish, *Opsanus*, dig under grass beds for shelter, depositing their eggs on the roofs of their burrows (Orth, 1975).

Waterfowl depend heavily on eelgrass for winter food. Now, the grass is so depleted that several species of diving ducks have decreased in the Bay, although they have increased in other areas.

Commercial Aspects of Depletion

Three bivalves -- the Virginia oyster *(Crassostrea virginica)*, the hard clam *(Mercenaria mercenaria)*, and the surf clam *(Spisula solidissima)* -- are considered in this work, in accordance with the North Carolina symposium report (Schwartz *et al.*, 1977) which listed alosid fishes as *Depleted*. Of these molluscs, the Virginia oyster has been the commercial mainstay of invertebrate seafoods in Chesapeake Bay throughout history. The oyster maintains its position by the aid of man to a great extent, since seed has long been moved between rivers. A large oyster may produce 50 million eggs per year, but few larvae survive to set. If spatfall is one in a thousand, the year class is at once beset by predators and, later, diseases. Boring snails *(Urosalpinx* and *Eupleura)* and oyster leeches *(Stylochus)* destroy most spat. Later, *Boccardia hamata* and *Polydora websteri* invade the shells and boring sponges fragment older valves. In spring, *Polydora ligni* may smother oyster spat by accreting silt. Finally, the diseases caused by *Perkinsia marinus (=Dermocystidium marinum)* and *Minchinia* spp. infect oysters and later kill them.

Hard clams *(Mercenaria)* occupy a wider range of substrates in the Bay than oysters do, but in most areas they occur in numbers too low for commercial production. Recruitment is better in Eastern Shore bays, and mariculture for the quahog has begun there. Relatively easy hatchery culture and the use of coarse aggregate enhances survival of this clam. Conchs appear to be the main predator on

seaside (John Kraeuter, pers. comm.), whereas blue crab and demersal fishes devastate clams in the Bay and rivers (Virnstein, 1977). Nevertheless, *Mercenaria* that attain a size of 2 to 3 inches have low death rates and may live to an age of 25 years.

Hard clam mariculture cannot come too soon, since surf clams are being over-exploited offshore. The fishery for this large oceanic clam was once centered off New England. Offshore Virginia is now the southern limit of its range and within a few years it has been depleted to the extent that harvesting restrictions have been imposed. It is normally scarce at the Bay mouth.

Soft clams *(Mya)*, along with hard clams, constitute an important recreational resource in Chesapeake Bay. They grow quickly, breed in spring and fall, and seldom fail to produce a set. They are commercially utilized from Maryland to Maine. Crabs may be their worst enemy, although fish consume the young and later nibble siphons.

Three species of large conchs *(Busycon)* are taken for marketing in the New York area. Since adults are 90% females in Virginia and North Carolina and require about 8 years to mature (John Kraeuter, pers. comm.), it seems obvious that a fishery will not last long. The winter crab-dredging fishery has always taken some. Conchs are bivalve predators that feed largely on hard clams.

Other potential food species from the Bay and marshes are the ribbed mussel *(Geukensia demissus)* and the periwinkle *(Littorina)*. Two recently arrived species in Virginia, living mainly in the oligohaline sector of the James River, are *Rangia cuneata* and *Corbicula manilensis*, which dominate the biomass in their habitats.

Still other uses of invertebrates are made by man. Bloodworms *(Glycera)* and squid are taken in small numbers in Virginia, but are mostly imported. Also, any sizable bivalve provides bait for sport fishing. Finally, the ancient *(Limulus)* is regularly bled. its serum being superior for some biochemical studies to that of the rabbit.

Natural Catastrophes

"Red tides" of diatoms and/or dinoflagellates occur frequently in the Bay, with severe outbreaks having been recorded in the mid-60's, a dry period. The vernal blooms are typically composed of diatoms, whereas dinoflagellates dominate late summer blooms. Spring blooms stimulate zooplankton and provide abundant food for oysters, whereas warm water blooms inhibit many species, particularly filter feeders.

Most Chesapeake invertebrates seem well adapted to normal weather changes but not to the extremes produced by tropical storms or hurricane rains. While coastal winter and spring storms cause havoc to beach residents and early nesting birds, it is the "tropical storm" deluges of rain which more seriously affect invertebrates. In August 1969, "Camille" destroyed thousands of bushels of oysters by lowering salinity and oxygen. Three years later "Agnes" crossed Virginia with heavy rains peaking on June 23, 1972 (Schubel, 1976). "Agnes" caused the greatest flood on record in Chesapeake Bay by dumping 31 million metric tons of clay and silt into the upper Bay. Even the Rappahannock received a million tons of soil, 98% of it remaining in the river (Nichols *et al.*, 1976). While most of the sediment stayed in tributaries and the upper Bay, fresh water -- mainly from the Susquehanna -- kept sea water from entering Chesapeake Bay significantly for almost a month. This caused both salinity and dissolved oxygen to be too low for many invertebrates.

Introduction of Exotic Species

Another insidious threat to Virginia waters is the introduction of exotic (foreign) species. While several of our East Coast species have been transplanted

to Europe and to our West Coast, we have been the recipient of only a few exotic transplants. Some exotics have become exceptionally abundant in Virginia in the past two decades: the wedge clam, *Rangia cuneata;* the Manila clam, *Corbicula manilensis;* and the parasitic sacculinid barnacle, *Loxothylacus panopei,* in mud crabs. Many believe that *Rangia* was endemic to the southeast Atlantic coast, but its explosive appearance, where none were seen before Harry Wells (1961) noted them, belies the relict tenet. More likely, once the clams reached the Atlantic coast from the Gulf, fishermen using them for bait soon extended their range. The Asiatic *Corbicula* took decades to cross the continent and it now dominates the tidal freshwater rivers to the joy of muskrats, gulls and Waltonians.

Microbial exotics are not so readily observed. Oyster diseases produce the most severe effects (Andrews, 1968), being responsible for a sustained long-term decline of the industry in higher salinities. Less disastrous than the oyster diseases was the introduction (Van Engel *et al.*, 1966) of a parasitic barnacle (sacculinid) which presumably entered from the Gulf of Mexico with Louisiana oysters brought into Virginia. It soon decimated the populations of two species of mud crabs. One, *Eurypanopeus depressus,* is particularly threatened because its salinity tolerance encompasses the entire range of the parasite. Once the most abundant of the five xanthid crabs in the Bay, this mud crab perhaps now exists in only 10% of its former numbers. *Rhithropanopeus harrisii* survives by living in waters fresher than those tolerated by the parasite.

Effects of Pollution

The Virginia Institute of Marine Science has been observing the Bay fauna for only 38 years, yet conspicuous changes in occurrence and abundance of fauna have been noted. Regular harmful dinoflagellate blooms occur every year, particularly in April-early May and July-August. Indeed, it is now apparent that some species of dinoflagellates inhibit oyster feeding (Andrews, pers. comm.) for periods up to six weeks.

In many cases one can only document changes, without knowing the causative factors. Benthic invertebrates sampled during 1960-66 off Gloucester Point, Virginia, comprised a diverse assemblage, which in the late 1960's underwent a reduction in diversity and a dramatic change in dominant species (Boesch *et al.*, 1976). Pristine environments in Chesapeake Bay no longer exist if, for example, one considers the fate of the bay scallops and sturgeons. Nevertheless, many environments still support numerous species.

The decrease of certain species may allow others to dominate. The York and other rivers typically have fine black mud smelling strongly of sulfides in deeper waters in summer. In recent years, channel muds have often produced no benthos in grab samples, whereas large holothurians, sponges and whip corals once occurred there commonly.

Inshore along the VIMS beach and shallows, large numbers of *Nassarius obsoletus* and *Nassarius vibex* abounded until 1976. Other common species were *Pagurus longicarpus* (in late summer), *Leptosynapta tenuis, Enoplobranchus sanguineus* and *Glycera* (bloodworms - two species). None of these have been found recently, and *Nereis succinea,* probably the most ubiquitous Bay species, has not been seen swarming in early summer or in fouling on structures. In 1976 and again in 1977, large spills of No. 6 oil fouled local beaches in late June, but studies were not conducted to demonstrate petroleum hydrocarbons as the cause of species disappearance. Soon after that spill the only benthic invertebrate found by digging near VIMS piers was the hemichordate, *Saccoglossus kowalewskii,* and no mud snails or other conspicuous invertebrates were found.

In the York River one early source of possible pollution involved heated water discharged from the Virginia Electric and Power Company's electric generating station below Yorktown (Warinner and Brehmer, 1966). The lower York also receives water from the American Oil Company refinery. In the warm water area only two benthic species were recorded, both common polychaetes taken in August when the temperature reached 35°C. This situation has since been corrected by discharging the heated water through a diffuser at a depth of 30 feet. However, there remains a conspicuous lack of eelgrass along that reach. Boesch (1975) found great differences between September-October and November-December samples, with the latter period having almost twice as many individuals but averaging only one more species. At Little Creek, lower numbers in warm months can be attributed to low dissolved oxygen levels.

In the late spring of 1973, 1974, and 1975, major fish kills in the lower James River were attributed to chlorine residuals introduced from sewage treatment plants (Bellanca and Bailey, 1977). Chlorine residuals well below levels observed during the fish kills have been shown to be toxic to oyster larvae, copepods and several fishes (Roberts *et al.*, 1975; Bender *et al.*, 1977; Roberts and Gleeson, 1978). Thus, chlorination of sewage discharges may be having subtle effects on faunal community structure in the James River.

The most serious perceived pollution now is the Kepone contamination of the James River, first recognized in 1975. There is no evidence of acute toxic effects within the James River, but various sublethal effects can be inferred. Low levels of Kepone cause a "bent back" syndrome in fishes (Couch *et al.*, 1977) similar to a pathological condition often encountered in fish from the James. Significant accumulation of Kepone in fish, oyster and crab tissues has resulted in restrictions on commercial and recreational fishing in order to protect human health. The effect of observed Kepone body burdens on the health of estuarine fauna remains to be fully elucidated. One might expect, however, significant effects on reproductive success, feeding activity, migratory patterns, and possible disease incidence, all of which ultimately affect population survival and community structure.

Explanation of Lists and Species Accounts

The Marine Invertebrates Committee has divided the affected species into six categories in order of their threatened status (Table 1). The categories and criteria for inclusion are as follows:

A. *Endangered*

1. Not seen in Virginia for 10 years.

B. *Threatened*

1. Ten or fewer specimens taken in last 10 years.
2. Species in the path of dredging or development that has limited geographic or habitat distribution. This qualification is independent of the number of individuals.

C. *Depleted*

1. Commercial species depressed from former abundance by over-harvesting.

D. *Special Concern*

1. Species not yet described.
2. Species collected on one or two occasions and species depressed by natural phenomena, commercial development, or causes unknown.
3. Species found only in Virginia or with limited geographic or habitat distributions.

E. *Status Undetermined*

1. Species about which little is known.
2. Species reported in literature but for which specimens are not extant.

F. *Recently Extinct or Extirpated*

1. Not seen since described from Virginia.
2. No longer occurs in Virginia.

Table 1. Number and Percentage of Species in Each Category

	Endangered	*Threatened*	*Special Concern*	*Undetermined*	*Depleted*	*Extirpated*	TOTAL
Porifera	--	--	3	1	--	--	4
Cnidaria	3	--	2	--	--	--	5
Rhynchocoela	7	2	4	2	--	--	15
Annelida	10	10	13	9	--	--	42
Oligochaeta	--	--	--	1	--	--	1
Mollusca							
Gastropoda	10	5	6	3	--	1	25
Bivalvia	2	1	8	5	3	1	20
Arthropoda							
Cladocera through Isopoda	2	1	10	5	--	--	18
Amphipoda	1	1	6	5	--	--	13
Decapoda	--	2	10	--	--	1	13
Echiurida through Chordata	1	1	6	--	--	2	10
TOTAL	36	23	68	31	3	5	166
Percentage	*21*	*14*	*41*	*20*	*1*	*2*	*100*

Endangered species logically should come first, although from a jaundiced viewpoint and with the passage of time these species may have little relevance to man's gustatory desires. Most of the *Endangered* species are small, but at least one, the bay scallop, once supported a thriving fishery on the Eastern Shore of Virginia. The bay scallop has now been extirpated from the Bay for 45 years.

Only 23 species are listed as *Threatened*. Further investigations now being done in the Bay may clarify the status of the listed species or at least put them in a category of less concern as more collections are made. Some *Threatened* species may become *Endangered* if large-scale dredging for channels and spoil deposition continues. Fortunately, many of these altered areas have been investigated during the past decade.

Special Concern is the largest category because it has so many avenues of entry (Table 2). Several large or conspicuous species have been included because they can no longer be found near VIMS. Two common species, the wharf isopod, *Ligia exotica*, and the common hermit crab, *Pagurus longicarpus*, returned in August, 1978, but only as juveniles. However, most of those included are "refugees" from *Zostera* beds. Many more were apparently affected in the late 1960's by low dissolved oxygen levels or other deleterious factors. Later, the "Agnes" storm reduced many species and the warm, wet years following prevented reestablishment of the populations of many species.

The *Status Undetermined* category contains 31 species, 9 of which are polychaetes. A great many polychaete species (at least 115) occur in Chesapeake Bay or in seaside bays. Many of these are minute, ranging down to meiofaunal (0.5 millimeters) size, and numerous others obviously have very restricted habitats, so it is understandable that we know little about these highly diverse worms. Lower Chesapeake Bay should hold many surprises for meiofaunal studies. In North Carolina, Gardiner (1975) has listed 340 polychaetes, but oceanic species are included. Only within the last 18 years have many polychaetes become known from Chesapeake Bay, mainly through the work of Marian Pettibone (1963) at the National Museum of Natural History. Continued efforts should reduce the *Status Undetermined* category.

The three *Depleted* species are all bivalve molluscs. Although three common bivalves are listed, the oyster, hard clam and surf clam will never be as endangered as the bay scallop. Oysters and surf clams produce much less food than they once did, and even conchs may soon require this category. There are only five *Extirpated* species, all of which were once seemingly well-established in the Bay, but have now been absent for several years. One, the introduced sea squirt *(Ecteinascidia turbinata)* occurred at the mouth of the York River, but has not been seen for several years -- a possible victim of "Agnes."

Members of the Committee besides the authors were Donald F. Boesch, Daniel M. Dauer, Robert J. Diaz, Robert J. Orth and Anthony J. Provenzano, some of whom contributed species accounts or provided portions of the introduction. Morris H. Roberts critically reviewed the introduction and provided the information on chlorine and Kepone pollution.

Only three committee members -- Andrews, Dauer, and Wass -- were able to attend the Symposium. Individuals attending the committee meeting expressed concern about some common species now depleted. The only critical issue dealt with categorization of the chosen species. Dauer was helpful in separating *Endangered* and *Threatened* species according to elapsed time and numbers of individuals (see Criteria, p. 200).

All bivalve illustrations are from a thesis by Donna Turgeon. Gastropod drawings were produced by Prudence Huddleston, formerly at VIMS. The drawing of *Rhithropanopeus* was taken from Marine Invertebrates of Scandinavia by M. E. Christiansen (1969). All other illustrations were produced by the Art Department at VIMS.

Table 2. Most Probable Cause for Designation as *Special Concern* Species

	Low salinity, low oxygen	Eelgrass loss	Northern limit	Oil spills; Pollution	Scarce Commensal	Southern limit	Erratic species	Development danger	Parasitism
Mycale cecilia	-	x	-	-	-	-	-	-	-
Microciona prolifera	x	-	-	-	-	-	-	-	-
Craniella laminaris	x	-	-	-	-	-	-	-	-
Leptogorgia virgulata	x	-	-	-	-	-	-	-	-
Edwardsia elegans	x	-	-	-	-	-	-	-	-
Amphiporus ochraceus	-	x	-	-	-	-	-	-	-
Tetrastemma candidum	-	x	-	-	-	-	-	-	-
Tetrastemma elegans	-	x	-	-	-	-	-	-	-
Zygonemertes virescens	-	x	-	-	-	-	-	-	-
Arenicola cristata	-	-	-	x	-	-	-	-	-
Aglaophamus circinata	-	-	-	-	-	x	-	-	-
Ancistrosyllis jonesi	x	-	-	-	-	-	-	-	-
Brania clavata	-	x	-	-	-	-	-	-	-
Cirriformia grandis	x	-	-	-	-	-	-	-	-
Cistena gouldi	x	-	-	-	-	-	-	-	-
Enoplobranchus sanguineus	-	-	-	x	-	-	-	-	-
Eumida sanguinea	-	x	-	-	-	-	-	-	-
Nephtys incisa	x	-	-	-	-	-	-	-	-
Phyllodoce castanea	-	-	x	-	-	-	-	-	-
Platynereis dumerilli	-	x	-	-	-	-	-	-	-
Schistomeringos caeca	-	-	-	-	-	x	-	-	-
Scoloplos rubra	-	-	x	-	-	-	-	-	-
Amygdalum papyrium	x	-	-	-	-	-	-	-	-
Anomia simplex	x	-	-	-	-	-	-	-	-
Barnea truncata	-	-	-	-	-	-	x	-	-
Cuspidaria glypta	-	-	x	-	-	-	-	-	-
Noetia ponderosa	x	-	-	-	-	-	-	-	-
Pandora trilineata	-	-	x	-	-	-	-	-	-

(continued)

	Low salinity, low oxygen	Eelgrass loss	Northern limit	Oil spills; Pollution	Scarce Commensal	Southern limit	Erratic species	Development danger	Parasitism
Petricola pholadiformis	-	-	-	-	-	-	-	x	-
Solemya velum	-	x	-	-	-	-	-	-	-
Crepidula convexa	-	x	-	-	-	-	-	-	-
Diastoma varium	-	x	-	-	-	-	-	-	-
Doris verrucosa	x	-	-	-	-	-	-	-	-
Elysia catulus	-	x	-	-	-	-	-	-	-
Stiliger fuscatus	-	x	-	-	-	-	-	-	-
Triphora nigrocincta	-	x	-	-	-	-	-	-	-
Cylindroleberis mariae	x	-	-	x	-	-	-	-	-
Loxoconcha impressa	-	x	-	-	-	-	-	-	-
Sarsiella texana	x	-	-	-	-	-	-	-	-
Sarsiella zostericola	x	-	-	-	-	-	-	-	-
Mysidopsis bigelowi	-	x	-	-	-	-	-	-	-
Cyclaspis varians	-	x	-	-	-	-	-	-	-
Edotea triloba	-	x	-	-	-	-	-	-	-
Erichsonella attenuata	-	x	-	-	-	-	-	-	-
Idotea balthica	-	x	-	-	-	-	-	-	-
Ligia exotica	-	-	-	x	-	-	-	-	-
Acanthohaustorius intermedius	x	-	-	-	-	-	-	-	-
Ampithoe longimana	-	x	-	-	-	-	-	-	-
Cerapus tubularis	x	-	-	-	-	-	-	-	-
Colomastix halichondriae	-	-	-	-	x	-	-	-	-
Cymadusa compta	-	x	-	-	-	-	-	-	-
Rudilemboides nageli	-	x	-	-	-	-	-	-	-
Alpheus heterochaelis	-	-	x	-	-	-	-	-	-
Alpheus normanni	-	-	x	-	-	-	-	-	-
Eurypanopeus depressus	-	-	-	-	-	-	-	-	x
Hippolyte pleuracantha	-	x	-	-	-	-	-	-	-
Lepidopa websteri	-	-	x	-	-	-	-	-	-

(continued)

	Low salinity, low oxygen	Eelgrass loss	Northern limit	Oil spills; Pollution	Scarce commensal	Southern limit	Erratic species	Development danger	Parasitism
Ocypode quadrata	-	-	-	-	-	-	-	x	-
Pagurus longicarpus	-	-	-	x	-	-	-	-	-
Pinnixa retinens	-	-	x	-	-	-	-	-	-
Pinnotheres maculatus	-	-	-	-	x	-	-	-	-
Rhithropanopeus harrisii	-	-	-	-	-	-	-	-	x
Thallasema hartmani	-	-	x	-	-	-	-	-	-
Leptosynapta tenuis	-	-	-	x	-	-	-	-	-
Pentamera pulcherrima	x	-	-	-	-	-	-	-	-
Sclerodactyla briareus	x	-	-	-	-	-	-	-	-
Botryllus schlosseri	x	-	-	-	-	-	-	-	-
Perophora viridis	x	-	-	-	-	-	-	-	-
TOTAL	21	24	9	6	2	2	1	2	2

Marine Invertebrates - List of Species by Categories

ENDANGERED

Phylum Cnidaria

Aiptasia eruptaurantia
Haloclava producta
Nematostella vectensis

Phylum Rhynchocoela

Amphiporus caecus
Amphiporus rubropunctus
Lineus bicolor
Lineus pallidus
Micrura rubra
Parapolia aurantiaca
Tetrastemma jeani

Phylum Annelida

Amphiduros sp.
Cabira incerta
Cossura sp.
Lysilla alba
Nereis acuminata
Nereis grayi
Orbinia ornata
Pherusa affinis
Pista maculata
Sigambra wassi

Phylum Mollusca; Gastropoda

Anachis avara
Aplysia willcoxi
Cyclostremiscus pentagonus
Diodora cayenensis
Hermaea cruciata
Melanella intermedia
Pyramidella candida
Solariorbus infracarinata
Teinostoma cryptospira
Vermicularia sp.

Phylum Mollusca; Bivalvia

Argopecten irradians
Paramya subovata

Phylum Arthropoda; Isopoda

Chiridotea caeca
Ptilanthura tenuis

Phylum Arthropoda; Amphipoda

Lembos smithi

Phylum Echiurida

"White echiurid"

THREATENED

Phylum Rhynchocoela

Lineus socialis
Tetrastemma vermiculus

Phylum Annelida

Brania wellfleetensis
Fabricia sabella
Harmothoe imbricata
Lepidasthenia commensalis
Parahesione luteola
Paranaitis speciosa
Samythella eliasoni
Schistomeringos rudolphi
Sthenelais boa
Travisia carnea

Phylum Mollusca; Gastropoda

Acanthodoris pilosa
Epitonium multistriatum
Marginella roscida
Phyllaplysia engeli
Sayella fusca

Phylum Mollusca; Bivalvia

Diplothyra smithi

THREATENED (cont.)

Phylum Arthropoda; Isopoda

Paracerceis caudata

Phylum Arthropoda; Amphipoda

Ampithoe valida

Phylum Arthropoda; Decapoda

Macrobrachium ohione
Dissodactylus mellitae

Phylum Echinodermata; Echinoida

Mellita quinquiesperforata

DEPLETED

Phylum Mollusca; Bivalvia

Crassostrea virginica
Mercenaria mercenaria
Spisula solidissima

SPECIAL CONCERN

Phylum Porifera

Mycale cecilia
Microciona prolifera
Craniella laminaris

Phylum Cnidaria

Leptogorgia virgulata
Edwardsia elegans

Phylum Rhynchocoela

Amphiporus ochraceus
Tetrastemma candidum
Tetrastemma elegans
Zygonemertes virescens

Phylum Annelida

Aglaophamus circinata
Ancistrosyllis jonesi
Arenicola cristata
Brania clavata
Cirriformia grandis
Cistena gouldi
Enoplobranchus sanguineus
Eumida sanguinea
Nephtys incisa
Phyllodoce castanea
Platynereis dumerilli
Schistomeringos caeca
Scoloplos rubra

Phylum Mollusca; Gastropoda

Crepidula convexa
Diastoma varium
Doris verrucosa
Elysia catulus
Stiliger fuscatus
Triphora nigrocincta

Phylum Mollusca; Bivalvia

Amygdalum papyrium
Anomia simplex
Barnea truncata
Cuspidaria glyptra
Noetia ponderosa
Pandora trilineata
Petricola pholadiformis
Solemya velum

Phylum Arthropoda; Crustacea; Ostracoda

Cylindroleberis mariae
Sarsiella texana
Sarsiella zostericola
Loxoconcha impressa

Phylum Arthropoda; Mysidacea

Mysidopsis bigelowi

Phylum Arthropoda; Cumacea

Cyclaspis varians

SPECIAL CONCERN (cont.)

Phylum Arthropoda; Isopoda

Edotea triloba
Erichsonella attenuata
Idotea balthica
Ligia exotica

Phylum Arthropoda; Amphipoda

Acanthohaustorius intermedius
Ampithoe longimana
Cerapus tubularis
Colomastix halichondriae
Cymadusa compta
Rudilemboides nageli

Phylum Arthropoda; Decapoda

Alpheus heterochaelis
Alpheus normanni
Hippolyte pleuracantha
Pagurus longicarpus
Lepidopa websteri
Eurypanopeus depressus
Rhithropanopeus harrisii
Pinnixa retinens
Pinnotheres maculatus
Ocypode quadrata

Phylum Echiurida

Thallasema hartmani

Phylum Echinodermata; Holothuroidea

Leptosynapta tenuis
Pentamera pulcherrima
Sclerodactyla briareus

Phylum Chordata; Ascideacea

Botryllus schlosseri
Perophora viridis

STATUS UNDETERMINED

Phylum Porifera

Craniella crania

Phylum Rhynchocoela

Oerstedia dorsalis
"White Nemertean"

Phylum Annelida

Aricidea wassi
Autolytus prolifer
Harmothoe acanellae
Lepidonotus squamatus
Marphysa sanguinea
Microphthalmus sczelkowii
Notocirrus spiniferus
Proceraea cornuta
Sthenelais limicola

Phylum Oligochaeta

Pontodrilus bermudensis

Phylum Mollusca; Gastropoda

Caecum pulchellum
Ercolania sp.
Tenellia sp.

Phylum Mollusca; Bivalvia

Dosinia discus
Martesia cuneiformis
Mysella planulata
Pitar morrhuanus
Solen viridis

Phylum Arthropoda; Crustacea; Cladocera

Ilyocryptus sordidus
Simocephalus exspinosus

Phylum Arthropoda; Stromatopoda

Squilla empusa

Phylum Arthropoda; Mysidacea

Heteromysis formosa

Phylum Arthropoda; Isopoda

Chiridotea almyra

Phylum Arthropoda; Amphipoda

Corophium aquafuscum
Idunella sp.
Lysianassa alba
Microprotopus raneyi
Parapleustes aestuarius

RECENTLY EXTINCT OR EXTIRPATED

Phylum Mollusca; Gastropoda
Terebra dislocata

Phylum Mollusca; Bivalvia
Polymesoda caroliniana

Phylum Arthropoda; Decapoda
Ogyrides alphaerostris

Phylum Echinodermata; Ophiuroidea
Ophiothrix angulata

Phylum Chordata; Ascidiacea
Ecteinascidia turbinata

Marine Invertebrates - Phylogenetic List of Species

Status

E = Endangered
T = Threatened
SC = Special Concern
U = Undetermined
X = Extirpated
D = Depleted

Phylum Porifera

SC *Mycale caecilia*
SC *Microciona prolifera*
SC *Craniella laminaris*
U *Craniella crania*

Phylum Cnidaria

E *Aiptasia eruptaurantia*
E *Haloclava producta*
E *Nematostella vectensis*
SC *Leptogorgia virgulata*
SC *Edwardsia elegans*

Phylum Rhynchocoela

E *Amphiporus caecus*
E *Amphiporus rubropunctus*
E *Lineus bicolor*
E *Lineus pallidus*
E *Micrura rubra*
E *Parapolia aurantiaca*
E *Tetrastemma jeani*
T *Lineus socialis*
T *Tetrastemma vermiculus*
SC *Amphiporus ochraceus*
SC *Tetrastemma candidum*
SC *Tetrastemma elegans*
SC *Zygonemertes virescens*
U *Oerstedia dorsalis*
U "White nemertean"

Phylum Annelida

E *Amphiduros* sp.
E *Cabira incerta*
E *Cossura* sp.
E *Lysilla alba*
E *Nereis acuminata*
E *Nereis grayi*
E *Orbinia ornata*
E *Pherusa affinis*
E *Pista maculata*
E *Sigambra wassi*
T *Brania wellfleetensis*
T *Fabricia sabella*
T *Harmothoe imbricata*
T *Lepidasthenia commensalis*
T *Parahesione luteola*
T *Paranaitis speciosa*
T *Samythella eliasoni*
T *Schistomeringos rudolphi*
T *Sthenelais boa*
T *Travisia carnea*
SC *Aglaophamus circinata*
SC *Ancistrosyllis jonesi*
SC *Arenicola cristata*
SC *Brania clavata*
SC *Cirriformia grandis*
SC *Cistena gouldi*
SC *Enoplobranchus sanguineus*
SC *Eumida sanguinea*
SC *Nephtys incisa*
SC *Phyllodoce castanea*
SC *Platynereis dumerilli*
SC *Schistomeringos caeca*
SC *Scoloplos rubra*
U *Aricidea wassi*
U *Autolytus prolifer*
U *Harmothoe acanellae*
U *Lepidonotus squamatus*
U *Marphysa sanguinea*
U *Microphthalmus sczelkowii*
U *Notocirrus spiniferus*
U *Proceraea cornuta*
U *Sthenelais limicola*

Phylum Oligochaeta

U *Pontodrilus bermudensis*

Phylum Mollusca; Gastropoda

E *Anachis avara*
E *Aplysia willcoxi*
E *Cyclostremiscus pentagonus*
E *Diodora cayenensis*
E *Hermaea cruciata*
E *Melanella intermedia*
E *Pyramidella candida*
E *Solariorbus infracarinata*
E *Teinostoma cryptospira*
E *Vermicularia* sp.
T *Acanthodoris pilosa*
T *Epitonium multistriatum*
T *Marginella roscida*
T *Phyllaplysia engeli*
T *Sayella fusca*
SC *Crepidula convexa*
SC *Diastoma varium*
SC *Doris verrucosa*
SC *Elysia catulus*
SC *Stiliger fuscatus*
SC *Triphora nigrocincta*
U *Caecum pulchellum*
U *Ercolania* sp.
U *Tenellia* sp.
X *Terebra dislocata*

Phylum Mollusca; Bivalvia

E *Argopecten irradians*
E *Paramya subovata*
T *Diplothyra smithi*
D *Crassostrea virginica*
D *Mercenaria mercenaria*
D *Spisula solidissima*
SC *Amygdalum papyrium*
SC *Anomia simplex*
SC *Barnea truncata*
SC *Cuspidaria glypta*
SC *Noetia ponderosa*
SC *Pandora trilineata*
SC *Petricola pholadiformis*
SC *Solemya velum*
U *Dosinia discus*
U *Martesia cuneiformis*
U *Mysella planulata*
U *Pitar morrhuanus*
U *Solen viridis*
X *Polymesoda caroliniana*

Phylum Arthropoda; Crustacea; Cladocera

U *Ilyocryptus sordidus*
U *Simocephalus exspinosus*

Phylum Arthropoda; Crustacea; Ostracoda

SC *Cylindroleberis mariae*
SC *Sarsiella texana*
SC *Sarsiella zostericola*
SC *Loxoconcha impressa*

Phylum Arthropoda; Stomatopoda

U *Squilla empusa*

Phylum Arthropoda; Mysidacea

SC *Mysidopsis bigelowi*
U *Heteromysis formosa*

Phylum Arthropoda; Cumacea

SC *Cyclaspis varians*

Phylum Arthropoda; Isopoda

E *Chiridotea caeca*
E *Ptilanthura tenuis*
T *Paracerceis caudata*
SC *Edotea triloba*
SC *Erichsonella attenuata*
SC *Idotea balthica*
SC *Ligia exotica*
U *Chiridotea almyra*

Phylum Arthropoda; Amphipoda

E *Lembos smithi*
T *Ampithoe valida*
SC *Acanthohaustorius intermedius*
SC *Ampithoe longimana*
SC *Cerapus tubularis*
SC *Colomastix halichondriae*
SC *Cymadusa compta*
SC *Rudilemboides nageli*

Phylum Arthropoda; Amphipoda (cont.)

U *Corophium aquafuscum*
U *Idunella* sp.
U *Lysianassa alba*
U *Microprotopus raneyi*
U *Parapleustes aestuarius*

Phylum Arthropoda; Decapoda

T *Macrobrachium ohione*
T *Dissodactylus mellitae*
SC *Alpheus heterochaelis*
SC *Alpheus normanni*
SC *Hippolyte pleuracantha*
SC *Pagurus longicarpus*
SC *Lepidopa websteri*
SC *Eurypanopeus depressus*
SC *Rhithropanopeus harrisii*
SC *Pinnixa retinens*
SC *Pinnotheres maculatus*
SC *Ocypode quadrata*
X *Ogyrides alphaerostris*

Phylum Echiurida

E "White echiurid"
SC *Thallasema hartmani*

Phylum Echinodermata; Holothuroidea

SC *Leptosynapta tenuis*
SC *Pentamera pulcherrima*
SC *Sclerodactyla briareus*

Phylum Echinodermata; Echinoida

T *Mellita quinquiesperforata*

Phylum Echinodermata; Ophiuroidea

X *Ophiothrix angulata*

Phylum Chordata; Ascideacea

SC *Botryllus schlosseri*
SC *Perophora viridis*
X *Ecteinascidea turbinata*

SPECIES ACCOUNTS

ENDANGERED (36)

1. SEA ANEMONE — *Aiptasia eruptaurantia* (Field)

Phylum: Cnidaria
Class: Anthozoa
Order: Actiniaria
Family: Aiptasiidae

Description: Column cylindrical, dome-shaped when constricted. Two color types: pinkish green and pinkish yellow; 10 to 12 bright vermillion warts, with 2 to 5 warts per row (Field, 1949).

Present Range: Chesapeake Bay to Beaufort, North Carolina.

Distribution in Virginia: York River; rare.

Reproduction: Unknown.

Status: *Endangered*. Not found for 12 years.

Protective Measures Proposed: None.

Remarks: One of several estuarine anemones needing more taxonomic and life history studies.

Author: Marvin L. Wass.

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2. SEA ANEMONE — *Haloclava producta* (Simpson)

Phylum: Cnidaria
Class: Anthozoa
Order: Actiniaria
Family: Ilyanthidae

Description: Elongate burrowing species. Upper column has 20 rows of papillae; tentacles stubby, swollen at tips (Gosner, 1971).

Present Range: Chesapeake Bay to Beaufort, North Carolina.

Distribution in Virginia: York River channel off Yorktown.

Habitat and Mode of Life: Burrows in deeper waters in Virginia.

Reproduction: Unknown.

Status: *Endangered*.

Protective Measures Proposed: None.

Remarks: More searching needed.

Author: Marvin L. Wass.

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3. SEA ANEMONE *Nematostella vectensis* Stephenson

Phylum: Cnidaria
Class: Anthozoa
Order: Actiniaria
Family: Edwardsiidae

Description: Undoubtedly the most eye-catching of all small Chesapeake anemones. Tentacles vary from 12 to 18, usually 14. It is essentially transparent, showing eight macronemes through body wall. Throat and tentacles splotched with white (Stephenson, 1935; Gosner, 1971).

Present Range: State of Washington, California, Massachusetts, Virginia and England.

Distribution in Virginia: Machodoc Creek, Chesapeake Bay.

Habitat and Mode of Life: In soft sediments of tidal creek choked with *Myriophyllum spicatum*. Evidently very euryhaline.

Reproduction: Unknown.

Status: *Endangered*. Not found elsewhere in Virginia.

Protective Measures Proposed: Further sampling in oligohaline waters.

Remarks: Reported in California tide pool with 60 parts per thousand salinity.

Author: Marvin L. Wass.

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4. RIBBON-WORM (NEMERTEAN) *Amphiporus caecus* (Verrill)

Phylum: Rhynchocoela
Class: Anopla
Order: Haplonemertini
Family: Amphiporidae

Description: Blind species, lacking ocelli. Neck with whitish furrow. Two red spots show through head. Animal scarlet with dark red dorsal stripe and pale orange sides (McCaul, 1963; Gosner, 1971).

Present Range: From depth of 35 meters off coast of Massachusetts.

Distribution in Virginia: Single specimen dredged from coarse sand at depth of 6 meters in Chesapeake Bay.

Habitat and Mode of Life: Dredged from coarse sand at 6 meters in Chesapeake Bay.

Reproduction: Unknown.

Status: *Endangered*. Known in Virginia from a single specimen.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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5. RIBBON-WORM (NEMERTEAN) *Amphiporus rubropunctus* McIntosh

Phylum: Rhynchocoela
Class: Anopla
Order: Haplonemertini
Family: Amphiporidae

Description: Body elongate, little flattened. Head vaguely marked from body by narrow neck. Color ochre, margins darker or greenish from intestine. Dominant feature is skin specked with bright red spots. Ten to twelve ocelli on each side (McCaul, 1963).

Present Range: York River near Yorktown bridge.

Distribution in Virginia: As above.

Habitat and Mode of Life: Occurs on eelgrass.

Reproduction: Unknown.

Status: *Endangered*. Known only from type locality in York River.

Protective Measures Proposed: Protect eelgrass.

Author: Marvin L. Wass.

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6. RIBBON-WORM (NEMERTEAN) *Lineus bicolor* (Verrill)

Phylum: Rhynchocoela
Class: Anopla
Order: Heteronemertini
Family: Lineidae

Description: Body little rounded; head sharply pointed, wider than body. Ground color ochre; head and forebody olive-green, brain bright red. Faint lengthwise striations cover body. Ocelli about 10, scattered. Proboscis long and very slender (Verrill, 1892; McCaul, 1963).

Present Range: Cape Cod to Virginia.

Distribution in Virginia: Lower York River.

Habitat and Mode of Life: Dredged from muddy bottom at depth of 13 meters. Usually associated with hydroids, algae and tunicates.

Reproduction: Unknown.

Status: *Endangered*. Caused by deteriorating deeper waters. Unrecorded since 1963.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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7. RIBBON-WORM (NEMERTEAN) *Lineus pallidus* (Verrill)

Phylum: Rhynchocoela
Class: Anopla
Order: Heteronemertini
Family: Lineidae

Description: Body long, filiform. Head distinct from body, 70 millimeters long, 1 millimeter wide. Cephalic grooves indistinct. Body white anteriorly to pale yellow-pink posteriorly (McCaul, 1963).

Present Range: Cape Ann, Massachusetts to Virginia.

Distribution in Virginia: One specimen taken at a depth of 2 meters in Burton's Bay, Eastern Shore.

Habitat and Mode of Life: Dredged from sandy mud.

Reproduction: Unknown.

Status: *Endangered*. Unless other records have been overlooked, this must be a rare species.

Protective Measures Proposed: None feasible.

Author: Marvin L. Wass.

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8. RIBBON-WORM (NEMERTEAN) *Micrura rubra* (Verrill)

Phylum: Rhynchocoela
Class: Anopla
Order: Heteronemertini
Family: Lineidae

Description: Body somewhat flattened, head indistinctly demarcated. Worm fragments easily. Cephalic grooves long, indistinct. Color pale reddish brown (Verrill, 1892; McCaul, 1963; Gosner, 1971).

Present Range: Bay of Fundy to Chesapeake Bay; maximum depth 70 meters.

Distribution in Virginia: Middle of Chesapeake Bay, depth 15 meters.

Habitat and Mode of Life: Dredged from muddy bottom.

Reproduction: Unknown.

Status: *Endangered*. Single specimen taken.

Protective Measures Proposed: None feasible.

Author: Marvin L. Wass.

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9. RIBBON-WORM (NEMERTEAN) *Parapolia aurantiaca* (Coe)

Phylum: Rhynchocoela
Class: Anopla
Order: Paleonemertini
Family: Lineidae

Description: Cephalic grooves oblique. Color orange to vermillion. Body 10 millimeters by 250 millimeters (Gosner, 1971).

Present Range: Probably Cape Cod to Chesapeake Bay.

Distribution in Virginia: Euhaline. Known only from Hog Island Bay.

Habitat and Mode of Life: From sand-silt substrate.

Reproduction: Unknown.

Status: *Endangered*. Only one specimen taken in Virginia.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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10. RIBBON-WORM (NEMERTEAN) *Tetrastemma jeani* (McCaul)

Phylum: Rhynchocoela
Class: Anopla
Order: Haplonemertini
Family: Tetrastemmatidae

Description: Body slender, long, rounded in cross-section. Head set off by slender neck, posterior pointed. Ocelli form a square. Body 0.7 millimeter by 14.0 millimeters. Color uniform dark brown dorsally (McCaul, 1963).

Present Range: Eeelgrass beds off Mumfort Island, York River, Virginia.

Distribution in Virginia: As above.

Habitat and Mode of Life: Found on eelgrass leaves.

Reproduction: Unknown.

Status: *Endangered*. Known from only one small area; only six found.

Protective Measures Proposed: Foster eelgrass.

Author: Marvin L. Wass.

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11. POLYCHAETE *Amphiduros* sp.

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Hesionidae

Description: Genus has eight pairs of tentacular cirri. Parapodia biramous. Pharynx reversible, fimbriated distally, lacking jaws. Antenna medial (Fauchald, 1977).

Present Range: Chesapeake Bay, Rappahannock Shoals Channel, X1-63, five specimens.

Distribution in Virginia: As above.

Habitat and Mode of Life: Found in silty clay.

Reproduction: Unknown.

Status: *Endangered*. Only one record.

Protective Measures Proposed: None.

Remarks: Evidently has very restricted habitat.

Author: Marvin L. Wass.

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12. POLYCHAETE *Cabira incerta* Webster

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Pilargidae

Description: Body long, 18 millimeters by 1.5 millimeters; segments to 54, subcylindrical, narrowed anteriorly. Parapodia small, indistinct. Proboscis cylindrical, three-ringed, with large papillae around opening of distal ring. Skin quite smooth, with few papillae (Pettibone, 1966).

Present Range: Webster (1879) described this species from Northampton County, Virginia in 1879. It was not seen again until Wass found five specimens in one grab off the Rappahannock River on July 21, 1961. None have been found since.

Distribution in Virginia: Chesapeake Bay off Rappahannock River, 6 fathoms, mud, July 21, 1961, five specimens.

Habitat and Mode of Life: Lives in dark, gray mud.

Reproduction: Unknown.

Status: *Endangered*. Found only in Chesapeake Bay.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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13. POLYCHAETE *Cossura* sp.

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Phyllodocidae

Description: Tiny worm, only a few millimeters long; has one long tentacle, lacks branchiae (Fauchald, 1977).

Present Range: Apparently known only from Chesapeake Bay.

Distribution in Virginia: Taken in York Spit Channel lower Chesapeake Bay, November 21, 1963; Gloucester Point, September 25, 1963.

Habitat and Mode of Life: Found in silty sediments.

Reproduction: Unknown.

Status: *Endangered*. Only one specimen found at each locality.

Protective Measures Proposed: None.

Remarks: Undescribed species determined to genus by Dr. Marian Pettibone.

Author: Marvin L. Wass.

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14. POLYCHAETE *Lysilla alba* Webster

Phylum: Annelida
Class: Polychaeta
Order: Terebellida
Family: Terebellidae

Description: Segments ill-defined; body usually with transverse lines of papillae. Setae absent or few, resembles translucent holothurian *Leptosynapta* (Pettibone, 1964; Fauchald, 1977).

Present Range: Unknown.

Distribution in Virginia: Gloucester Point, 1972, one specimen, M. L. Wass.

Habitat and Mode of Life: In *Zostera* bed.

Reproduction: Unknown.

Status: *Endangered*.

Protective Measures Proposed: None.

Remarks: None seen since 1972. At Woods Hole made surface depressions in muddy sand after manner of *Leptosynapta*.

Author: Marvin L. Wass.

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15. POLYCHAETE *Nereis acuminata* (Ehlers)

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Nereidae

Description: Size 70 x 4 millimeters; segments to 75. Prostomium squarish, front strongly convex. Tentacular cirri short, reaching setigers 3-9. Parapodia long throughout. Brown, curved jaws of proboscis hold 6 to 15 teeth. Alive, color is white, transparent, or bright pink with brown and purple (Pettibone, 1963 - as *Nereis arenaceodonta;* Gardner, 1975).

Present Range: Massachusetts to Florida, California, Mexico, Philippines, Australia, New Zealand, Tasmania, South Africa and India.

Distribution in Virginia: Chesapeake Bay, one off Rappahannock River, 37 feet, sand. Identified by Marian H. Pettibone. Dauer found three off Cape Charles, 1978.

Habitat and Mode of Life: At Woods Hole found among algae, tunicates and in tubes on rocks (Pettibone, 1963). In North Carolina in shell with hermit crab; also in fine sand (Gardiner, 1975).

Reproduction: Spawning preceded by four months of couple formation, a period of fighting with same sex. Male and female construct single tube with many openings. Eggs laid and fertilized in tube, after which female leaves tube and dies or is eaten by male.

Status: *Endangered.* Rare in Chesapeake Bay. Also found in Chincoteague Bay.

Protective Measures Proposed: None.

Remarks: It seems very unusual that this species should not have been taken a great many times in Chesapeake Bay.

Author: Marvin L. Wass.

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16. POLYCHAETE *Nereis grayi* Pettibone

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Nereidae

Description: Body thread-like. Tentacular cirri long, reaching setiger 6. Parapodia similar throughout. Proboscis with brown amber-colored jaws (Pettibone, 1963).

Present Range: Massachusetts to North Carolina.

Distribution in Virginia: Chesapeake Bay, off Rappahannock River, June 1961, 37 feet.

Habitat and Mode of Life: At Woods Hole in mud; in elongate mud tubes of *Maldanopsis elongata.* Dredged in 10 fathoms in silty clay and fine sand. In Virginia in fine sand.

Reproduction: Unknown.

Status: *Endangered*. Only two specimens found.

Protective Measures Proposed: None.

Remarks: Identified by Marian H. Pettibone.

Author: Marvin L. Wass.

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17. POLYCHAETE — *Orbinia ornata* Verrill

Phylum: Annelida
Class: Polychaeta
Order: Orbiniida
Family: Orbiniidae

Description: Length to 250 millimeters, width to 7 millimeters; segments to 300. Reddish, middorsal glandular areas begin at setigers 7-8. Thoracic setigers about 24. Crotchets golden to brown. Anal ring with pair of long anal cirri. Extended proboscis soft, saclike around mouth. Color yellow-orange to reddish brown (Pettibone, 1963).

Present Range: Massachusetts (Cape Cod) to Florida, Gulf of Mexico and California. Low water to 18 fathoms.

Distribution in Virginia: Eastern Shore, poly-euhaline.

Habitat and Mode of Life: In sand.

Reproduction: Sexually mature in June and early July. Eggs pale or yellow.

Status: *Endangered*. Rare.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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18. POLYCHAETE — *Pherusa affinis* (Leidy)

Phylum: Annelida
Class: Polychaeta
Order: Flabelligerida
Family: Flabelligeridae

Description: Body covered with short papillae; hooked neurosetae begin at fifth setiger (Pettibone, 1964).

Present Range: From at least Woods Hole to Cape Hatteras offshore. More common offshore than in estuaries (Gary Gaston, pers. comm.).

Distribution in Virginia: Chesapeake Bay, near York Spit Channel, east of York Spit Light.

Habitat and Mode of Life: At Woods Hole, taken in mud, shallow water and by night light from docks.

Reproduction: Unknown.

Status: *Endangered*. Only one specimen found.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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19. POLYCHAETE *Pista maculata* (Dalyell)

Phylum: Annelida
Class: Polychaeta
Order: Terebellida
Family: Terebellidae

Description: Single pair of branched branchiae; eyespots numerous. Thoracic setigerous segments 16 (Pettibone, 1964).

Present Range: Massachusetts to Chesapeake Bay.

Distribution in Virginia: Off Rappahannock River, one specimen.

Habitat and Mode of Life: Probably in deeper waters of estuaries and sublittoral shores.

Reproduction: Unknown.

Status: *Endangered.*

Protective Measures Proposed: None.

Remarks: None found since 1962.

Author: Marvin L. Wass.

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20. POLYCHAETE *Sigambra wassi* Pettibone

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Pilargidae

Description: Incomplete body had 192 segments; large, 70 x 4 millimeters. Body flattened, convex dorsally, flattened ventrally. Skin smooth; wrinkled and areolated, especially in front and mid-sections. Proboscis cylindrical; papillae around mouth (Pettibone, 1966).

Present Range: Chesapeake Bay, off Rappahannock River.

Distribution in Virginia: As above.

Habitat and Mode of Life: Sand; depth 6 fathoms.

Reproduction: Unknown.

Status: *Endangered.* Only two taken in June, 1962; not seen since then. Similar species found elsewhere.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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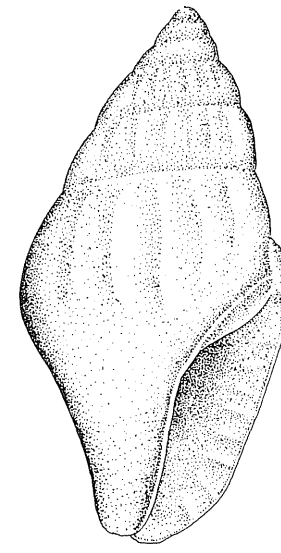
21. GREEDY DOVE-SHELL — *Anachis avara* Say

Phylum: Mollusca
Class: Gastropoda
Order: Neogastropoda
Family: Columbellidae



Description: Shell lengthy, spire somewhat ovate. Lower half of body-whorl marked with about 15 smooth lengthwise ribs, breaking series of fine revolving lines. Small aperture narrow, oval; both lips toothed inside margins. Length about 15 millimeters (Abbott, 1974).

Present Range: Massachusetts to Florida and Texas.

Distribution in Virginia: Lower Bay.

Habitat and Mode of Life: Reported as common on eelgrass (Abbott, 1974). Not found in Chesapeake Bay for at least two decades.

Reproduction: Abbott (1974) refers to this species as "A very common, low-tide, eelgrass species..."

Status: *Endangered*. Not found in Alex Marsh's thorough study of eelgrass associates at Mumfort Island, York River, Virginia (Marsh, 1973). Collected from VIMS beach by W. G. Hewatt in 1958 and from Hog Island Bay, Eastern Shore in 1963 by M. Wass. More recently, Robert Orth has not found it in his eelgrass-bed studies. It was found at the York River Bridge by J. D. Andrews shortly after completion of the bridge.

Protective Measures Proposed: None.

Remarks: It seems impossible that this species could have completely disappeared from Chesapeake Bay.

Author: Marvin L. Wass.

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22. WILLCOX'S SEA HARE — *Aplysia willcoxi* Heilprin

Phylum: Mollusca
Class: Gastropoda
Order: Aplysiomorpha
Family: Aplysiidae

Description: Adult large, to 30.5 centimeters long. Cephalic tentacles and erect rhinophores present. Eyes anterior to rhinophores and near surface. Internal amber shell horny. Mantle flaps large, overlapping back when not swimming. Head greenish, body olive green to brown, with black reticulations; gill and mantle edges light purple. Extrudes ink when annoyed (Abbott, 1974).

Present Range: Cape Cod, Massachusetts to Florida.

Distribution in Virginia: One animal taken from seaside lagoon, Eastern Shore, Virginia (Vogel, 1977).

Habitat and Mode of Life: Fed only on sea lettuce *(Ulva)*, rejecting other algae.

Reproduction: Unknown.

Status: *Endangered*.

Protective Measures Proposed: Knowledge of habits lacking.

Author: Marvin L. Wass.

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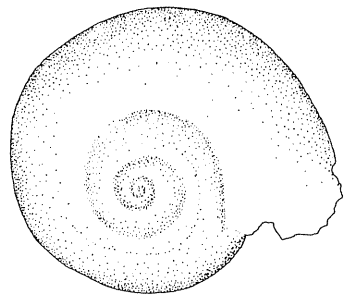
23. TRILIX VITRINELLA — *Cyclostremiscus pentagonus* (Gabb)

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Vitrinellidae



Description: Width 3 millimeters, height 1 millimeter. Disc-shaped, with small glassy knob a little above older whorls. Umbilicus deep, funnel-shaped. Operculum many-spiraled (Abbott, 1974).

Present Range: Chesapeake Bay and North Carolina to Florida, Texas and West Indies.

Distribution in Virginia: Found only in York River off Gloucester Point from 30 to 60 feet. Specimen identified by Robert Work.

Habitat and Mode of Life: In silt-clay sediments.

Reproduction: Unknown.

Status: *Endangered*. Very rare. At northern limit of range. Industrial effluents may have eliminated this species by now in the York River.

Protective Measures Proposed: None.

Remarks: Could also have perished earlier from 1972 low salinity and low oxygen combination.

Author: Marvin L. Wass.

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24. CAYENNE KEYHOLE LIMPET — *Diodora cayenensis* (Lamarck)

Phylum: Mollusca
Class: Gastropoda
Order: Archaeogastropoda
Family: Fissurellidae

Description: Length to 25 millimeters. Cone-shaped shell has keyhole slot at elevated peak. Radiating ribs crossed by striae produce lattice pattern. Color ranges from gray to yellow, with radiating dark bands (Abbott, 1974).

Present Range: Maryland to southern Florida, Brazil and Bermuda.

Distribution in Virginia: Only found on seaside of Eastern Shore.

Habitat and Mode of Life: Intertidal to fairly deep water.

Reproduction: Unknown.

Status: *Endangered.* Only on Eastern Shore and very rare there. J. D. Andrews has seen hundreds of shells in piles on seaside of Eastern Shore.

Protective Measures Proposed: Don't collect live limpets.

Remarks: A very interesting animal to study because of its unusual structure, habits and rarity.

Author: Marvin L. Wass.

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25. CRUCIATE HERMES — *Hermaea cruciata* Gould

Phylum: Mollusca
Class: Gastropoda
Order: Sacoglossa
Family: Hermaeidae

Description: Adult aeolidiform; 10 millimeters long; body slender, with dorsal cerata and with digestive gland diverticula at distal end. Background color pale green. Wart-like spots cover epidermis. Rolled rhinophores have brown on dorsal side. Eyes posterior to base of rhinophores (Abbott, 1974).

Present Range: Massachusetts and Chesapeake Bay.

Distribution in Virginia: York River, upper meso-lower polyhaline (Vogel, 1977).

Habitat and Mode of Life: Found in *Zostera* community. Feeds on algae.

Reproduction: Mates and lays eggs in October. Larvae free-swimming.

Status: *Endangered.* Extremely rare due to dearth of eelgrass.

Protective Measures Proposed: Replant eelgrass.

Remarks: Only three specimens found in Chesapeake Bay.

Author: Rosalie M. Vogel.

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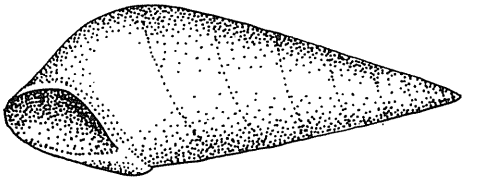
26. CUCUMBER MELANELLA — *Melanella intermedia* Cantraine

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Melanellidae

Description: Length 6-12 millimeters, with 10-13 whorls tapering to apex. Entrance narrow with thin, sharp outer lip (Abbott, 1974).



Present Range: New Jersey to Brazil, Bermuda and Europe.

Distribution in Virginia: Found only in Hampton Roads area.

Habitat and Mode of Life: Abbott (1974) says this species is parasitic on *Holothuria impatiens*, but in Chesapeake Bay it would have to be on *Thyone briareus*.

Reproduction: Unknown.

Status: *Endangered*. Knowledge lacking on host-commensal relationship.

Protective Measures Proposed: Search for hosts.

Remarks: More studies should be made in the laboratory on commensal relationships.

Author: Marvin L. Wass.

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27. BRILLIANT PYRAM — *Pyramidella candida* Morch

Phylum: Mollusca
Class: Gastropoda
Order: Aplysiomorpha
Family: Pyramidellidae

Description: Length 12-14 millimeters. Shell conic, sides flat, shiny white. Suture grooved, crenulated. Columella has three strong, spiral plaits. Operculum thin, tannish (Abbott, 1974).

Present Range: Virginia to Brazil.

Distribution in Virginia: Off Rappahannock River; Gloucester Point.

Habitat and Mode of Life: Evidently parasitic on some invertebrate, which must also be scarce (Boss, 1965).

Reproduction: Unknown.

Status: *Endangered*. Only found twice in Virginia.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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28. GABB'S VITRINELLA — *Solariorbus infracarinata* Gabb

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Vitrinellidae

Description: Broad, low-spiraled shape. Height 1 millimeter, width 1.8 millimeters. Umbilicus widening to one-fifth of shell width. Two strong cords below keel, base smooth (Abbott, 1974).

Present Range: Until found in the lower York River, its range was south half of Florida, Texas and the Caribbean.

Distribution in Virginia: Only in York River off Gloucester Point.

Habitat and Mode of Life: Found in soft sediments.

Reproduction: Unknown.

Status: *Endangered*. Tremendous distance between Chesapeake Bay and south Florida seems very unusual.

Protective Measures Proposed: None feasible.

Remarks: Specimen was identified by Robert Work.

Author: Marvin L. Wass.

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29. CRYPTIC TEINOSTOME — *Teinostoma cryptospira* Verrill

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Vitrinellidae

Description: Tiny, 2 to 3 millimeters in diameter. Shell depressed, white, smooth, and with umbilical callus. Operculum chitinous (Abbott, 1974).

Present Range: Chesapeake Bay to West Indies.

Distribution in Virginia: York River, off Gloucester Point, 30 to 60 feet in silt-clay.

Habitat and Mode of Life: Unknown.

Reproduction: Unknown.

Status: *Endangered*. In Virginia found in only one small area. Oil refinery and electric generating plant within two and one-half miles.

Protective Measures Proposed: Too difficult.

Remarks: Possibly more might have been taken if one-half millimeter sieve sizes had been used. Determined by Robert Work.

Author: Marvin L. Wass.

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30. WORM-SHELL — *Vermicularia* sp.

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Turritellidae

Description: Resembles *knorri*. Closely spiraled for about 6 centimeters, then random to form mass 25 centimeters long by 12 centimeters high.

Present Range: Unknown.

Distribution in Virginia: In ocean about 20 miles off Accomack County, upper end of Virginia's Eastern Shore.

Habitat and Mode of Life: At least two other mollusc species were embedded in the colony. Area from which taken was probably quite rich.

Reproduction: Unknown.

Status: *Endangered*, possibly extinct. Due to massive dredging for surf clams off the Virginia coast in recent years.

Protective Measures Proposed: None feasible.

Remarks: *Vermicularia knorri* occurs from North Carolina to Florida, but does not resemble the specimens taken off Virginia as closely as does *Vermicularia spirata*.

Author: Marvin L. Wass.

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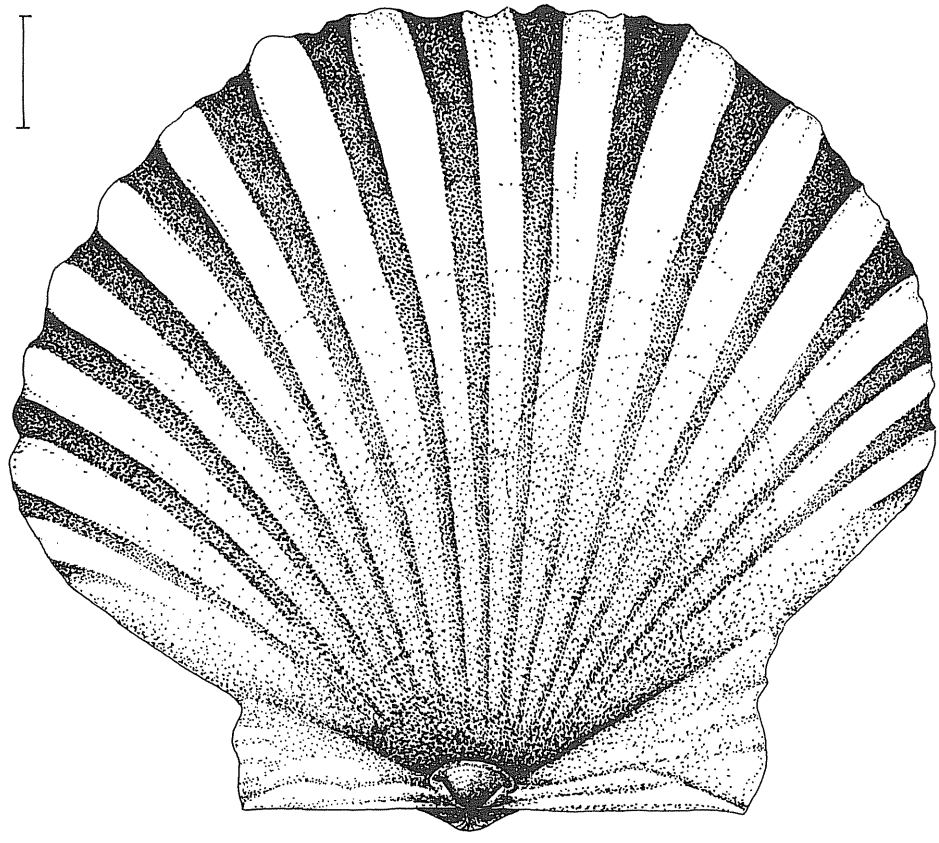
31. BAY SCALLOP — *Argopecten irradians* Lamarck

Phylum: Mollusca
Class: Bivalvia
Order: Pteroconchida
Family: Pectinidae



Description: Length to 75 millimeters. Shell circular, with projecting ears; strong, inflated. Inequivalve, ears unequal, left valve most convex. Sculpture 12-21 low, square radial ribs. Margin deeply scalloped at ventral margin. Periostracum absent; color much varied with white, orange, red-brown, purple and black seen (Abbott, 1974). Appears as *Pecten irradians* in Pierce (*In:* Brown, 1950).

Present Range: Nova Scotia to north Florida and Texas.

Distribution in Virginia: Seaside of Eastern Shore; formerly from Yorktown to mouth of Bay before 1930-31 when eelgrass was decimated by a wasting disease.

Habitat and Mode of Life: Free-living after spat stage, usually in groups on shallow beds, particularly where tides are diminished by eelgrass beds. Erratic in occurrence.

Reproduction: Hermaphrodites release spawn in water for larval dispersal. Young spat attach on vertical surfaces such as eelgrass. Mature in one year.

Status: *Endangered.* None in Chesapeake Bay now. Scarce and without adequate brood stock on Eastern Shore. Hatchery breeding and juvenile penning has been successful on a small scale.

Protective Measures Proposed: Protection and re-establishment of eelgrass beds is essential to scallop culture in the wild. Farming scallops is feasible biologically, if not economically. Breeding sanctuaries may be possible but control of predators (crabs and drills) would be necessary.

Author: Jay D. Andrews.

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32. SUBOVATE SOFT CLAM

Paramya subovata (Conrad)

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Corbulidae

Description: Length 10 millimeters. Shell small, subquadrate, beaks anterior to midline. Hinge teeth and anterior ligament lacking. Hinge has resilium; latter borders of pit may be carinated. Pallial line somewhat broken; no sinus present (Abbott, 1974).

Present Range: Delaware to Florida and Texas.

Distribution in Virginia: Found only once, off north end of Parramore Island, February, 1970.

Habitat and Mode of Life: Commensal with the echiurid *Thallasema hartmani* in North Carolina (Jenner and McCrary, 1970). Same relationship has not been found in Virginia.

Status: *Endangered.* Both host and commensal could be eliminated by dredging, spoiling, or (in York River) by low oxygen, low salinity or oil spills.

Protective Measures Proposed: None.

Remarks: Only water quality maintenance will save such rare species.

Author: Marvin L. Wass.

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33. ISOPOD *Chiridotea caeca* Say

Phylum: Arthropoda
Class: Crustacea
Order: Isopoda
Family: Idoteidae

Description: Length 15 millimeters. Body broadly ovate, thorax flattened, abdomen half length of body, tapering to acute telson. Abdomen has four segments, last forming sharp telson. Color varied, mottled gray to dark (Schultz, 1969).

Present Range: Nova Scotia to Florida; surface to 3 meters.

Distribution in Virginia: Only found in Pamunkey River; offshore in plankton.

Habitat and Mode of Life: Free-living, presumably burrowing shallowly.

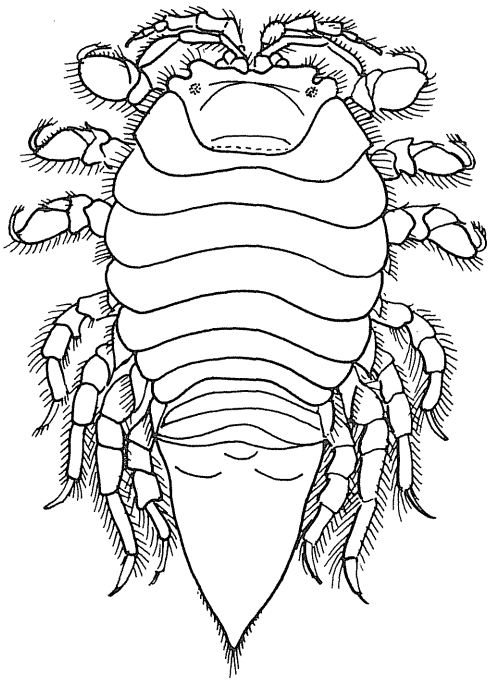
Reproduction: Unknown.

Status: *Endangered*. Not seen in Virginia since 1960.

Protective Measures Proposed: None.

Remarks: Further searching needed.

Author: Marvin L. Wass.



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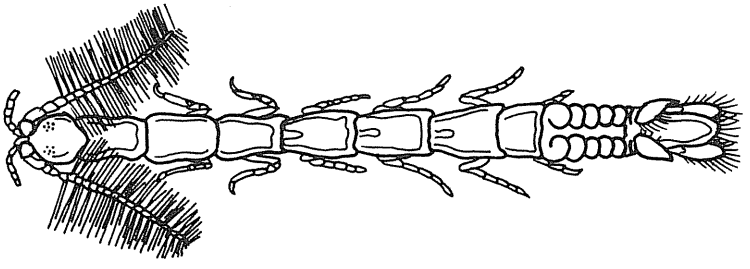
34. ISOPOD *Ptilanthura tenuis* Harger

Phylum: Arthropoda
Class: Crustacea
Order: Isopoda
Family: Anthuridae

Description: Length of males 11 millimeters. Head and body long, narrow, ending in projection. Eyes small. First antennae short in female; second antennae in male fringed with long setae. Uropods narrow, pointed. Color mottled brown (Schultz, 1969).



Present Range: Bay of Fundy to Chesapeake Bay; perhaps to Cape Hatteras.

Distribution in Virginia: One record, off Rappahannock River.

Habitat and Mode of Life: Sandy bottom, deep water.

Reproduction: Unknown.

Status: *Endangered*. Species very rare.

Protective Measures Proposed: None.

Remarks: Probably on upper oceanic shelf.

Author: Marvin L. Wass.

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35. AMPHIPOD — *Lembos smithi* Holmes

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Aoridae

Description: Length 5-6 millimeters. Eye small, black, oval. Antenna 1 slender, long; antenna 2 heavier, flagellum short. Male gnathopods longer, more expanded than carpus. Second gnathopod has smaller subchelate propodus. Last pair of pereiopods longest. Body reddish brown to black; dorsal side orange through purple (Bousfield, 1973).

Present Range: Cape Cod to northern Florida.

Distribution in Virginia: One specimen from Hog Island Bay, Eastern Shore; four from Gloucester Point, February 1967.

Habitat and Mode of Life: At Gloucester Point, found among *Zostera* roots and detritus. Ovigerous May-September (Bousfield, 1973).

Reproduction: Unknown.

Status: *Endangered*. Only five taken.

Protective Measures Proposed: None feasible, except enhancement of eelgrass.

Author: Marvin L. Wass.

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36. ECHIURID "White echiurid"

Phylum: Echiurida Order: Unknown
Family: Unknown

Description: Small white worm less than 1 inch in length. Integument translucent white, revealing large number of fecal pellets within. Skin rather "warty."

Present Range: Known only from York River below the bridge in fine sediment and deep water.

Distribution in Virginia: As above.

Habitat and Mode of Life: Presumably burrows and feeds on fine sediments.

Reproduction: Unknown.

Status: *Endangered.* Inhabits area where many effluents enter river.

Protective Measures Proposed: Seemingly impossible.

Remarks: Almost certainly undescribed.

Author: Marvin L. Wass.

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THREATENED (23)

1. RIBBON-WORM (NEMERTEAN) *Lineus socialis* (Leidy)

Phylum: Rhynchocoela
Class: Anopla
Order: Heteronemertini
Family: Lineidae

Description: Body very long, thread-like, width to 8 millimeters, length to 25 centimeters. Six pairs of tiny eyespots. Worm dark from olive-green to red or black. Occasionally in tangled masses (Miner, 1950; Pratt, 1951; Gosner, 1971).

Present Range: New England to Virginia.

Distribution in Virginia: York River near Yorktown (McCaul, 1963).

Habitat and Mode of Life: In subtidal sand, may feed on psammofauna.

Reproduction: Unknown.

Status: *Threatened*. Evidently quite scarce.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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2. RIBBON-WORM (NEMERTEAN) *Tetrastemma vermiculus* (Quatrefages)

Phylum: Rhynchocoela
Class: Anopla
Order: Haplonemertini
Family: Tetrastemmatidae

Description: Body rounded throughout. Head broad, anteriorly truncated; posterior blunt. Head not set off from body. Notch marks rhynchopore. Body round, 14 by 0.5 millimeters. Ocelli form square. Proboscis long, slender. Color irregular mottlings of brown pigment (McCaul, 1963; Gosner, 1971).

Present Range: Bay of Fundy to Florida; also European coast.

Distribution in Virginia: On eelgrass in shallow water of York River; to 70 meters in deeper water.

Habitat and Mode of Life: On eelgrass in shallow water; unknown in deeper water in Virginia.

Reproduction: Unknown.

Status: *Threatened*. Due to decrease of eelgrass and possible damage from oil spills.

Protective Measures Proposed: Protect eelgrass.

Remarks: Evidently quite rare in Virginia.

Author: Marvin L. Wass.

3. POLYCHAETE *Brania wellfleetensis* Pettibone

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Syllidae

Description: Another tiny species, 7 x 0.4 millimeters, segments to 31. Prostomium with two pairs of eyes, anterior pair larger. Proboscis with anterior tooth. Body colorless. Females bear large eggs, one per segment, attached ventrally on setigers 14 to 29 or so (Pettibone, 1963).

Present Range: Massachusetts to Chesapeake Bay.

Distribution in Virginia: Chesapeake Bay, Rappahannock Shoals channel, 1963, one specimen.

Habitat and Mode of Life: Low water to 10 fathoms. Substrate unknown.

Reproduction: Unknown.

Status: *Threatened*. Known only from very busy ship channel slated for dredging to depth of 50 feet during next 9 years.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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4. POLYCHAETE *Fabricia sabella* (Ehrenberg)

Phylum: Annelida
Class: Polychaeta
Order: Sabellida
Family: Sabellidae

Description: Body minute; with 10 to 12 setigerous segments; eyes two pairs, on antipodal segments. Branchiae 6, on first segment.

Present Range: New England to Chesapeake Bay.

Distribution in Virginia: Mouth of York River on spider crab, *Libinia*, Willis Hewatt; lower Bay, D. F. Boesch, one, 1970; lower James River, Peter Larsen, one, 1973.

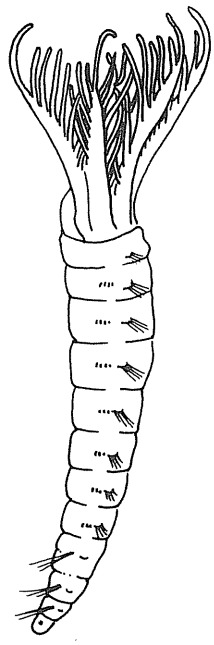
Habitat and Mode of Life: Poorly known. Only sabellid able to leave its tube.

Reproduction: Unknown.

Status: *Threatened*. Obviously rare.

Protective Measures Proposed: None.

Author: Marvin L. Wass.



5. SCALE WORM *Harmothoe imbricata* Linne

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Polynoidae

Description: Large species; up to 65 millimeters long and 19 millimeters in width. Prostomium has distinct cephalic peaks. Elytra have conical microtubercles. Neurosetae have long spinous regions. Dorsal color gray to dark green, brown, or black (Pettibone, 1963).

Present Range: Ubiquitous. One of most common polynoids in all northern waters. Found both intertidally and dredged.

Distribution in Virginia: Only in Elizabeth River.

Habitat and Mode of Life: Lives commensally with many other invertebrates. Has long planktotrophic life. Semipelagic until grown. Tolerates wide range of salinities.

Reproduction: Eggs carried under elytra from mid-April through May.

Status: *Threatened*. Found once, in Elizabeth River; one specimen taken by Michael Richardson. Elizabeth River seems unable to harbor many scarce species.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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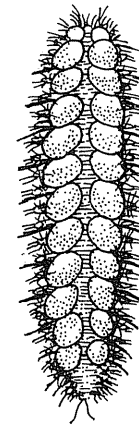
6. SCALE WORM *Lepidasthenia commensalis* Webster

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Polynoidae

Description: Large species; up to 100 millimeters long, 9 millimeters wide. Body long, wormlike, much flattened. Elytra 30-50. Notosetae few, delicate; neurosetae stout, amber. Color dark reddish purple, gray or black (Pettibone, 1963).



Present Range: Massachusetts to North Carolina.

Distribution in Virginia: Rappahannock Shoals, June, 1962, 34 feet, one; Gloucester Point, September 25, 25 feet, one.

Habitat and Mode of Life: Active crawler; usually intertidal; lives commensally with other polychaetes, mostly terebellids. Occurs on flats of muddy sand and coarse gravel with mud. Often in tubes of *Amphitrite ornata* and *Diopatra cuprea*.

Reproduction: Unknown.

Status: *Threatened*. Occurs at mid-depth and on inshore bottoms where serious oil spills have occurred in the York River. Not taken recently.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

7. POLYCHAETE *Parahesione luteola* Webster

Phylum: Annelida
Class: Polychaeta
Order: Nereidiformia
Family: Hesionidae

Description: Small species; length to 15 millimeters; segments to 45. Body widest in middle. One dorsal tentacular segment, six pairs of cirri crowded. Proboscis with large basal portion. Color reddish yellow (Pettibone, 1963).

Present Range: Massachusetts to Gulf of Mexico in low water.

Distribution in Virginia: Lower York River and James River oyster beds; also Elizabeth River.

Habitat and Mode of Life: Found in *Zostera* and oyster beds (Larsen, 1974).

Reproduction: Unknown.

Status: *Threatened*. Only two found in Lower York River by Robert Orth in July, 1969; 16 in James River oyster bed after more than a year's quarterly sampling at eight sites in oyster beds of James River; one found in Elizabeth River.

Protective Measures Proposed: Conservation of oyster rocks and eelgrass.

Remarks: Apparently only in eelgrass and oyster beds in Chesapeake Bay.

Author: Marvin L. Wass.

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8. POLYCHAETE *Paranaitis speciosa* Webster

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Phyllodocidae

Description: Length to 18 millimeters, width 3 millimeters; segments to 55. Body widest in middle, tapering gradually, more so anteriorly. Proboscis narrow, cylindrical, papillated. Color varies: iridescent, greenish yellow with red spots mid-dorsally, with reddish band on segments 9 and 10 (Pettibone, 1963).

Present Range: Maine to Chesapeake Bay. Low water to 100 fathoms.

Distribution in Virginia: Found once in Sarah's Creek, near Gloucester Point.

Habitat and Mode of Life: Found at low water in sand in beds of *Mytilus edulis* and on tubes of *Diopatra*. Dredged from shallow bottoms of sand, clay, mud and shells in New England. In mud-detritus bottom.

Reproduction: Unknown.

Status: *Threatened*. Only one specimen found. Determined by Marian H. Pettibone.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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9. POLYCHAETE *Samythella eliasoni* Day

Phylum: Annelida
Class: Polychaeta
Order: Terebellida
Family: Ampharetidae

Description: Length 10 millimeters; in fragile mud tube. Prostomium flattened triangular lobe overhanging mouth; one pair of tiny eyes. Branchial ridge with three-paired gills (Day, 1973).

Present Range: Chesapeake Bay, Virginia, North Carolina and Sweden.

Distribution in Virginia: Found only at Cherrystone Island near Cape Charles in 1965.

Habitat and Mode of Life: Unknown.

Reproduction: Unknown.

Status: *Threatened.* Species in an area where oil spills threaten.

Protective Measures Proposed: Surveillance.

Author: Marvin L. Wass.

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10. POLYCHAETE *Schistomeringos rudolphi* Delle Chiaje

Phylum: Annelida
Class: Polychaeta
Order: Eunicida
Family: Dorvilleidae

Description: Length to 50 millimeters, width 3 millimeters; segments to 80. Living worms have reached 70 millimeters long, 0.7 millimeter wide; very contractile. Body as in *Schistomeringos caeca.* Prostomium with two or three rings. Antennae with 5-12 articles. Fore eyes larger, between bases of antennae and palps (Pettibone, 1963, as *Stauronereis*).

Present Range: Virginian Province to depth of 263 meters.

Distribution in Virginia: First found in Virginia at Gloucester Point at 15 feet by Wass; later in the Elizabeth River by Michael Richardson. Only one specimen each time. Dauer found two in Lynnhaven in 1978.

Habitat and Mode of Life: In fine sand at Gloucester Point.

Reproduction: Unknown.

Status: *Threatened.* Only four specimens taken from perhaps 2,000 grab samples.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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11. POLYCHAETE *Sthenelais boa* (Johnston)

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Sigalionidae

Description: Length to 200 millimeters, width to 5 millimeters; segments to 200 or more. Elytra subreniform or lunate, with deep emargination in anterior border. Color: elytra varied, mottled gray on most, with dark brown mid-dorsally, darker bands on borders (Pettibone, 1963).

Present Range: Massachusetts (Cape Cod) to Brazil, Norway to Mediterranean, Indian Ocean and Japan.

Distribution in Virginia: Rappahannock Shoals, 1962, one specimen; York River, Vepco area, 1964, one specimen. Two off Cape Charles, 1978, by Dan Dauer.

Habitat and Mode of Life: Shallows to 75 feet; silt.

Reproduction: Unknown.

Status: *Threatened.*

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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12. POLYCHAETE *Travisia carnea* Verrill

Phylum: Annelida
Class: Polychaeta
Order: Opheliida
Family: Opheliidae

Description: Length about 75 millimeters; oblong or torpedo-like, pointed at both ends. Setae small, slender; branchiae begin on third setigerous segment, continuing to 20th. Color light red to deep flesh-color, with branchiae bright red (Miner, 1950).

Present Range: Martha's Vineyard, Massachusetts to Chesapeake Bay.

Distribution in Virginia: Chesapeake Bay, off Rappahannock River, 23 feet, one specimen; five individuals off Cape Charles by Dauer.

Habitat and Mode of Life: Lives in sand.

Reproduction: Unknown.

Status: *Threatened.* Rare.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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13. PILOSE DORIS — *Acanthodoris pilosa* (Abildgaard)

Phylum: Mollusca
Class: Gastropoda
Order: Nudibranchia
Family: Onchidoridiidae

Description: Adults 7-25 millimeters long. Rhinophores and gills retract into pits and angled rearward, with about 15 perfoliations on distal one-third. Gills seven, bipinnate, in median dorsal area around anal and renal openings. Mantle covers body with conical-shaped papillae over entire dorsum. Foot wider than body. Eye spots invisible. Genital openings on right side between mantle and foot (Abbott, 1974).

Present Range: Labrador to Chesapeake Bay.

Distribution in Virginia: Cherrystone Creek on bayside of Eastern Shore and from seaside (Vogel, 1977).

Habitat and Mode of Life: Feeds on various ectoprocts, including *Alcyonidium verrilli* and *Electra crustulenta*.

Reproduction: Large numbers of eggs produced, which hatch in 5-10 days.

Status: *Threatened*. Only six adults have been found.

Protective Measures Proposed: None.

Remarks: Species breeds in April and May. Could be more widespread unless euhaline.

Author: Marvin L. Wass.

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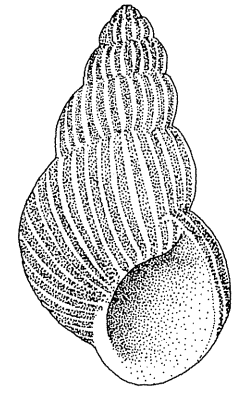
14. MANY-RIBBED WENTLETRAP — *Epitonium multristriatum* Say

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Epitoniidae



Description: Eight whorls cover crowded ribs from aperture to tip of spire; crowned by tiny protoconch. Color quite white (Abbott, 1974).

Present Range: Massachusetts to Bermuda, Florida and Texas, to 120 fathoms.

Distribution in Virginia: Lower Chesapeake Bay.

Habitat and Mode of Life: Unknown.

Reproduction: Unknown.

Status: *Threatened*. Only found once in Chesapeake Bay.

Protective Measures Proposed: None.

Remarks: Needs laboratory study of habits and prey.

Author: Rosalie M. Vogel.

15. BOREAL MARGINELLA *Marginella roscida* Redfield

Phylum: Mollusca
Class: Gastropoda
Order: Neogastropoda
Family: Marginellidae

Description: Length 12 millimeters. Outer lip not sinuate, usually marked by four spots. Spire high, cream colored, with three faint spiral bands of purplish orange. Nucleus white (Abbott).

Present Range: Massachusetts to South Carolina..

Distribution in Virginia: Formerly at York Spit. Last seen at Cape Charles.

Habitat and Mode of Life: Found on sand in shallow water.

Reproduction: Unknown.

Status: *Threatened.* Due to nearness of considerable extensive development. The 1976 oil spill covered this area.

Protective Measures Proposed: None.

Remarks: There is a possibility that this species could have been *Marginella apicina* Menks, but specimens have been lost.

Author: Marvin L. Wass.

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GASTROPOD *Phyllaplysia engeli* Marcus

Phylum: Mollusca
Class: Gastropoda
Order: Aplysiomorpha
Family: Aplysiidae

Description: Length to 26 millimeters. Parapodia form small openings over pallial cavity. Oral tentacles and rhinophores rolled. Eyes at surface next to rhinophore bases. Mouth with paired oral lobes anterior to openings. Animal has brown cuticular shell or none. Color green with tiny white, or pink to purple papillae on body. Rhinophores clear, with pink rings. Foot and gill green (Abbott, 1974).

Present Range: Virginia to Brazil.

Distribution in Virginia: Mouth of Cherrystone Creek, lower polyhaline (Vogel, 1977).

Habitat and Mode of Life: Found on *Zostera;* feeds on blade epiphytes.

Reproduction: Spawns in fall, lays flat mass of eggs. None seen in Virginia.

Status: *Threatened.* Extremely rare.

Protective Measures Proposed: Protect *Zostera.*

Author: Rosalie M. Vogel.

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17. BROWN SAYELLA — *Sayella fusca* C. B. Adams

Phylum: Mollusca
Class: Gastropoda
Order: Megogastropoda
Family: Pyramidellidae

Description: Minute, 5 millimeters. Shell translucent, elongate. Periostracum glossy. Whorls with growth lines and fine spiral striations. Sutures marked. Aperture flaring, with fold inside (Abbott, 1974).

Present Range: Prince Edward Island to Florida.

Distribution in Virginia: Lower Chesapeake Bay; York River.

Habitat and Mode of Life: Parasitic on invertebrates, probably annelids.

Reproduction: Unknown.

Status: *Threatened*. Knowledge of hosts unknown.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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18. SMITHS' MARTESIA — *Diplothyra smithi* Tryon

Phylum: Mollusca
Class: Bivalvia
Order: Heterondontida
Family: Pholadidae

Description: Length to 16 millimeters. Shell pear-shaped. Strong callum in adult; light, brittle, inflated; equivalve, umbones prominent. Shell sculptured in anterior triangle with very fine, close-set concentric ridges and radial ribs. Periostracum gray to dull yellow. Siphons short, united, white (Abbott, 1974).

Present Range: Massachusetts to Texas.

Distribution in Virginia: Lower Chesapeake Bay.

Habitat and Mode of Life: Bores in oyster shells.

Reproduction: Unknown.

Status: *Threatened*. Quite rare.

Protective Measures Proposed: None.

Remarks: Seemingly more common before disease destroyed many high-salinity oyster beds.

Author: Marvin L. Wass.

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19. ISOPOD *Paracerceis caudata* Say

Phylum: Arthropoda
Class: Crustacea
Order: Isopoda
Family: Sphaeromidae

Description: Small, rectangular species. Only outer branch of uropods visible. First of two abdominal segments produced as spine. Outer branch of uropods lacking spines. Horizontal sinus across uropod; four teeth, two on either side of uropod (Schultz, 1969).

Present Range: New Jersey to West Indies; 0-46 meters (Schultz, 1969).

Distribution in Virginia: Second most abundant species in eelgrass in 1971 (Marsh, 1973).

Habitat and Mode of Life: Since 1972 found by Robert Orth only once on each side of Chesapeake Bay. Apparently only on eelgrass.

Reproduction: Young out of brood pouches seen from June into September (Marsh, 1973).

Status: *Threatened*. Threatened status caused by freshets, low dissolved oxygen and oil pollution. Local extinction could occur.

Protective Measures Proposed: Surveillance after catastrophes to assess damage.

Remarks: Almost complete disappearance has prevailed for six years.

Author: Marvin L. Wass.

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20. AMPHIPOD *Ampithoe valida* Smith

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Ampithoidae

Description: Length to 11 millimeters. First four coxal plates deep, coxa 5 longest. Eye small, round, black. Antenna 1 longest; peduncle short. Male gnathopod 1, segment 5 longer than 6. Gnathopod 2 longer than 1, segment 6 swollen, with rounded median tooth and prominent posterior angle. Uropod 2 shorter than 1 (Bousfield, 1973).

Present Range: Atlantic and Pacific coasts; New Hampshire to Cape Canaveral, Florida (Fox and Bynum, 1975).

Distribution in Virginia: Known only from two specimens (male and female) taken in the Warwick River on fouling plates (Feeley and Wass, 1971).

Habitat and Mode of Life: Usually in shallow water on *Ulva*. Annual, several broods, May-September (Bousfield, 1973).

Reproduction: Unknown.

Status: *Threatened*. Effect of increasing sewage effluent unknown.

Protective Measures Proposed: None. Species apparently common in Maryland portion of Chesapeake Bay.

Author: Marvin L. Wass.

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21. DECAPOD *Macrobrachium ohione* Smith

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Palaemonidae

Description: Length: male 68 millimeters, female 102 millimeters. Rostrum high, straight, tip curving up; margin with 9-13 teeth, lower margin with 1 to 3 teeth. Carapace smooth. Antennal scale 2.5 times longer than broad. First legs reach beyond scale. Second legs of adult female stronger than in male; fingers shorter than palm (Williams, 1965).

Present Range: Virginia to Georgia; Mississippi drainage mouth to St. Louis, Missouri and Aransas Bay, Texas.

Distribution in Virginia: In oligohaline zones of the Pamunkey and James Rivers (Hobbs and Massman, 1952).

Habitat and Mode of Life: Presumably it partly burrows into soft mud and feeds on detritus.

Reproduction: Eggs carried by female until hatching occurs.

Status: *Threatened*. In the James River, many must encounter the canal and screens in the Surry Plant. Furthermore, they could be affected by Kepone or other hazardous pollutants.

Protective Measures Proposed: Provide suitable water quality, keep them out of generating plant intakes, and refrain from using them for bait or food.

Remarks: First reported from Virginia in 1952 and Virginia is still the northern limit on the Atlantic coastal plain.

Author: Marvin L. Wass.

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22. DECAPOD *Dissodactylus mellitae* Rathbun

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Pinnotheridae

Description: Carapace: Male, length 2.9 millimeters, width 3.5 millimeters; ovigerous female, length 3.3 millimeters, width 4.5 millimeters. Carapace convex, smooth; front concave. Eyes small. Chelipeds short, stout; hand longer than other articles combined. Color light, with few dark mottlings (Williams, 1965).

Present Range: Vineyard Sound, Massachusetts to Charleston, South Carolina and Pensacola, Florida.

Distribution in Virginia: Evidently only a very small area near Kiptopeke, Virginia, commensal with the Keyhole Sand-dollar.

Habitat and Mode of Life: On shallow, sandy bottom.

Reproduction: Unknown; probably May to August.

Status: *Threatened*. Depletion caused by dredging, oil spills, possible sand-mining.

Protective Measures Proposed: None.

Remarks: Possibly occupies one of smallest habitats in Chesapeake Bay.

Author: Marvin L. Wass.

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23. KEYHOLE SAND-DOLLAR *Mellita quinquiesperforata* Leske

Phylum: Echinodermata
Class: Echinoida
Order: Clypeasteroida
Family: Mellitidae

Description: Length to 11 centimeters. Disc very flat, rounded, except at rear. Mouth ventral in center, with radiating grooves. Test pierced by five holes (hence name) (Gosner, 1971).

Present Range: Seems to occur in small numbers in shallow areas along the coast of Chesapeake Bay near Cape Charles. Gosner (1971) believed its northern limit was Chesapeake Bay. It ranges south to the Gulf of Mexico, but no tests have been seen by Wass on the coast from Chesapeake Bay to Cape Hatteras.

Distribution in Virginia: At York Spit Light in 1960; now only near Cape Charles City.

Habitat and Mode of Life: Occurs on fine sand substrates. Feeds by moving currents of fine sand over body. *Dissodactylus mellitae* is a commensal pinnotherid crab associated only with this sand-dollar in Chesapeake Bay.

Reproduction: During summer.

Status: *Threatened.* Decline caused by unknown factors which have restricted its range. Possibly subject to massive dredging in area. Apparent northern limit at upper end of Bay mouth (Gosner, page 573).

Protective Measures Proposed: Not feasible.

Remarks: Possibly a relict population separated from North Carolinian population.

Author: Marvin L. Wass.

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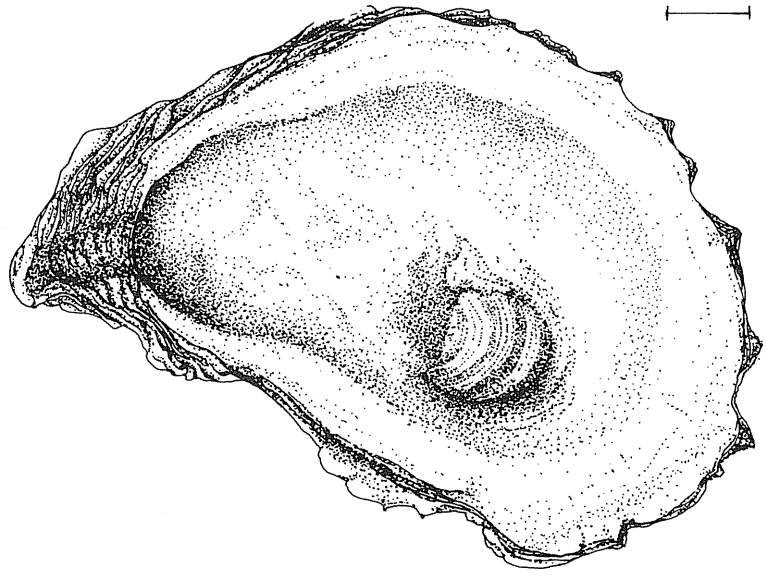
DEPLETED(3)

1. VIRGINIA OYSTER — *Crassostrea virginica* Gmelin

Phylum: Mollusca
Class: Bivalvia
Order: Pteroconchida
Family: Ostreidae



Description: An irregularly-shaped bivalve with a thick shell and tightly-closed valves held shut by one large muscle. Shell broadly oval in ideal conditions; often distorted, bent or elongated in nature. Left valve deeply cupped, thicker than right. Inequilateral, beaks anterior, inconspicuous. Shell formation prolific. This fast-growing mollusk has large areas of gill surface for pumping and filtering plankton from brackish waters (Galtsoff, 1964; Abbott, 1974).

Present Range: New Brunswick to Texas.

Distribution in Virginia: Brackish waters throughout Chesapeake Bay and its tributaries where salinities achieve 10 parts per thousand a few months of the year.

Habitat and Mode of Life: Oysters live intertidally and subtidally wherever hard substrate is available - shell beds, pilings, bridges, piers. Recruitment is irregular but may be intensive, depending on salinity and circulatory regimes. Life-span is long in low salinities where predators and diseases are excluded. In favorable places, oysters setting one on another create reefs. Oyster beds are substrate, food and refuge for a large community of associated and dependent invertebrate species.

Reproduction: Mass spawning in the warm season is followed by 10 to 14 days of planktonic life. Losses from predation and dispersal are very high during this period. Setting occurs on shells and other hard substrates in wide range of salinities (5 to 35 parts per thousand) from 1 July to 1 October in Virginia.

Status: *Depleted.* Oysters were severely depleted from their status when commercial harvesting began about 100 years ago. Although restricted to antiquated gear, continuous harvesting of oysters has resulted in overfishing. Most natural beds in polyhaline waters (20 parts per thousand salinity) are barren. Even where spat setting is adequate, predators prevent survival and effective recruitment. Most oysters are harvested now from private and public beds in low salinity waters (5 to 20 parts per thousand salinity) where both predators and diseases are excluded.

Protective Measures Proposed: Most important is to protect estuarine waters from nutrient and toxic pollutants that upset oyster reproduction and food organisms. Silting, salinity changes and overfishing are additional threats. Avoid introduction of pest and pathogen species with exotic shellfish.

Remarks: A new disease caused by a sporozoan called MSX *(Minchinia nelsoni)* has greatly accentuated depletion of oysters by preventing survival of susceptible seed stocks in high salinity areas. The lower Chesapeake Bay grounds are no longer planted by private oyster growers. Resistant brood stocks have been bred and selected but seed oysters from these must be produced in hatcheries.

Pollution by man is a severe threat to oyster communities in Chesapeake Bay. Kepone contamination has restricted harvesting of oysters in the James River to seed that is replanted in clean waters for cleaning. Chlorine disinfection of sewage threatens to intercept and kill oyster larvae riding the tides as they pass discharging plants. Steadily increasing loads of sewage may destroy oyster populations and most associated organisms by preventing survival of planktonic larvae unless safer methods of nutrient and bacterial control are found.

The failure of oyster fisheries in various parts of the world led to the introduction of exotic species in the hope that the industry could be preserved. This has occurred on the West Coast of North America, Australia and New Zealand, and most recently in France in 1967 - all with the Pacific or Japanese oysters *(Crassostrea gigas)*. In each instance, new diseases have broken out in endemic oysters, with catastrophic consequences. In addition, exotic predators and pests have accompanied the oyster imports with far-reaching effects.

Fortunately, the Middle Atlantic Coast is a difficult environment with a continental climate and wide temperature extremes that most exotic species find too strenuous. Few marine exotics are known to occur in Chesapeake Bay but it is unwise to tempt fate. The Portugese oyster, *Crassostrea angulata*, is virtually gone from the coast of France in less than a decade after a new gill disease appeared, and *Crassostrea gigas* replaced it. Exotic species and their associates are often a severe threat to endemics in disturbed habitats. If they succeed, these exotics often become pests for many years until biotic controls have time to ameliorate their "weedy" tendencies. The southern Atlantic Coast of France is in the "pest" phase with *Crassostrea gigas* now.

There is little danger that *Crassostrea virginica* will become an endangered species. Its wide geographic range and salinity tolerance, including long periods of fresh water in winter and spring when temperatures are low, insure survival. It is also tolerant of many pollutants - heavy metals, pesticides, and bacterial loads. However, genetic diversity could be impaired if oysters were depleted from certain river systems where distinctive physiological and immunological strains are recognized, *e.g.*, the Potomac River population which appears to be a separate race of oysters. These races appear to retain their identity despite much transplanting of seed oysters from other areas.

Author: Jay D. Andrews.

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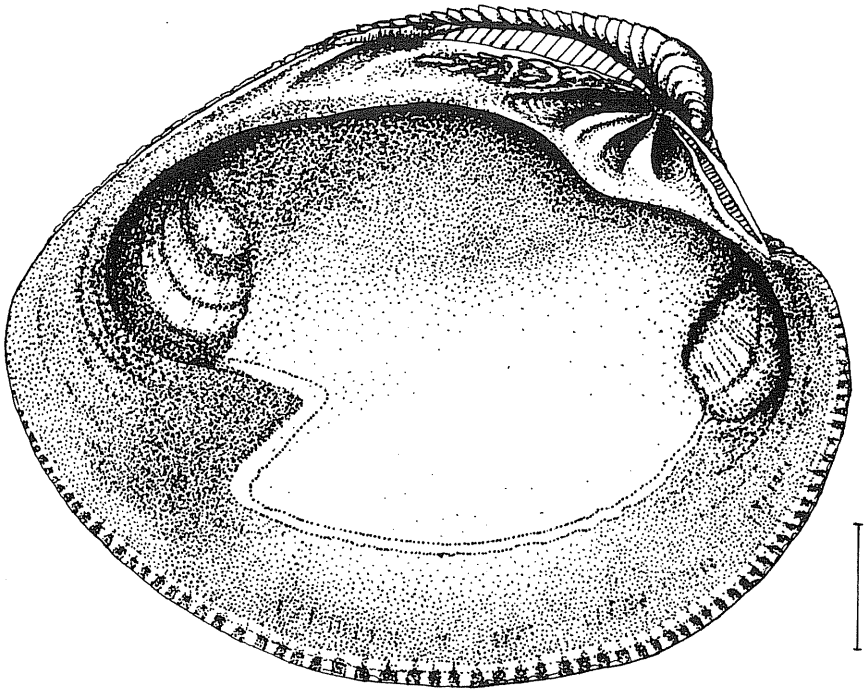
2. HARD CLAM, QUAHOG — *Mercenaria mercenaria* Linnaeus

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Veneridae



Description: Maximum length 125 millimeters. Shell subtriangular to ovate, posterior drawn out; heavy, inflated, equivalve, umbones prominent. Lunule conspicuous, heart-shaped. Strong concentric ridges and ribs sculpture valves. Interior flat white or iridescent. Pearls very rare. Siphons short, united (Abbott, 1974).

Present Range: Gulf of St. Lawrence to Gulf of Mexico.

Distribution in Virginia: Lower Chesapeake Bay and lower parts of rivers.

Habitat and Mode of Life: In suitable bottoms above 10 parts per thousand salinity and having sediment soft enough in which to burrow.

Reproduction: Exceedingly poor in Chesapeake Bay; much better in seaside bays of Eastern Shore.

Status: *Depleted.* Increasing scarcity due somewhat to commercial harvesting, but probably due mainly to destruction of small clams by the blue crab.

Protective Measures Proposed: Perhaps most easily cultured clam, but rock aggregate must be added to mud to prevent blue crabs from eating clams.

Author: Dexter S. Haven.

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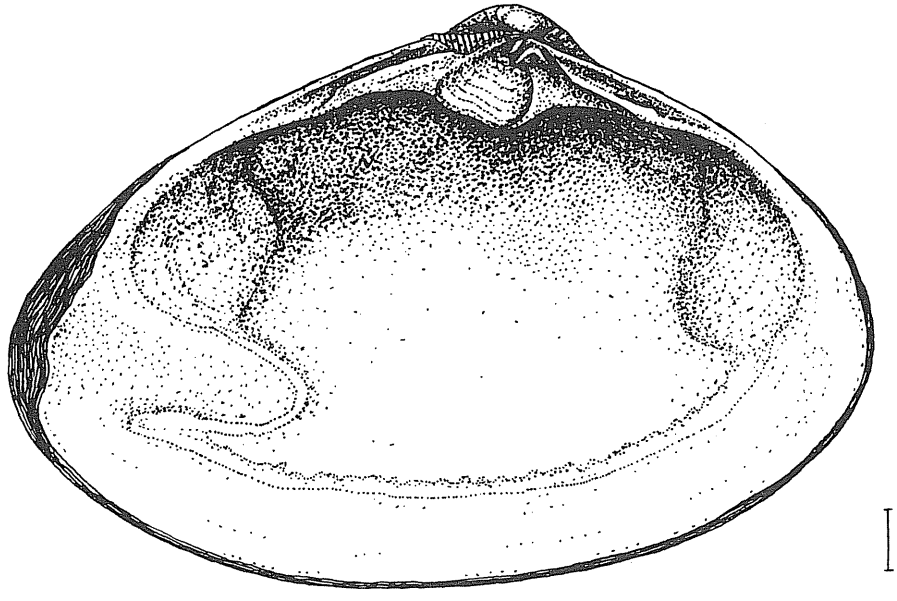
3. ATLANTIC SURF CLAM — *Spisula solidissima* Dillwyn

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Mactridae



Description: Length to 180 millimeters. Shell oval; heavy, inflated, equivalve. Sculpture of fine concentric lines. Left valve with three cardinal teeth and two laterals; right valve with two cardinal teeth and four laterals. Shell interior white, smooth. Periostracum shiny, thin, light brown. Shell margin smooth. Siphons short and united (Abbott, 1974).

Present Range: Nova Scotia to South Carolina.

Distribution in Virginia: Taken rarely in Hampton Roads and lower Bay except along shore at Cape Charles and Cape Henry.

Habitat and Mode of Life: Burrows in bottom and extrudes siphons through sand.

Reproduction: Wastage of larvae and young is great. Brood stocks may need to be large for successful recruitment. Predators abundant and may seriously deplete small populations.

Status: *Depleted.* Numbers remain large but fishing was recently restricted to two days a week because of overfishing off Virginia.

Protective Measures Proposed: Limit catch.

Remarks: May come back quickly if successful yearclass occurs. Market and restrictions could portend the future.

Author: Marvin L. Wass.

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SPECIAL CONCERN (68)

1. SPONGE — *Mycale cecilia* de Laubenfels

Phylum: Porifera
Class: Demospongiae
Order: Poecilosclerina
Family: Ophlitaspongiidae

Description: Flat colonies up to 8 centimeters in diameter forming crusts on shells and calcareous tubes. Color pale yellow to green and tan; texture soft to slimy (Wells, Wells and Gray, 1960).

Present Range: Panama, Hawaii, North Carolina, and Chesapeake Bay.

Distribution in Virginia: Known only from York River.

Habitat and Mode of Life: Lives on stems of eelgrass near bases of grass (Marsh, 1973).

Reproduction: Embryos orange.

Status: *Special Concern.* Died back when eelgrass disappeared during lowered salinities.

Protective Measures Proposed: None.

Remarks: Possibly a new species, subspecies, or variant. Alex Marsh noted different color.

Author: Marvin L. Wass.

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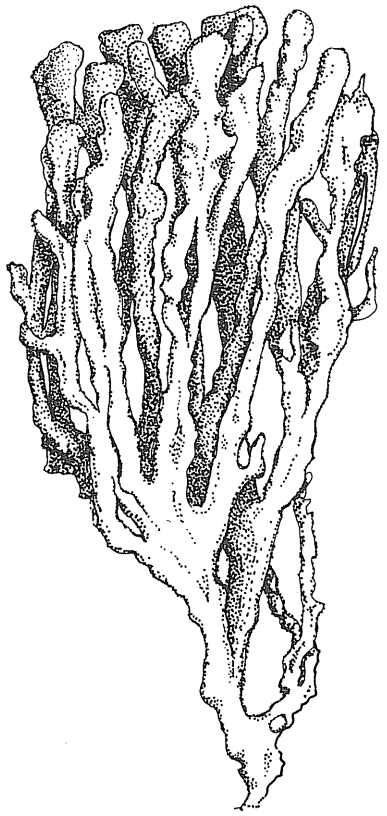
2. RED-FINGER SPONGE *Microciona prolifera* (Ellis and Solander)

Phylum: Porifera
Class: Demospongiae
Order: Poecilosclerina
Family: Microcionidae



Description: A famous sponge because of its ability to regroup cells put through a fine cloth and form new sponges. This sponge, unlike others, flourishes in colder water, forming tough, ramifying and anastomosing dark red masses up to 2 feet long (Burbanck *In:* Brown, 1950). Most fascinating sponge in the Bay; it shelters many higher animals.

Present Range: North Carolina to New England.

Distribution in Virginia: Over much of Bay to 10 parts per thousand salinity. Now very scarce in York River, none having washed up at VIMS in live condition in the past winter (1977-78).

Habitat and Mode of Life: Occurs on pilings, oyster shells and other firm substrates.

Reproduction: By various reproductive devices. H. V. Wilson did cell reaggregation studies on this species.

Status: *Special Concern.* Has continued to decrease since the 1972 storm. Few seen have been in poor condition.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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3. POTATO SPONGE *Craniella laminaris* (George and Wilson)

Phylum: Porifera
Class: Demospongiae
Order: Choristida
Family: Craniellidae

Description: Colonies begin with conic form, becoming amorphous as they tip. The hard gray structures luxuriate in summer over mud and silty sand, often being partly buried (Wells, Wells and Gray, 1960).

Present Range: From Chesapeake Bay southward.

Distribution in Virginia: Bay and lower rivers above about 20 parts per thousand salinity.

Habitat and Mode of Life: Usually on firmer bottom unless broken loose. Probably grows rapidly. Must filter much water when abundant.

Reproduction: Unknown.

Status: *Special Concern.* Greatly decreased since 1970.

Protective Measures Proposed: None.

Remarks: Once common on VIMS beach in 60's, now found dead in lower York River (few). Jay Andrews found many dead specimens at York Spit in May, 1978.

Author: Marvin L. Wass.

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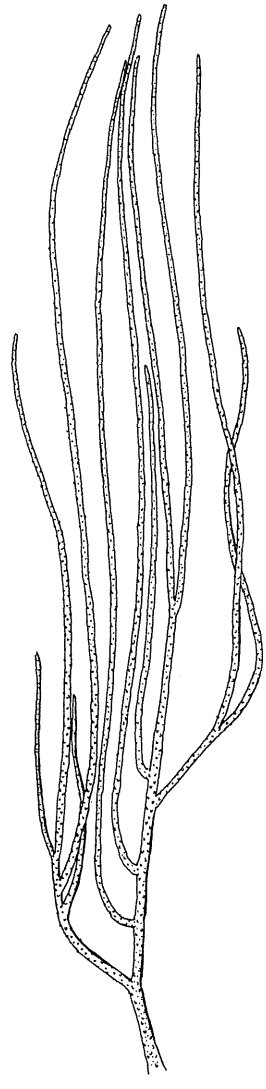
4. SEA WHIP

Leptogorgia virgulata Lamarck

Phylum: Cnidaria
Class: Anthozoa
Subclass: Alcyonaria
Order: Gorgonacea
Family: Gorgoniidae



Description: Slender, branching, up to 2 feet in length (Gosner, 1971). Occurs in two colors: dark purple in York River, yellow-tan in lower Bay. River specimens more terete (bushy).

Present Range: Chesapeake Bay to northern Gulf of Mexico.

Distribution in Virginia: Lower parts of major rivers and in lower Bay.

Habitat and Mode of Life: Attach by holdfast to solid objects such as oyster shells.

Reproduction: Almost certainly in summer.

Status: *Special Concern*. Not seen in York River since 1972 storm occurred.

Protective Measures Proposed: None.

Remarks: Reasons for lack of return in the York River are unknown.

Author: Marvin L. Wass.

5. SEA ANEMONE — *Edwardsia elegans* Verrill

Phylum: Cnidaria
Class: Anthozoa
Order: Actiniaria
Family: Edwardsiidae

Description: Aura of mystery surrounds this species. Most abundant burrowing anemone, it is vermiform, has 16 tentacles with ragged rust-orange covering on scapus. Tentacular disk delicately beautiful in life (Miner, 1950).

Present Range: Woods Hole to Chesapeake Bay.

Distribution in Virginia: Mesopolyhaline, sandy mud; depths.

Habitat and Mode of Life: Life history never studied.

Reproductions: Unknown.

Status: *Special Concern.* Low salinities and low oxygen followed Tropical Storm Agnes. Other unknown causes had already produced marked declines.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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6. RIBBON-WORM (NEMERTEAN) — *Amphiporus ochraceus* Verrill

Phylum: Rhynchocoela
Class: Anopla
Order: Haplonemertini
Family: Amphiporidae

Description: Body elongate, to 70 millimeters. Inverted V-shaped groove behind head. Worms active, often leech-like. Color ochre. Brain yellow to red. Ocelli 14. Proboscis exceeding body; has herring-bone pattern in retraction (Goodchild *In:* Brown, 1950; McCaul, 1963).

Present Range: Massachusetts to Texas.

Distribution in Virginia: Known from Mumfort Island, York River in Chesapeake Bay.

Habitat and Mode of Life: Common on *Zostera* before Tropical Storm Agnes destroyed the beds.

Reproduction: Mainly in summer.

Status: *Special Concern.* Greatly depleted after loss of eelgrass following 1972 tropical storm.

Protective Measures Proposed: Attempt to reestablish eelgrass.

Author: Marvin L. Wass.

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7. RIBBON-WORM (NEMERTEAN) *Tetrastemma candidum* (Müller)

Phylum: Rhynchocoela
Class: Anopla
Order: Haplonemertini
Family: Tetrastemmatidae

Description: Head rounded, slender neck distinct. Body thickened in mid-section, tapering tail pointed. Four ocelli form a square. Body 0.5 by millimeters. Color greenish-brown, with scattered red-brown (McCaul, 1963; Gosner, 1971).

Present Range: Circumpolar; on Atlantic shores, from Norway to South Africa; from Labrador to Florida; Gulf Coast to Louisiana; on Pacific Coast from Alaska to Mexico.

Distribution in Virginia: Frequently collected from eelgrass in the York River by Alex Marsh (1970; 1973).

Habitat and Mode of Life: Frequent on eelgrass.

Reproduction: Unknown.

Status: *Special Concern*. Habitat much regressed.

Protective Measures Proposed: Protect eelgrass.

Author: Marvin L. Wass.

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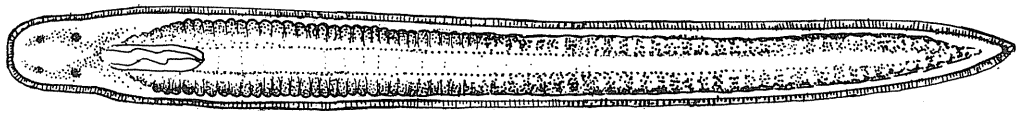
8. RIBBON WORM (NEMERTEAN) *Tetrastemma elegans* Girard

Phylum: Rhynchocoela
Class: Anopla
Order: Haplonemertini
Family: Tetrastemmatidae



Description: Head demarcated by narrow neck; body rounded. Ocelli in square of four. Length usually 0.6 millimeter by 15 millimeters. Outstanding color is pair of brown stripes over length of body. Background cream, may show green eggs laterally (McCaul, 1963).

Present Range: Southern coast of Cape Cod to Chesapeake Bay.

Distribution in Virginia: Second most abundant nemertean at Mumfort Island, Gloucester Point, Virginia.

Habitat and Mode of Life: Found on eelgrass leaves.

Reproduction: Abundant on eelgrass in June; common from April through August.

Status: *Special Concern*. Disappeared from Mumfort Island, York River, after 1972 storm. Recovery of grass has not occurred.

Author: Marvin L. Wass.

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9. RIBBON WORM (NEMERTEAN) *Zygonemertes virescens* Verrill

Phylum: Rhynchocoela
Class: Anopla
Order: Haplonemertini
Family: Amphiporidae

Description: Very active worm. In moving forward it is rounded in cross-section; when moving backward, worm is short and flattened. Worm 40 by 0.5 millimeters; may contract to 10 by 1.5 millimeters. Three rows of eyes in adults. Color dull olive green, head lighter; dorsum diffusely granulated; posterior two-thirds of body has irregular pigment blotches (McCaul, 1963).

Present Range: Bay of Fundy to Florida, and West Coast.

Distribution in Virginia: In Virginia, reported only from eelgrass. Most abundant nemertean on *Zostera*.

Reproduction: Species found only from mid-April to early October; abundant June through August.

Status: *Special Concern*. Habitat destroyed by low salinity in 1972. No recovery had occurred by 1978.

Author: Marvin L. Wass.

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10. POLYCHAETE *Aglaophamus circinata* (Verrill)

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Nephtyidae

Description: Prostonium subpentagonal, anterior margin thin, spatulate; translucent areas near bases of frontal antennae. Tentacular segment enlarged. Proboscis with subterminal papillae in 14 longitudinal rows (Pettibone, 1963).

Present Range: Gulf of St. Lawrence to North Carolina. In depths ranging from 2 to 787 meters.

Distribution in Virginia: Six specimens collected off Cape Charles at depths ranging from 2 to 10 meters.

Habitat and Mode of Life: Collected on bottoms of mud and sand with gravel, rocks and shells.

Reproduction: Unknown.

Status: *Special Concern*. This species is probably at the southern extent of its range near the Chesapeake Bay.

Protective Measures Proposed: None.

Author: Daniel M. Dauer.

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11. POLYCHAETE *Ancistrosyllis jonesi* Pettibone

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Pilargiidae

Description: Body long, flattened dorsoventrally, tapered anteriorly; parapodia deeply cut. Lateral antennae shorter than palpophores. Lacking defined eyes. Notopodia enlarged, inflated, conical. Stout hooked notosetae begin on setiger 6. Size about 1 millimeter wide and perhaps 30 millimeters long (Pettibone, 1966).

Present Range: Chesapeake Bay and North Carolina.

Distribution in Virginia: Chesapeake Bay off Rappahannock River, 7 fathoms mud, July 21, 1963; also in York River at Clay Bank and Gloucester Point, M. Wass, D. Boesch. James River oyster bed, one specimen, P. Larsen, 1974.

Habitat and Mode of Life: Intertidal in sand mixed with gravel, mud and shell fragments in North Carolina (Gardner, 1975).

Reproduction: Unknown.

Status: *Special Concern*. Evidently a rare species.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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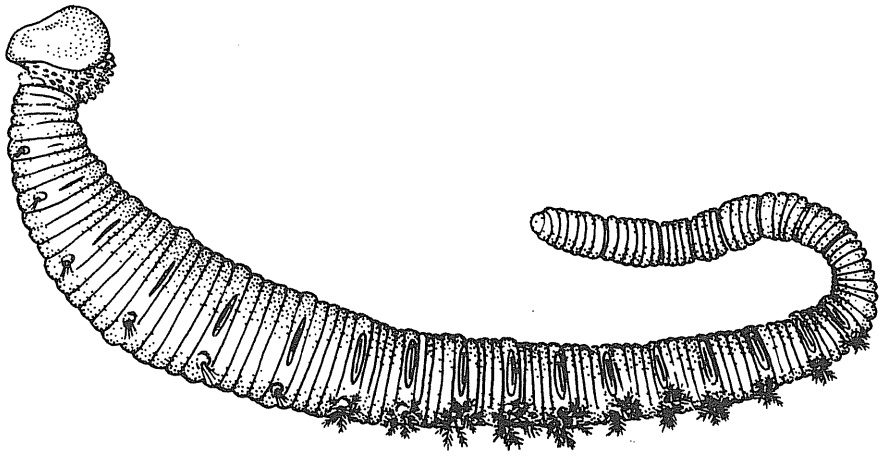
12. POLYCHAETE *Arenicola cristata* Stimpson

Phylum: Annelida
Class: Polychaeta
Order: Capitellida
Family: Arenicolidae



Description: Large dark green worm burrowing into sand and producing large jelly-like masses incorporating eggs. A diatom is common in the jelly mass. Skin of worm annulated; long setae cage head region. Mucus layer envelops sand; skin segments indistinct. Green blood colors skin; reddish gills tufted (Brown, 1950).

Present Range: Cape Cod to Florida.

Distribution in Virginia: Basically in lower Bay at salinities between 10 and 25 parts per thousand.

Habitat and Mode of Life: In finer sands and silts.

Reproduction: Jelly-like egg masses on flats were abundant in early 1960's.

Status: *Special Concern.* None have been seen at VIMS in the 1970's. Dauer collected 10 in Broad Bay of Lynnhaven, indicating a healthy population there.

Protective Measures Proposed: None.

Remarks: Oil spills may have been responsible, but low salinities might also have been detrimental.

Author: Marvin L. Wass.

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13. POLYCHAETE — *Brania clavata* (Claparede)

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Syllidae

Description: Tiny species; length to 4 millimeters, width to 0.3 millimeter, segments 21-35. Prostomium has two pairs of eyes; lateral pair with large lenses. Eggs and young attach to dorsal body of female on setigers 9-24 and appear crowded, nearly covering dorsum (Pettibone, 1963).

Present Range: Gulf of St. Lawrence to Virginia; Ireland to Tristan da Cunha; Japan Sea and Mexico.

Distribution in Virginia: Gloucester Point, 1964, six per square meter, M. Wass; Mumfort Island, 1968, 13 per gram of *Zostera*, G. A. Marsh (1970, 1973); Chesapeake Bay (Back River), 1970, two specimens, R. Orth; one specimen off Cape Charles, Dan Dauer.

Habitat and Mode of Life: Seems restricted to eelgrass in Chesapeake Bay where it may graze on diatoms.

Reproduction: Mature males and females with eggs appeared on the surface at Woods Hole, July to September.

Status: *Special Concern.* None seen recently.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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14. FRINGED WORM *Cirriformia grandis* Verrill

Phylum: Annelida
Class: Polychaeta
Order: Spionida
Family: Cirratulidae

Description: Very large, tentaculate worm, 15 centimeters by 6 millimeters. Proboscis unarmed. Body filiform, elongate. Segments eight and nine have two bundles of setae on either side, together with two clusters of long brachial cirri (Miner, 1950; Day, 1973). Clusters are crowded cirri. Color yellow to orange-brown. Cirri very active. *Cirratulus grandis* in Miner (1950).

Present Range: Massachusetts to North Carolina.

Distribution in Virginia: In mesopolyhaline waters of lower rivers.

Habitat and Mode of Life: Lives in soft sediments of river slopes and channels; usually below a depth of 10 feet.

Reproduction: Unknown.

Status: *Special Concern.* Numbers drastically reduced after 1972 storm.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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15. ICE CREAM CONE WORM *Cistena gouldi* Verrill

Phylum: Annelida
Class: Polychaeta
Order: Terebellida
Family: Amphictaeidae

Description: One of most aberrant polychaetes in view of sand-grain cone and golden setae forming operculum. Two sets of long, golden setae with about 15 in each set. Worm uses these sharp-pointed setae to dig its burrow (Miner, 1950; Pettibone, 1964).

Present Range: Maine to North Carolina; to 15 fathoms.

Distribution in Virginia: Polyeuhaline in sandy areas.

Habitat and Mode of Life: Burrows in bottom with head down.

Reproduction: Often very good.

Status: *Special Concern.* Severe decrease occurred about 1964 in the York River and the species has not recovered its former numbers. Dauer found it common off Lynnhaven and Cape Charles (Boesch, Wass and Virnstein, 1976).

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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16. POLYCHAETE *Enoplobranchus sanguineus* Verrill

Phylum: Annelida
Class: Polychaeta
Order: Terebellida
Family: Terebellidae

Description: An unusual worm looking like a filamentous mop of motile blood red threads, each branch ending in sharp setae. Animal may attain length of 14 inches and tentacles likewise (Miner, 1950; Pettibone, 1964).

Present Range: Gulf of St. Lawrence to Virginia.

Distribution in Virginia: Reported only between eelgrass and lower low water at Gloucester Point. Should occur elsewhere but not reported.

Habitat and Mode of Life: Burrows, sending great numbers of contractile branches through the fine sediment; very difficult to collect an entire worm.

Reproduction: Unknown.

Status: *Special Concern*. Greatly decreased along with eelgrass habitat.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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17. POLYCHAETE *Eumida sanguinea* Oersted

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Phyllodocidae

Description: Minute species, about 12 millimeters long, but composed of approximately 65 segments. Two pairs of stout antennae and an unpaired antenna occur. Eyes large, black. Parapodial cirri lanceolate (Pettibone, 1963).

Present Range: Iceland, Norway, Mediterranean Sea, and Gulf of St. Lawrence to Georgia and Gulf of Mexico. West Coast of United States, Galapagos, Japan, Red Sea, Indian Ocean and New Zealand.

Distribution in Virginia: Found to depths of 30 feet in sand in lower Bay at Kiptopeke (scarce), York River (four), and James River.

Habitat and Mode of Life: Intertidal on shells, under rocks, on pilings. Dredged on bottoms of mud, gravel, stones, shells, algae, bryozoans and especially with sandy tunicate, *Amaroucium pellucidum*.

Reproduction: At Woods Hole, numerous small specimens and females with masses of green eggs occurred during summer months.

Status: *Special Concern*. Greatly decreased along with eelgrass habitat.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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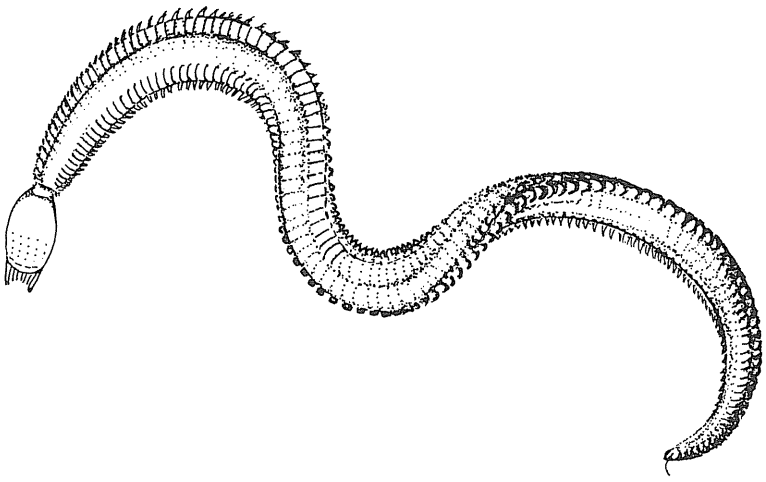
18. POLYCHAETE *Nephtys incisa* Malmgren

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Nephtyidae



Description: Medium size; length to 60 millimeters, width to 4 millimeters. Prostomium arched dorsally, with four antennae. Parapodia with bilobed acicular lobes. Posterior lamella elongate, exceeding acicular lobes. Branchiae cirriform, sickle-shaped (Pettibone, 1963).

Present Range: Greenland, Iceland, Norway, Sweden, North Sea, Baltic Sea, Mediterranean Sea, Gulf of St. Lawrence to Chesapeake Bay, Virginia. Low water to 950 fathoms.

Distribution in Virginia: Chesapeake Bay, mainly at depths of 5 to 15 fathoms.

Habitat and Mode of Life: Found in muddy sand, debris, shells and detritus.

Reproduction: Eggs produced in summer.

Status: *Special Concern.* Population greatly depleted in late 1960's, perhaps due to low dissolved oxygen in summer.

Protective Measures Proposed: None, until cause of great decline can be determined.

Remarks: Was one of most common species at the York River site in early 1960's.

Author: Marvin L. Wass.

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19. POLYCHAETE *Phyllodoce castanea* (Marenzeller)

Phylum: Annelida Order: Phyllodocida
Class: Polychaeta Family: Phyllodocidae

Description: Length to over 20 millimeters, width 2 millimeters. Tentacular cirri rounded in cross-section. Anterior dorsal cirri ropelike, middle cirri conical. Color yellow to deep red (Gardiner, 1975).

Present Range: Widely distributed in tropical and subtropical oceans. Intertidal to 500 meters.

Distribution in Virginia: Known from a single specimen collected off Cape Charles.

Habitat and Mode of Life: Probably an active carnivore. Collected on pilings, coral, and in fine sand.

Reproduction: Unknown.

Status: *Special Concern.* This species is probably at the northern extent of its geographic distribution.

Protective Measures Proposed: None.

Author: Daniel M. Dauer.

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20. POLYCHAETE *Platynereis dumerilli* Audouin and Milne-Edwards

Phylum: Annelida Order: Phyllodocida
Class: Polychaeta Family: Nereidae

Description: Length to 75 millimeters, width to 6 millimeters; segments to 90. Body cylindrical, tapered posteriorly. Prostomium suboval. Four eyes quite large. Proboscis with amber jaws, each with 5-13 teeth. Color from iridescent olive green to reddish with violet chromatophores (Pettibone, 1963).

Present Range: Almost cosmopolitan in warm seas.

Distribution in Virginia: Formerly abundant on grass beds to salinities up to 15 parts per thousand.

Habitat and Mode of Life: Population seemed to be mainly on eelgrass. Forms tenacious, transparent tubes on various substrates elsewhere.

Reproduction: By male and female swarmers, form modified epitokes. Males pursue females. Sexual elements emptied into water where fertilization and development occur; or (at Woods Hole) by a "unique copulatory mechanism, as in *Platynereis dumerilli megalops*. Virginia situation unknown. Adults die after spawning.

Status: *Special Concern.* Depleted following Tropical Storm Agnes.

Protective Measures Proposed: Eelgrass must be returned to former habitats.

Author: Marvin L. Wass.

21. POLYCHAETE — *Schistomeringos caeca* (Webster and Benedict)

Phylum: Annelida
Class: Polychaeta
Order: Eunicida
Family: Dorvilleidae

Description: Length to 8 millimeters, width 0.6 millimeter; segments to 60. Body long, slender, cylindrical, tapered at both ends; flattened ventrally, arched dorsally. Prostomial antennae with 10-15 articles. Color white (Pettibone, 1963, as *Stauronereis*).

Present Range: Gulf of St. Lawrence to Massachusetts, Virginia, North Carolina, Washington, north Japan Sea. Intertidal to 154 meters.

Distribution in Virginia: Two individuals collected off Cape Charles.

Habitat and Mode of Life: Small, carnivorous polychaetes found mainly intertidal to shallow depths. Occur in a wide variety of sediment types.

Reproduction: Unknown.

Status: *Special Concern.* Although few specimens have been collected, it appears that North Carolina represents the extreme southern extent of its distribution.

Protective Measures Proposed: None.

Author: Daniel M. Dauer.

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22. POLYCHAETE — *Scoloplos rubra* (Webster)

Phylum: Annelida
Class: Polychaeta
Order: Orbiniida
Family: Orbiniidae

Description: Length near 70 millimeters, width 1 millimeter. Prostomium acute in front, longer than wide; eyes absent. Thorax broadly oval and much depressed. Branchiae large by sixth segment. Color varies from shades of red to orange with mid-body green (Hartman, 1951).

Present Range: Chesapeake Bay to Florida.

Distribution in Virginia: Six specimens collected near the Narrows of the Lynnhaven complex and two specimens collected off Cape Charles.

Habitat and Mode of Life: Collected on bottoms ranging from fine sands to mixed shell and sand.

Reproduction: Unknown.

Status: *Special Concern.* This species is probably at the northern extent of its geographical range.

Protective Measures Proposed: None.

Author: Daniel M. Dauer.

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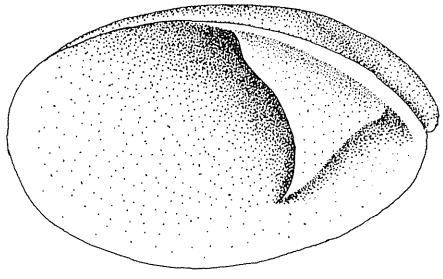
23. CONVEX SLIPPER-SHELL — *Crepidula convexa* Say

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Calyptraeidae



Description: Length to 13 millimeters long by 5 millimeters high; apex usually overhangs near margin of shell, which is highly arched. Color dull green speckled with varied flecks. Interior mottled with dark brown; diaphragm white with yellow edge (Abbott, 1974).

Present Range: Massachusetts to Bermuda, Florida, Texas and West Indies.

Distribution in Virginia: Lower parts of rivers and adjacent shores and bays, including Eastern Shore.

Habitat and Mode of Life: Most abundant on eelgrass, but also on oysters and other substrates in areas with salinities above 10 parts per thousand.

Reproduction: Egg mass composed of a group of egg capsules joined in a sticky mass. During two-week incubation period, egg mass is attached to sticky pad or to propodium. Egg capsules divided into two compartments, totalling about 200 to over 1300 eggs. Average production is three broods per season (Hendler and Franz, 1971).

Status: *Special Concern*. Marsh (1973) found this the most abundant species in his shallowest eelgrass station. His area and many others have not recovered, hence limiting *Crepidula convexa*.

Protective Measures Proposed: Replenish eelgrass.

Remarks: Since *Crepidula convexa* has no larval stage, it will take a long time to repopulate former habitats, especially in eelgrass beds.

Author: Marvin L. Wass.

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24. VARIABLE BITTIUM — *Diastoma varium* Say

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Cerithiidae

Description: Length about 7 millimeters by 2 millimeters. Conical shell with six to eight whorls overlain by spirals and cross-ridges. Aperture rounded; anterior canal a small notch. Operculum with four to five spirals (Abbott, 1974).

Present Range: Maryland to Florida, Texas and Brazil.

Distribution in Virginia: Only where eelgrass is abundant.

Habitat and Mode of Life: Evidently requires eelgrass substrate to graze on diatoms.

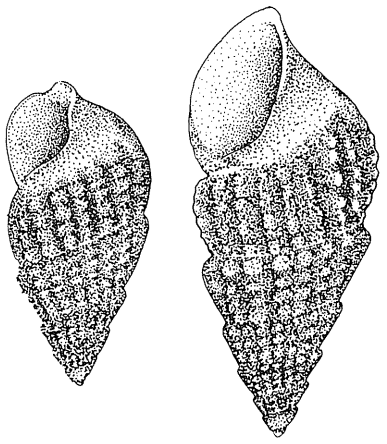
Reproduction: Summer.

Status: *Special Concern.* Slowly returning to former areas but still rare in the best grass beds on the Western Shore of the Bay.

Protective Measures Proposed: Reintroduce *Diastoma* to areas where eelgrass has returned.

Remarks: *Diastoma* was the most abundant species on eelgrass before the 1972 June flood (Marsh, 1973).

Author: Marvin L. Wass.



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25. VERRUCOSE DORIS — *Doris verrucosa* Linnaeus

Phylum: Mollusca
Class: Gastropoda
Order: Nudibranchia
Family: Dorididae

Description: Adult 20 to 60 millimeters long. Dorsal surface of mantle has "mushroom" papillae. Body oval, lacking projections. Branching branchiae 15, encircling anus. Rhinophores perfoliate. Mantle covers entire body and foot. Eyespots hidden in adult. Color orange-yellow on gray, with two long dark stripes dorsally (Abbott, 1974).

Present Range: Massachusetts to Brazil.

Distribution in Virginia: Deep waters of Bay and mouth of Cherrystone Creek; salinity polyhaline (Vogel, 1977).

Habitat and Mode of Life: Found on sponges, encrusting or free growing; benthic. Active June to January.

Reproduction: Mates and lays eggs in August. Larvae free-swimming.

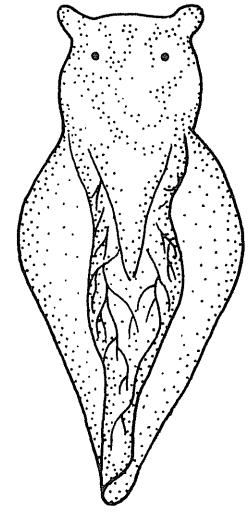
Status: *Special Concern.* Disappeared from most of Bay after Tropical Storm Agnes; returning slowly to Eastern Shore bayside and western shore.

Protective Measures Proposed: Provide habitats for sponges.

Author: Rosalie M. Vogel.

26. KITTY CAT ELYSIA — *Elysia catulus* Gould

Phylum: Mollusca
Class: Gastropoda
Order: Nudibranchia
Family: Elysiidae



Description: Adults 3 millimeters long. Parapodia not meeting dorsally. Outline of body catlike. Color dark to light green; head has three white patches, one dorsally and one on either side of head posterior to rolled rhinophores (Abbott, 1974).

Present Range: Nova Scotia to Virginia.

Distribution in Virginia: Shallow waters, lower polyhaline (Vogel, 1977).

Habitat and Mode of Life: Found in *Zostera* beds on blades. Feeds on *Zostera*.

Reproduction: Not observed in Virginia; suspect mating in Fall.

Status: *Special Concern*. Much depleted. Rare in Virginia; almost eliminated in Chesapeake Bay after Tropical Storm Agnes.

Protective Measures Proposed: Protect eelgrass.

Author: Rosalie M. Vogel.

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27. DUSKY STILIGER — *Stiliger fuscatus* Gould

Phylum: Mollusca
Class: Gastropoda
Order: Sacoglossa
Family: Hermaeidae

Description: Small (3 millimeters), aeolidiform, lacking tentacles, has one pair of rhinophores and dorsal cerata; latter cylindrical, five on a side. Foot lobed anteriorly, tapered posteriorly. Anal opening dorsal. Color rusty to black, white tips on cerata and white strip on rhinophores (Abbott, 1974).

Present Range: New Hampshire to Virginia.

Distribution in Virginia: Lower Bay and Eastern Shore (Vogel, 1977).

Habitat and Mode of Life: Confined to eelgrass, at least in Chesapeake Bay.

Reproduction: Tremendously successful in July and August at Mumfort Island area in York River; is the most abundant species during that time. Disappears during rest of year.

Status: *Special Concern:* Due to eelgrass die-off in 1972 and following warm winters.

Protective Measures Proposed: Reestablish eelgrass in former areas.

Remarks: Marsh (1976) found 4,327 specimens at Mumfort Island in 1970, far exceeding other species in July and August and making this species the third most abundant gastropod in that study.

Author: Rosalie M. Vogel.

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28. BLACK-LINED TRIFORA *Triphora nigrocincta* C. B. Adams

Phylum: Mollusca
Class: Gastropoda
Order: Archaeogastropoda
Family: Triphoridae

Description: Long, 7 millimeters, spiral shell has about 15 sinistral whorls marked with three rows of conspicuous tubercles, separated by revolute grooves on each whorl, except first four or five smooth; apical whorls are smooth, except that body whorl has four rows. Color reddish-black to black (Abbott, 1974).

Present Range: Massachusetts to Bermuda and Florida; Texas to Brazil.

Distribution in Virginia: Wherever eelgrass abounds in lower rivers above salinities of 10 parts per thousand and adjacent Bay shores.

Habitat and Mode of Life: Like some other small snails, this species probably grazes on the epiflora of *Zostera*.

Reproduction: Unknown; egg cases probably attached to *Zostera* blades.

Status: *Special Concern*. Low salinity after Tropical Storm Agnes and subsequent "accidents," *e.g.*, oil spills, have precluded return of this and other species in the York River.

Protective Measures Proposed: Probably impossible.

Remarks: *Triphora nigrocincta* is an interesting species worthy of study before it decreases further.

Author: Marvin L. Wass.

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29. PAPER MUSSEL *Amygdalum papyrium* (Conrad)

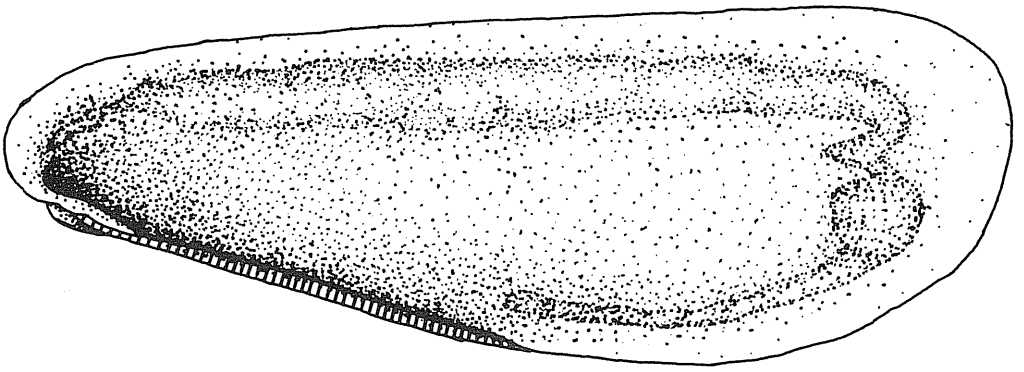
Phylum: Mollusca
Class: Bivalvia
Order: Pteroconchida
Family: Mytilidae

Description: Shell elongate, 30 millimeters long, smooth, fragile, equivalve; inequilateral, beaks near anterior end, directed forward. Periostracum thin, varnished. Concentric growth lines have fine sculpture. Color iridescent gray to yellow-brown, overlain with reddish brown design (Abbott, 1974).

Present Range: Maryland to Florida and Texas.

Distribution in Virginia: In shallow, sheltered waters on wigeon grass and eelgrass.

Habitat and Mode of Life: Attaches to sea grasses.



Reproduction: Unknown.

Status: *Special Concern*. Suffers from loss of eelgrass, which has not yet recovered.

Protective Measures Proposed: Protect *Ruppia* and *Zostera*.

Author: Marvin L. Wass.

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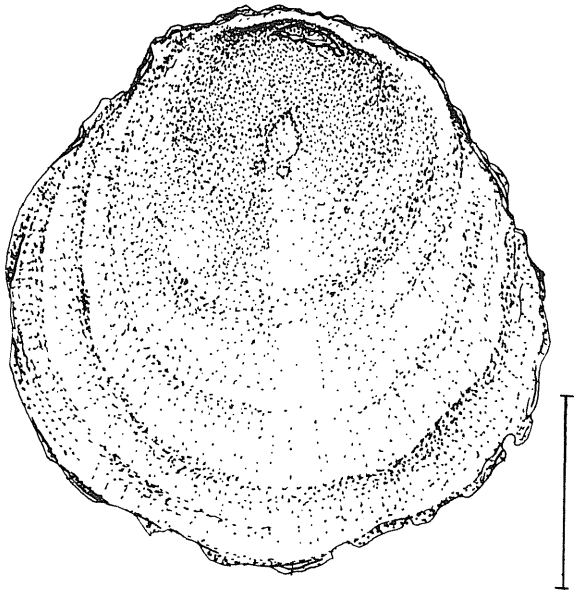
30. COMMON JINGLE SHELL — *Anomia simplex* Orbigny

Phylum: Mollusca
Class: Bivalvia
Order: Pteroconchida
Family: Anomiidae



Description: Length to 51 millimeters. Shell irregular, near circular, inequivalve; right valve fragile, left strong. Right valve smaller and flatter than convex left valve. Periostracum absent. Color yellow, dull orange or tan. Sculpture raised undulations. Margin jagged. Siphons lacking. Attaches to solid surface (Abbott, 1974).

Present Range: Cape Cod to Bermuda, Florida, Texas and Brazil.

Distribution in Virginia: In lower Chesapeake Bay and lower parts of major rivers.

Habitat and Mode of Life: Attached to oysters and other solid substrates. Color silvery, dull-orange and translucent yellow.

Reproduction: Unknown.

Status: *Special Concern.* Much reduced after passage of Tropical Storm Agnes; apparently far from recovered as yet.

Protective Measures Proposed: None.

Remarks: Shells occasionally used decoratively; prized by children and beachcombers.

Author: Marvin L. Wass.

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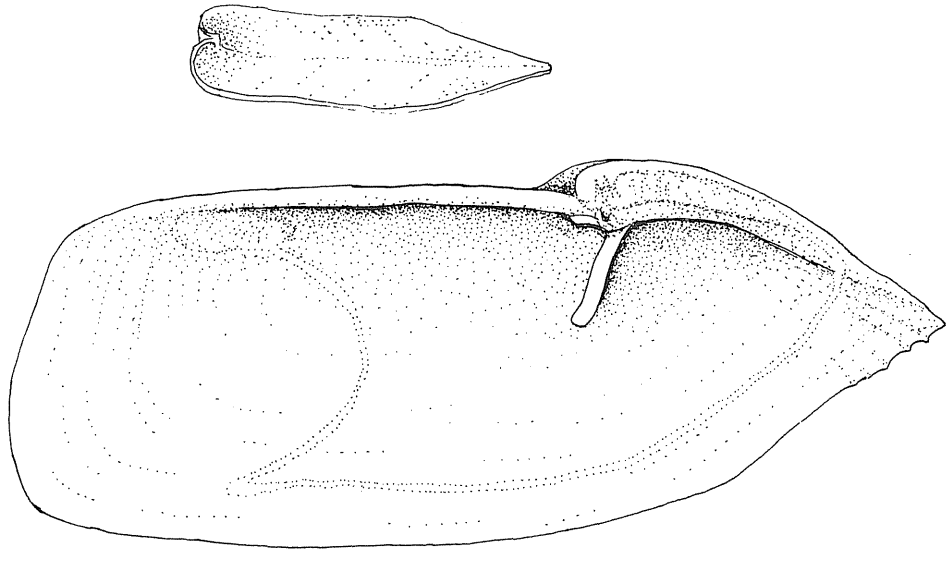
31. FALLEN ANGEL WING

Barnea truncata Say

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Pholadidae



Description: Length to 70 millimeters. Shell rectangular; posterior truncate, anterior pointed, pedal gape wide; thin, fragile, little inflated. Periostracum thin, straw yellow. Sculpture concentric ridges and radiating ribs drawn into small spires where they cross (Abbott, 1974).

Present Range: Salem, Massachusetts to Texas and Brazil; above salinities of 10 parts per thousand.

Distribution in Virginia: Goodwin Island on the York River and Cedar Island.

Habitat and Mode of Life: Burrows into mud, clay and peat (Chanley and Andrews, 1971).

Reproduction: Unknown.

Status: *Special Concern*. Restricted to rather scarce habitats, where it may be quite common.

Protective Measures Proposed: Attempt to save peat and clay banks of the Bay and rivers.

Author: Marvin L. Wass.

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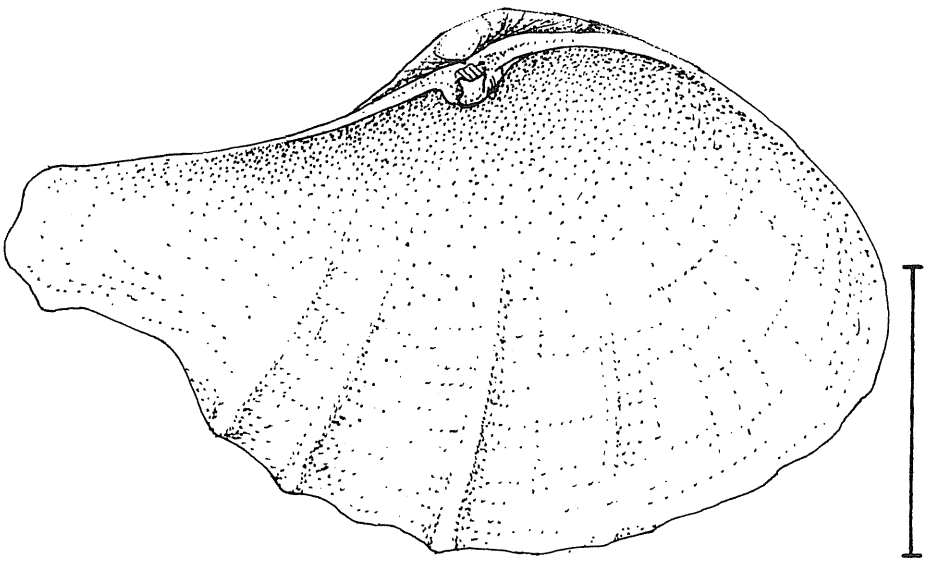
32. CAROLINA CUSPIDARIA — *Cuspidaria glypta* (Bush)

Phylum: Mollusca
Class: Bivalvia
Order: Poromyacea
Family: Cuspidariidae



Description: Length to 5 millimeters. Shell subovate, posterior prominent, spout projecting distally, gaping at end. Shell thin, little compressed, inequivalve; left most convex. Sculpture very delicate growth lines, with three prominent radial ribs posteriorly and a fourth near midline. Margin crenulate at ribs. Siphons lacking (Abbott, 1974).

Present Range: Chesapeake Bay to West Indies.

Distribution in Virginia: Lower Chesapeake Bay off Rappahannock River, rare; specimen in York River, 30 feet.

Habitat and Mode of Life: Unknown; presumably uses "handle" to reach substrate surface.

Reproduction: Unknown. Probably quite low.

Status: *Special Concern.* Not seen in 15 years. Northern limit of range.

Protective Measures Proposed: None.

Remarks: Believed by Abbott (1974) to be young of *Cuspidaria costellata.*

Author: Marvin L. Wass.

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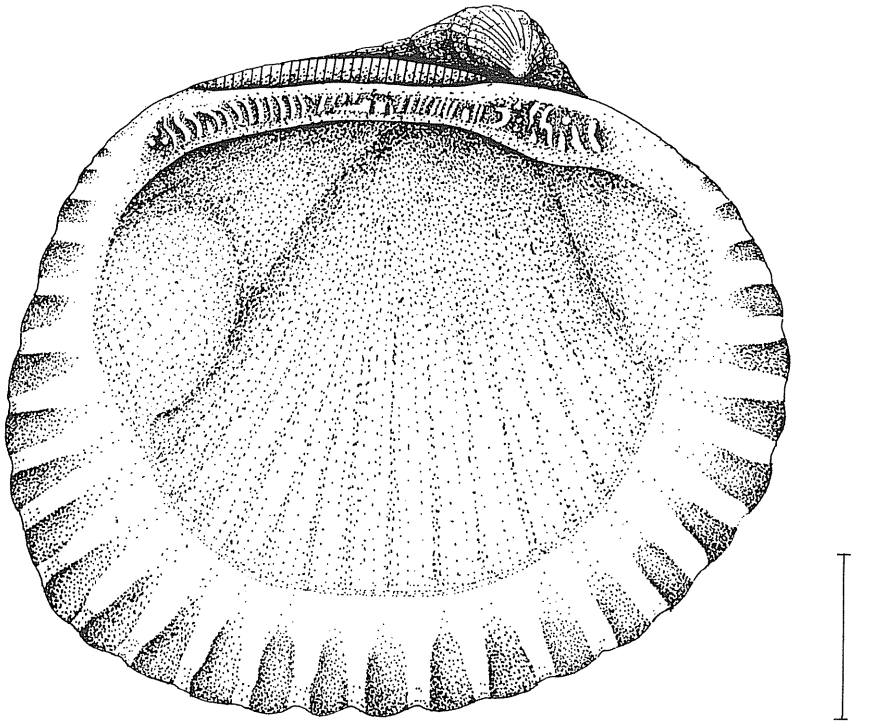
33. PONDEROUS ARK *Noetia ponderosa* Say

Phylum: Mollusca
Class: Bivalvia
Order: Prionodontida
Family: Arcidae



Description: Length to 65 millimeters. Shell rectangular ovate; heavy, equivalve. Hinge straight, approximately 35 teeth. Adductor scars elevated. Margin scalloped with about 27 ribs. Siphons lacking. Periostracum heavy, dark, worn from beaks. Ligament a wide, black, spear-shaped band (Abbott, 1974).

Present Range: Chesapeake Bay to Florida and Texas; areas above salinities of 15 parts per thousand.

Distribution in Virginia: In polyhaline and euhaline waters, mainly in Eastern Shore bays, to depth of 86 feet at Yorktown bridge.

Habitat and Mode of Life: In fine sand and silt; more common on Eastern Shore.

Reproduction: Unknown.

Status: *Special Concern.* Depleted in lower salinity waters by low salinity and low dissolved oxygen. Not yet returned to all of former areas.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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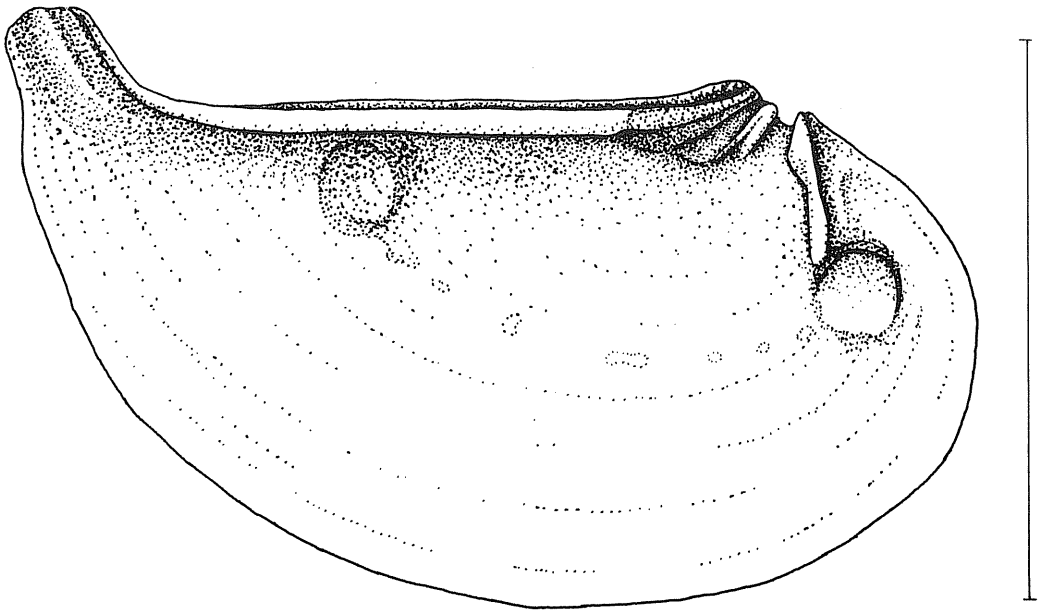
34. SAY'S PANDORA — *Pandora trilineata* Say

Phylum: Mollusca
Class: Bivalvia
Order: Pandoracea
Family: Pandoridae



Description: Length to 30 millimeters. Shell crescent-like; strong square ridge along hinge; thin, very compressed, flat; inequivalve; left valve overlapping right. Shell very delicate, color white (Abbott, 1974).

Present Range: Virginia to Florida, Texas, and to a depth of 60 fathoms in the ocean.

Distribution in Virginia: Several specimens taken in 1950's by Andrews at York Spit; off Rappahannock River in Chesapeake Bay, 1963; one off Cape Charles by Dauer, 1978.

Habitat and Mode of Life: Burrows in sand.

Reproduction: Clams hermaphroditic. Eggs large and extruded on mucus strands. Veligers free-swimming about one day before setting (Boss and Merrill, 1965).

Status: *Special Concern.* Very few found; dredging and spoiling imminent along York Spit and Rappahannock Channels.

Protective Measures Proposed: None.

Remarks: A rather small species; perhaps more scarce at northern limit.

Author: Marvin L. Wass.

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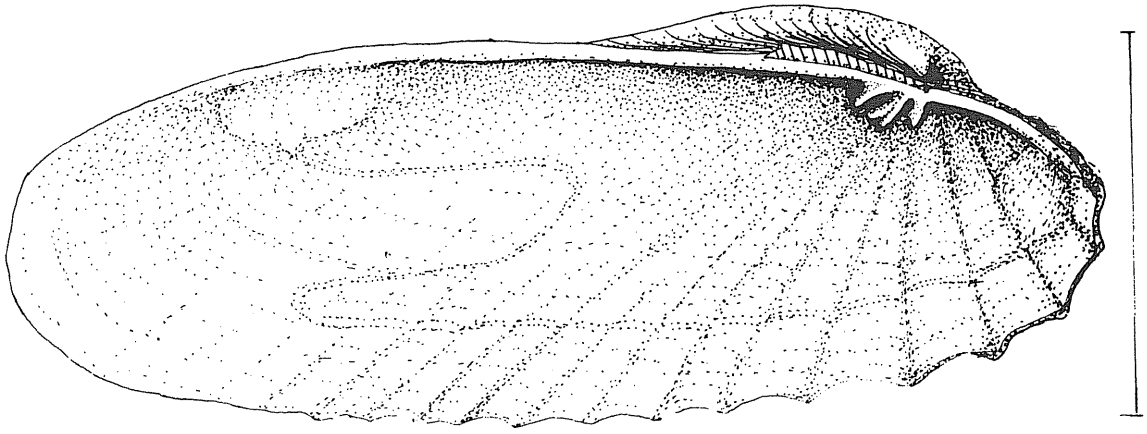
35. FALSE ANGEL WING — *Petricola pholadiformis* Lamarck

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Petricolidae



Description: Length to 65 millimeters. Shell elongate-oval; thin, brittle, inflated, equivalve. Ligament a prominent arched band. Lunule ill defined, escutcheon lacking. Sculpture 40 or more radiating ribs. Right valve with two cardinal teeth, left with three. Pallial sinus deep, margin crenulate where ribs reach margin. Color dull white to fawn. Periostracum dark brown (Abbott, 1974).

Present Range: Gulf of St. Lawrence to Texas and Uruguay.

Distribution in Virginia: Common around lower Bay in intertidal peat.

Habitat and Mode of Life: Peat for burrowing is quite scarce and often eroding above salinities of 10 parts per thousand.

Reproduction: Unknown.

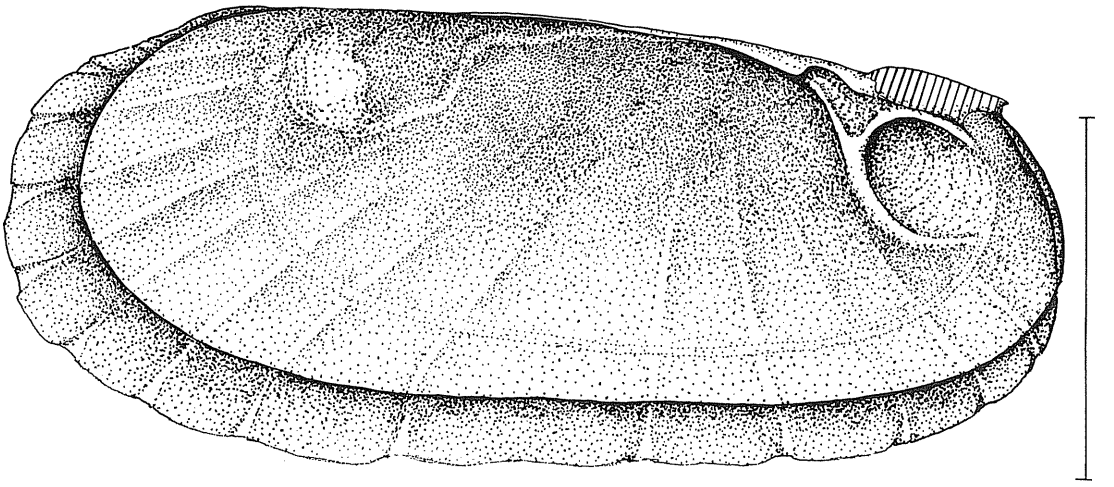
Status: *Special Concern.* Due to scarcity of habitats. Formerly abundant in salt water pipe systems in York River. Sporadic in occurrence.

Protective Measures Proposed: Attempt to save eroding peat marshes.

Author: Marvin L. Wass.

36. COMMON ATLANTIC AWNING CLAM — *Solemya velum* Say

Phylum: Mollusca
Class: Bivalvia
Order: Protobranchia
Family: Soleymacidae



Description: Length to 25 millimeters. Shell elongate-ovate, gaping, paper thin, little calcified, moderately inflated; equivalve. Periostracum smooth, shiny, horny, brown: radial markings extend beyond margins as a fringe. Shell interior blue-violet. Margin smooth. Siphons lacking. (Abbott, 1974).

Present Range: Nova Scotia to northern Florida.

Distribution in Virginia: Lower Chesapeake Bay, particularly where *Zostera* beds occur.

Habitat and Mode of Life: Moves about through eelgrass.

Reproduction: Unknown.

Status: *Special Concern.* Seems absent wherever eelgrass has disappeared.

Protective Measures Proposed: Protect eelgrass.

Remarks: Very interesting mollusk. Most primitive Chesapeake bivalve and deserving of all possible protection.

Author: Marvin L. Wass.

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37. OSTRACOD *Cylindroleberis mariae* (Baird)

Phylum: Arthropoda
Class: Crustacea
Subclass: Ostracoda
Order: Myodocopa
Family: Cylindroleberidae

Description: Large species, length 2 millimeters. Valves elliptical, notched in front. Body shiny, rather compressed (Miner, 1950).

Present Range: Massachusetts to Virginia.

Distribution in Virginia: Mesopolyhaline; apparently only abundant in eelgrass beds.

Habitat and Mode of Life: Shallow burrower in fine sand.

Reproduction: Unknown.

Status: *Special Concern.* Reduced, especially where lower salinities reduced eelgrass beds.

Protective Measures Proposed: None.

Remarks: Up-to-date sampling needed.

Author: Marvin L. Wass.

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38. OSTRACOD *Sarsiella texana* Kornicker and Wise

Phylum: Arthropoda
Class: Crustacea
Subclass: Ostracoda
Order: Myodocopa
Family: Sarsiellidae

Description: Length to 1.33 millimeters. Carapace of adult female oval, lacking sinus; a pointed area on ventral margin one-third distance from posterior end. Narrow, little-raised rim borders carapace, which lacks ornaments. Carapace compressed dorsally; thinning towards ventral end, posteriorly. Furca of adults with five claws.

Present Range: Virginia to Texas.

Distribution in Virginia: Poorly known; probably mainly polyhaline.

Habitat and Mode of Life: Evidently same as *Sarsiella zostericola;* congeneric habitat differences unknown.

Reproduction: Summer.

Status: *Special Concern.* Population usually about 10% of *Sarsiella zostericola.*

Protective Measures Proposed: None.

Remarks: Studies needed.

Author: Marvin L. Wass.

39. OSTRACOD *Sarsiella zostericola* Cushman

Phylum: Arthropoda
Class: Crustacea
Subclass: Ostracoda
Order: Myodocopa
Family: Sarsiellidae

Description: Adult female laterally oval, with point on ventral margin near posterior end; lacking anterior sinus. Slight rim borders carapace. Surface has puncta and three raised ribs radiating from hub near center. Adult male carapace has prominent anterior rostrum (Miner, 1950).

Present Range: At least Virginia to Texas.

Distribution in Virginia: Lower York River.

Habitat and Mode of Life: Associated with eelgrass beds, but abundant in deeper waters in early 1960's.

Reproduction: Unknown.

Status: *Special Concern.* Depleted by loss of eelgrass beds in some areas and possibly by low dissolved oxygen levels in deeper water.

Protective Measures Proposed: None.

Remarks: Annual sampling should be done.

Author: Marvin L. Wass.

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40. OSTRACOD *Loxoconcha impressa* (Baird)

Phylum: Arthropoda
Class: Crustacea
Subclass: Ostracoda
Order: Podocopa
Family: Loxoconchidae

Description: Tiny species. Shell narrowed posteriorly and notched at upper posterior angle. Ventral margin has flattened border. Shell evenly punctate (Miner, 1950).

Present Range: Vineyard Sound to Chesapeake Bay.

Distribution in Virginia: In Rappahannock and York Rivers (Elliott *et al.*, 1966).

Habitat and Mode of Life: Apparently confined to *Zostera* and *Ruppia* beds.

Reproduction: Summer.

Status: *Special Concern.* Due to eelgrass setback.

Protective Measures Proposed: Protect eelgrass.

Author: Marvin L. Wass.

41. OPOSSUM SHRIMP *Mysidopsis bigelowi* (Tattersall)

Phylum: Arthropoda
Class: Crustacea
Order: Mysidacea
Family: Mysidae

Description: Length 7.5 millimeters. Carapace has blunt point between eyes. Eyes of medium size, occupying less than half of whole eye. Antennal scale with setae present on inner and outer margins. Telson armed with many spines. Antennal scale approximately five times as long as telson; latter cleft (Wigley *In:* Smith, 1964).

Present Range: Virginia; shallows to about 200 feet offshore (Gosner, 1971).

Distribution in Virginia: Mobjack Bay and York River (Mumfort Island); also at Wachapreague, Virginia (Van Engel, 1972).

Habitat and Mode of Life: Common on eelgrass in deeper beds before 1972 (Marsh, 1973).

Reproduction: Unknown.

Status: *Special Concern.* Due to depletion of eelgrass.

Protective Measures Proposed: Protect eelgrass.

Author: Marvin L. Wass.

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42. CUMACEAN *Cyclaspis varians* Calman

Phylum: Arthropoda
Class: Crustacea
Order: Cumacea
Family: Bodotriidae

Description: Length of female 3 millimeters, male smaller. Cephalothorax well rounded above. Carapace compressed, height more than half length. Rostrum short. Abdomen long, slender. Separation of thorax and abdomen indistinct (Wigley *In:* Smith, 1964).

Present Range: Southern New England to Virginia.

Distribution in Virginia: York River (Clay Bank), three in eelgrass bed, Robert Orth; Elizabeth River, rare, Michael Richardson.

Habitat and Mode of Life: Burrows in grass beds and possibly in other substrates.

Reproduction: Unknown.

Status: *Special Concern.* Obviously quite rare in Chesapeake Bay.

Protective Measures Proposed: None.

Remarks: Possibly tied to grass beds.

Author: Marvin L. Wass.

43. ISOPOD *Edotea triloba* Say

Phylum: Arthropoda
Class: Crustacea
Order: Isopoda
Family: Idoteidae

Description: Length about 7 millimeters. Body ovate. Thoracic segments appear scalloped. First antennae shorter. Head wide, anterior margin has two broad points before the eyes. Telson has large, round hump in center (Schultz, 1969).

Present Range: Maine to Virginia.

Distribution in Virginia: Widely distributed; perhaps most abundant in eelgrass beds. Orth found 540 per square meter in a *Zostera* bed. Wass found 600 per square meter in Tangier Sound at 87 feet (27 meters).

Habitat and Mode of Life: Lives at all depths where detritus or grassbeds occur above salinities of 10 parts per thousand.

Reproduction: Females brood young in pouch.

Status: *Special Concern.* Usually abundant in eelgrass beds when these flourish. Now depleted by lack of grass beds and possibly by low dissolved oxygen and, in shallows, by oil residue.

Protective Measures Proposed: None feasible, except grass restoration, which promises to be difficult.

Remarks: Not in danger, but quite reduced.

Author: Marvin L. Wass.

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44. ISOPOD *Erichsonella attenuata* Harger

Phylum: Arthropoda
Class: Crustacea
Order: Isopoda
Family: Idoteidae

Description: Length 12 millimeters. Body elongate. Uropods ventral, forming chamber enclosing pleopods. Sides of head entire; eyes lateral. Pleotelson forming near triangular point, with minute tubercle on either side (Schultz, 1969).

Present Range: Connecticut to North Carolina.

Distribution in Virginia: Shallows of lower ends of rivers and along stable shores.

Habitat and Mode of Life: Clinging to eelgrass, where it probably feeds on microalgae. Ranked fifth in total numbers of fauna on eelgrass.

Reproduction: Females ovigerous April to November; retained in marsupium until about 2 millimeters long; 35-40 young carried in marsupium.

Status: *Special Concern.* Obviously tied to eelgrass. If true, this species must have one of the shortest ranges on the Atlantic coast. Now greatly reduced by eelgrass die-off.

Protective Measures Proposed: Possibly replanting eelgrass if winters stay cool.

Remarks: Once was the fifth most abundant species on eelgrass (Marsh, 1973).

Author: Marvin L. Wass.

45. ISOPOD *Idotea balthica* Pallis

Phylum: Arthropoda
Class: Crustacea
Order: Isopoda
Family: Idoteidae

Description: Length near 35 millimeters. Abdomen over one-third longer than body, divided into two short and one long segment. Telson with three teeth, central two largest. Female much smaller (Schultz, 1969).

Present Range: Gulf of St. Lawrence to Rio de Janeiro; also in eastern Atlantic and Mediterranean.

Distribution in Virginia: Apparently only on eelgrass (Marsh, 1973).

Habitat and Mode of Life: Swims among grass and moves along stems. Probably feeds on diatoms.

Reproduction: Unknown.

Status: *Special Concern.* Obviously associated mainly with eelgrass in Virginia. Hence now greatly depleted.

Protective Measures Proposed: Foster eelgrass by planting.

Remarks: Rather unique in habits and range; less common than *Erichsonella attenuata.*

Author: Marvin L. Wass.

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46. RAPID ISOPOD *Ligia exotica* Roux

Phylum: Arthropoda
Class: Crustacea
Order: Isopoda
Family: Ligidae

Description: Large littoral isopod, about 35 millimeters long. Body somewhat tear-drop shaped. Antennae long, divergent. Carapace consisting of at least 11 segments. Long slender legs capable of great speed on any firm surface. Runs much like a cockroach.

Present Range: Unknown. Possibly from Delaware Bay and at least to Gulf Coast of Florida; also occurs in Japan.

Distribution in Virginia: On old pilings and breakwaters wherever salinity is above about 15 parts per thousand.

Habitat and Mode of Life: Lives in crevices in shade, where wave splash is frequent. Does both oral and anal drinking (Parry, 1953). Large water needs must be deadly when oil covers surfaces.

Reproduction: Unknown.

Status: *Special Concern.* Once very abundant at VIMS. Only juveniles seen recently. Great decrease obviously due to increasing massive oil spills in York River. Situation seems normal elsewhere in Virginia.

Protective Measures Proposed: Cease oil spills and leaks.

Remarks: Perhaps amateur naturalists needed to keep surveillance on this and other intertidal species.

Author: Marvin L. Wass.

47. AMPHIPOD *Acanthohaustorius intermedius* Bousfield

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Haustoriidae

Description: Length 4.5 millimeters. Body broad, rostrum acute, side plates acuminate rearward, plate with spinous process. Gnathopod 1 simple, segment 5 greatly enlarged; telson wide, deeply notched (Bousfield, 1973).

Present Range: East side of Cape Cod Bay and Georges Bank south to Cape Kennedy.

Distribution in Virginia: Lower Bay, upper polyhaline and euhaline.

Habitat and Mode of Life: Burrowing in fine sand to depth of 40 meters.

Reproduction: Females ovigerous May-September.

Status: *Special Concern.* Occurs in oligohaline areas subject, in some cases, to habitat loss by dredging, low oxygen and industrial effluents.

Protective Measures Proposed: Definitive survey and occasional subsequent surveillance.

Remarks: May be significant part of food chains in low salinity marshes.

Author: Marvin L. Wass.

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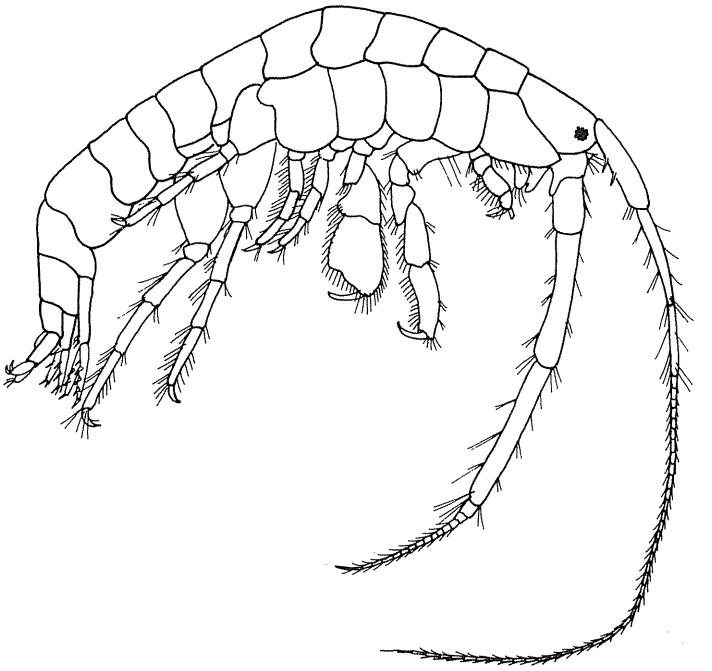
48. AMPHIPOD *Ampithoe longimana* Smith

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Ampithoidae



Description: Length 10 millimeters. Eye rather large, round, black. Antennae 1 and 2 almost equal to length of body; peduncles long. Antenna 2 has bristled, setose whorls. Male gnathopod has segments 5 and 6 elongate; segments 5 and 6 in female are short, stout. Gnathopod 2, segments 5 and 6 heavier than gnathopod 1. Telson short, apex rounded (Bousfield, 1973).

Present Range: Florida to southern Maine.

Distribution in Virginia: Most common on eelgrass at salinity below 13 parts per thousand (Feeley and Wass, 1971).

Habitat and Mode of Life: Makes nests on algae and eelgrass (*Zostera*) (Marsh, 1970).

Reproduction: Females ovigerous May-September.

Status: *Special Concern*. Depleted due to die-back of eelgrass in 1972. Recovery very slow.

Protective Measures Proposed: Replanting of eelgrass.

Remarks: Food for fish and larger invertebrates.

Author: Marvin L. Wass.

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49. AMPHIPOD *Cerapus tubularis* Say

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Corophiidae

Description: Tiny species, length to 4.5 millimeters. Antenna 1 and 2 short, flagellum has three segments. Antenna 1, peduncular segment 1, very broad, forming tube plug. Uropod 1, peduncle with soft ciliated lobes; outer ramus with up to 18 bordering cusps. Uropod 2 with cusps and a spine (Bousfield, 1973).

Present Range: Cape Cod to eastern Florida, to depths of over 100 feet (Bousfield, 1973). Salinity 15 to 21 parts per thousand.

Distribution in Virginia: In silt-clay sediments at depths of 15 to 30 feet.

Habitat and Mode of Life: In flexible, portable tube having a rectangular cross-section.

Reproduction: Females ovigerous June-September.

Status: *Special Concern*. Depleted since 1965, seemingly due to low dissolved oxygen in York River (Boesch, Wass and Virnstein, 1976).

Protective Measures Proposed: Possible control of sources of biological oxygen demand (BOD) and heated water.

Remarks: Depletion known certainly in York River.

Author: Marvin L. Wass.

50. AMPHIPOD *Colomastix halichondriae* Bousfield

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Colomastigidae

Description: Minute species, length 2-3 millimeters. Head and rostrum short, acute. Eye round, red. Gnathopod 1 slender, long, 4-6 setae at end. Gnathopod, segment 5 short, deep; segment 6 rather powerful, with palmar tooth and large hinge tooth. Telson with apex subtruncate (Bousfield, 1973).

Present Range: Cape Cod to Chesapeake Bay and Georgia; possibly Gulf Coast (Bousfield, 1973).

Distribution in Virginia: Commensal in only two sponges; salinity above 15 parts per thousand.

Habitat and Mode of Life: Food unknown; lives in sun sponge, *Halichondria bowerbanki* and in *Haliclona permollis;* winter habitat unknown. Marsh (1970) found 110 specimens on *Zostera* in *Haliclona.*

Reproduction: Unknown.

Status: *Special Concern.* Depleted by die-back of *Zostera* and by low salinity. Possibly also by oil spills.

Protective Measures Proposed: Mainly reestablishing *Zostera* to former areas.

Author: Marvin L. Wass.

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51. AMPHIPOD *Cymadusa compta* Smith

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Ampithoidae

Description: Length 7-11 millimeters in male, 12-15 millimeters in female. Body arched at junction of thorax and abdomen. First antenna exceeds second; flagellum very long. First and second gnathopods of male strong, near equal, covered with plumose setae (Bousfield, 1973).

Present Range: Central Main to Gulf Coast (Bousfield, 1973).

Distribution in Virginia: Formerly abundant in lower rivers, 15 to 23 parts per thousand salinity (Feeley and Wass, 1971).

Habitat and Mode of Life: Only abundant on eelgrass, where it forms tubes. Annual; several broods May-September (Bousfield, 1973).

Reproduction: Unknown.

Status: *Special Concern.* Depleted severely due to eelgrass regression.

Protective Measures Proposed: Some replanting of eelgrass.

Author: Marvin L. Wass.

52. AMPHIPOD *Rudilemboides nageli* Bousfield

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Aoridae

Description: Minute species, length 3 millimeters. Body slender, coxal plates shallow. Head short; anterior lobe prominent, acute; eye basal. Gnathopods 1 and 2 slender in female; in male weakly subchelate, palm short, exceeded by dactyl, segment 5 swollen (Bousfield, 1973).

Present Range: Cape Cod to Georgia; eastern Gulf of Mexico (Bousfield, 1973).

Distribution in Virginia: Thus far known only from eelgrass in York River.

Habitat and Mode of Life: Apparently confined to eelgrass or, farther south, other marine grasses.

Reproduction: Females ovigerous from May to August.

Status: *Special Concern.* Depleted in eelgrass die-back in 1972 and in following wet years and warm winters.

Protective Measures Proposed: Replenishment of eelgrass.

Remarks: One of several species common on eelgrass in favorable years.

Author: Marvin L. Wass.

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53. BIG-CLAWED SNAPPING SHRIMP *Alpheus heterochaelis* Say

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Alpheidae

Description: Length of male 40 millimeters, female 50 millimeters. Rostrum carinate to base of eyestalks. Carapace over one-half length of abdomen. Eyes small, under carapace. Antennae little longer than body. First legs strongly chelate, very unequal. Larger chela strongly chelate, very unequal. Abdomen compressed, smooth. Color dark translucent green, with purple on carapace sides; chelipeds marked with white. Walking legs pale red, tips of uropods blue with narrow border of orange. Outer blade with red patch above blue and a narrow white border (Williams, 1963).

Present Range: Chesapeake Bay to Sao Paulo, Brazil.

Distribution in Virginia: Seems to have been reported only from Gloucester Point in oyster trays.

Habitat and Mode of Life: In shell piles, etc.

Reproduction: Probably during July and August.

Status: *Special Concern.* Evidently scarce, taxonomy of larvae confused (Sandifer, 1972).

Protective Measures Proposed: Provide "artificial reefs."

Remarks: At northern limit of range.

Author: Marvin L. Wass.

54. GREEN SNAPPING SHRIMP *Alpheus normanni* Kingsley

Phylum: Arthropoda Order: Decapoda
Class: Crustacea Family: Alpheidae

Description: Male 26 millimeters, ovigerous female 16 millimeters. Carapace two-thirds length of abdomen, little compressed. Rostrum extending back to base of eyestalks. Eyes under ocular hoods. Antennae little longer than body. Chelae unequal; larger broad, flattened. Smaller chela one-half as wide, three-quarters as long. Telson with two pairs of dorsal spines. Color gray or dull green; large chela dark green, usually banded with yellow-brown. Large chela with two pale bands; finger black, dactyl reddish (Williams, 1965).

Present Range: Chesapeake Bay to Bermuda, West Indies, and Sabine, Texas.

Distribution in Virginia: Polyhaline. Gloucester Point, York River Channel, Cherrystone Creek and James River.

Habitat and Mode of Life: Requires hiding places such as oyster shells, rocks and cans.

Reproduction: Larvae all from surface samples in August, except one in September (Sandifer, 1972).

Status: *Special Concern.* Northern limit of range; apparently rare. None reported since 1965.

Protective Measures Proposed: Artifacts needed in which to hide.

Remarks: Oyster-shell dredging, creosoted piling and oil spills may be inimical.

Author: Marvin L. Wass.

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55. EELGRASS SHRIMP *Hippolyte pleuracentha* Stimpson

Phylum: Arthropoda Order: Decapoda
Class: Crustacea Family: Hippolytidae

Description: Small shrimp. Length 12 to 18 millimeters. Body smooth; plumose hair-tufts on carapace. Rostrum stout at base, thin and decurved distally. Eyes large. Antennal scale exceeding rostrum. Legs 3-5 long. Abdomen strongly bent at segment 3; dactyls with series of combs on inner border (Williams, 1965).

Present Range: New Jersey to Galveston, Texas; Bermuda.

Distribution in Virginia: Occurs wherever eelgrass grows in Chesapeake Bay.

Habitat and Mode of Life: Tied to eelgrass; not known from *Ruppia.*

Reproduction: Summer months.

Status: *Special Concern.* Perhaps entirely dependent on eelgrass beds, which are now at a low point.

Protective Measures Proposed: Eeelgrass replenishment.

Author: Marvin L. Wass.

56. LONG-WRISTED HERMIT *Pagurus longicarpus* Say

Phylum: Arthropoda Order: Decapoda
Class: Crustacea Family: Paguridae

Description: Carapace length: male 10 millimeters, female 11 millimeters. Shield broad as long. Rostrum obsolete. Eyestalks stout, cornea dilated. Antennal peduncles exceeding eyes by one-third of last article. Right cheliped larger and longer than left. Left cheliped smaller, hairier. Walking legs iridescent; posterior carapace light green (Williams, 1965).

Present Range: Nova Scotia to northern Florida; Sanibel Island to Texas coast.

Distribution in Virginia: Mouth of Potomac River to depth of 53 meters on continental shelf.

Habitat and Mode of Life: Migrates to deeper water in winter; returns to shallows in summer. Feeds on algae and detritus.

Reproduction: Ovigerous March to October (Roberts, 1971).

Status: *Special Concern.* This formerly abundant hermit crab was not seen at Gloucester Point in 1977. A 200,000 gallon oil spill occurred on June 26, 1977. However, larvae of this species reached Gloucester Point in August 1978 -- a hopeful sign.

Protective Measures Proposed: Perhaps cessation of oil spills and attention to biological oxygen demand (BOD) sources.

Remarks: This tragedy should not have happened to such a valuable species for research and classroom interest.

Author: Marvin L. Wass.

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57. WEBSTER'S SCALEY-TUBE *Lepidopa websteri* Benedict

Phylum: Arthropoda Order: Decapoda
Class: Crustacea Family: Albuneidae

Description: Carapace length 12 millimeters. Carapace as broad as long, front has setose fringe. Eyestalks oval, lamellate. Antennules exceeding eyestalks, flagella nearly three times as long as carapace. First legs have broad flat articles; fifth legs greatly reduced. Uropods small (Williams, 1965).

Present Range: Previously known from Drum Inlet and Beaufort Inlet, North Carolina (south to) Petit Bois, Mississippi. Larvae, and now an adult, known from mouth of Chesapeake Bay.

Distribution in Virginia: A single female was taken by trawl at 7 meters on sandy bottom off Fishermans Island by Old Dominion University Research Vessel *Holton* 26 January 1976.

Habitat and Mode of Life: Burrows in sand beaches in Carolinian zone; probably in deeper water on Virginia coast.

Reproduction: Larvae reported by Sandifer (1972) from the mouth of Chesapeake Bay and along the Eastern Shore. Goy (1976) found larvae in Bay mouth in July and August.

Status: *Special Concern.* Probably at northern end of range. Should occur in outer beach sands.

Protective Measures Proposed: None feasible, lacking more knowledge of the habitat.

Author: Anthony J. Provenzano.

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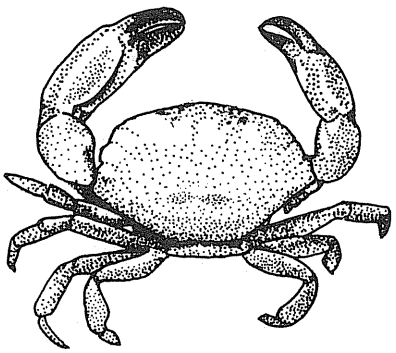
58. FLAT MUD CRAB *Eurypanopeus depressus* Smith

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Xanthidae



Description: Length 14 millimeters, width 20 millimeters. Carapace transversely oval, flattened posteriorly. Four anterolateral teeth. Chelipeds unequal; larger heavy, inflated, dactyl strongly curved. Unusual blood-red spot occurs on third maxilliped (Williams, 1965).

Present Range: Chesapeake Bay south along Atlantic and Gulf Coasts. Not common in Delaware Bay (?).

Distribution in Virginia: Formerly widely distributed in Chesapeake Bay in salinities above 12 to 15 parts per thousand (summer breeding temperatures); population now much depressed by sacculinid parasite *Loxothylacus panopaei*, a parasitic barnacle (Van Engel *et al.*, 1966; Ryan, 1956).

Habitat and Mode of Life: Scavenger on oyster beds, shelly and rocky shores, pilings, and in eelgrass beds. More abundant in shallow waters (less than 20 feet in depth).

Reproduction: Females with egg "sponges" common throughout warm season prior to 1964; specimens now scarce and more frequently exhibit externae of sacculinid parasite. Severe depression of reproduction in past 14 years.

Status: *Special Concern.* Formerly the most abundant of five species of mud crabs in Chesapeake Bay, now fourth in abundance. Habitats not changed appreciably although oyster populations, which support major crab populations, are much reduced in high salinities where crabs live. A sporozoan disease, *Minchinia nelsoni*, caused disastrous oyster mortalities beginning in 1959. Gulf of Mexico oysters imported to replace lost supplies were the source of the sacculinid invasion. No recuperation of crab population has occurred.

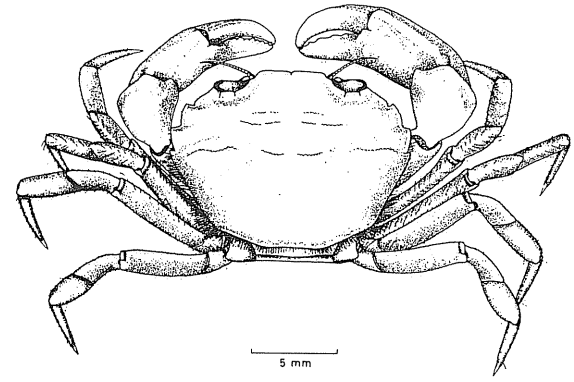
Protective Measures Proposed: None considered feasible.

Remarks: The mud crab *Neopanope texana sayi* increased rapidly in abundance with competition removed. It now replaces *Eurypanopeus depressus* as a major scavenger on oyster beds, etc.

Author: Jay D. Andrews.

59. HARRIS' MUD CRAB *Rhithropanopeus harrisii* Gould

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Xanthidae



Description: Length 15 millimeters, width 19 millimeters. Carapace subsquadrate, three-quarters as long as wide. Chelipeds unequal. Major chela with short solid finger and strongly curved dactyl. Minor chela with longer immovable finger and long dactyl. Walking legs long, somewhat hairy. Color brown above, paler below; fingers light (Williams, 1965).

Present Range: New Brunswick, Canada to Veracruz, Mexico and northeast Brazil.

Distribution in Virginia: Throughout lower salinity waters of Chesapeake Bay, mostly in tributaries to Bay (Ryan, 1956; Van Engel, 1966). Common on oyster beds.

Habitat and Mode of Life: Subtidal mud crab living in lower breeding salinities than other mud crabs (about 10 to 18 parts per thousand during summer).

Reproduction: Breeds in warm season without competition in its primary habitats on oyster beds. Withstands freshets well. It fills a niche that other xanthid scavengers cannot utilize.

Status: *Special Concern.* Formerly common on oyster beds. Populations now fluctuate with salinities due to parasitization by sacculinid *Loxothylacus panopaei*. *Rhithropanopeus harrisii* tolerates lower salinities than parasite; hence, in wet years crab populations rebound only to be decimated in dry years by the sacculinid. Species not apparently endangered after 14 years of extreme fluctuations of populations.

Protective Measures Proposed: None considered feasible.

Remarks: This species is important in a salinity zone where most other scavengers are excluded.

Author: Jay D. Andrews.

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60. SCANNING PINNIXA *Pinnixa retinens* Rathbun

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Pinnotheridae

Description: Male length 4 millimeters, width 7 millimeters; ovigerous female length 6 millimeters, width 12 millimeters. Carapace sloping down to margins.

Chelipeds small, long as first leg; fingers slender, not gaping. Third leg stout. Telson wider than long (Williams, 1965).

Present Range: Found only in Chesapeake Bay, Alligator Harbor, Florida and Aransas, Texas.

Distribution in Virginia: Type from Poplar Island, Maryland, 20 fathoms, soft bottom (Rathbun, 1918). Recent specimens from York and James River (Hampton) and off Rappahannock River.

Habitat and Mode of Life: Commensal host unknown. No larvae taken by Sandifer in plankton tows.

Reproduction: Unknown.

Status: *Special Concern.* Lack of knowledge of life history and evident paucity over entire Carolinian Province.

Protective Measures Proposed: None possible.

Remarks: Seems to prefer deeper areas and estuaries or coastal bays.

Author: Marvin L. Wass.

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61. MUSSEL CRAB *Pinnotheres maculatus* Say

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Pinnotheridae

Description: Mature female: Size circular, diameter near 14 millimeters. Front of carapace little advanced. Orbits small, eyes round. Chelipeds and fingers stout. Walking legs slender, hairy. Abdomen large. Color dull brown. Mature male: Carapace flat, one-half as wide as female. Color is a striking pattern of white bare spots on dark background. Young females resemble males (Rathbun, 1918; Williams, 1965).

Present Range: Off Martha's Vineyard, Massachusetts to Mar del Plata, Argentina (Williams, 1965).

Distribution in Virginia: Polyhaline. Off mouth of Potomac River; New Point Comfort.

Habitat and Mode of Life: Commensal in several bivalves and in *Chaetopterus* tubes; possibly more abundant when bay scallops were in the Bay. Apparently never found in Eastern Shore seaside bays (Sandifer, 1972).

Reproduction: Unknown.

Status: *Special Concern.* Seemingly much decreased in recent decades, possibly due to demise of bay scallops and advent of winter dredging for crabs in the lower Bay.

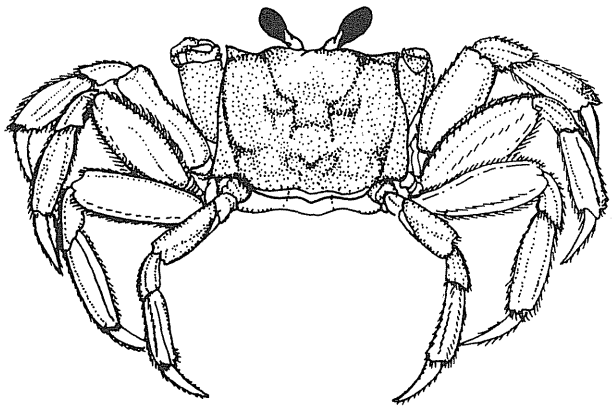
Protective Measures Proposed: None feasible.

Remarks: Unlikely to increase due to dredging and decrease of shellfish.

Author: Marvin L. Wass.

62. GHOST CRAB *Ocypode quadrata*

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Ocypodidae



Description: Carapace - length 44 millimeters, width 50 millimeters. Carapace squarish, with H-shaped depression in center. Front and side margins raised, beaded. Orbits and eyestalks large, club-shaped. Chelipeds well-developed, rough, serrulate above. Large hand with vertical stridulating ridge of tubercles (Williams, 1965).

Present Range: Block Island, Rhode Island to Santa Catarina, Brazil.

Distribution in Virginia: Once reached York County (Dexter Haven); now generally rare from Ocean View to lower Virginia Beach, except at Cape Henry. Occurs on all Eastern Shore outer beaches.

Habitat and Mode of Life: Burrows in sand beaches above normal high-tide line. Races to tide line to catch sand-fiddlers and to feed on carrion.

Reproduction: Egg deposition occurs from May to July.

Status: *Special Concern*. Likely to become increasingly endangered on southeastern beaches of Virginia. If present, very scarce in Ocean View-Virginia Beach area.

Protective Measures Proposed: Promote attitude of appreciation. Explain usefulness of ghost crabs as scavengers.

Remarks: Probably most interesting denizen of ocean beaches. Also probably performs useful function by mixing sands of different grain sizes.

Author: Marvin L. Wass.

63. HARTMAN'S ECHIURID *Thallasema hartmani* Fisher

Phylum: Echiurida
Order: Echiuroidea
Family: Thallasemidae

Description: Length 40 millimeters, proboscis 8 millimeters. Two inconspicuous nephridia. Segment of intestine between end of foregut and start of siphon very long, exceeding extended specimen. Skin papillae numerous, elongate. Setae with hook not sharply bent. Lower lip of mouth formed by flange of proboscis. Color in life reddish (Fisher, 1947).

Present Range: Lower Chesapeake Bay and North Carolina.

Distribution in Virginia: Lower York River below Clay Bank at depths below 10 feet; off Rappahannock Spit, depth about 75 feet, by *Fish Hawk* in 1920.

Habitat and Mode of Life: Burrows in bottom, but most taken in trawls.

Reproduction: Unknown.

Status: *Special Concern.* Probably more rare in Virginia than in North Carolina (Porter and McCrary, 1977).

Protective Measures Proposed: Prevent pollution.

Remarks: Commensal clam (Jenner and McCrary, 1970) found in Virginia only once, near Parramore Island, but not with host.

Author: Marvin L. Wass.

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64. COLORLESS SYNAPTA *Leptosynapta tenuis* Ayres

Phylum: Echinodermata
Class: Holothuroidea
Order: Apodida
Family: Synaptidae

Description: Length to 14 centimeters, diameter 10 millimeters. Flexible, translucent species, banded lengthwise by five bands seen through body wall. Tentacles 12, branched. Calcareous anchors occur beneath skin. Stomach usually filled with foreign material (Miner, 1950).

Present Range: New England to North Carolina.

Distribution in Virginia: Lower Bay to 15 parts per thousand salinity.

Habitat and Mode of Life: Most abundant in shallow fine sand beaches, as at Gloucester Point.

Reproduction: Spring of the year, when they come out of the substrate and swarm.

Status: *Special Concern.* Apparently absent from Gloucester Point following passage of Tropical Storm Agnes. However, recent oil spills may be more detrimental.

Protective Measures Proposed: None feasible at this late date, except possible control of oil spills.

Remarks: Life history poorly known.

Author: Marvin L. Wass.

65. FIVE-PARTED SEA CUCUMBER *Pentamera pulcherrima* (Ayres)

Phylum: Echinodermata
Class: Holothuroidea
Order: Dendrochirota
Family: Phylloporidae

Description: Small species, length to 5 centimeters. Tentacles 10, much branched. Five ambulacral tracts with two double rows of tube feet. Flat, calcareous tables (plates) in integument (Miner, 1950; Gosner, 1971).

Present Range: Vineyard Haven, Massachusetts to South Carolina.

Distribution in Virginia: Formerly abundant on old oyster beds in the lower York River and Mobjack Bay; also Hampton Roads.

Habitat and Mode of Life: Creeps over bottom by use of tube-feet; requres shell or other firm substrates.

Reproduction: Unknown.

Status: *Special Concern.* Apparently now absent from York River.

Protective Measures Proposed: None seem feasible, but conservation of shell beds is important.

Author: Marvin L. Wass.

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66. PLATE-FINGERED CUCUMBER *Sclerodactyla briareus* (Lesueur)

Phylum: Echinodermata
Class: Holothuroidea
Order: Dendrochirota
Family: Sclerodactylidae

Description: Length to 10 centimeters. Body elongate; able to form ovoid shape. Tentacles 10, tree-like. Tube feet scattered over surface. Color dull brown to black (Miner, 1950; see *Thyone briareus* in Reid *In:* Brown, 1950).

Present Range: Vineyard Sound to Gulf of Mexico.

Distribution in Virginia: Eastern Shore bayside creeks; formerly lower York River to Wormley Rock.

Habitat and Mode of Life: In deeper water, but not on anaerobic fine silt.

Reproduction: Sexes separate; filaments emit sex products into a chamber connected to a genital duct which conducts eggs or sperm cells to genital ducts.

Status: *Special Concern.* Now very rare in York River; formerly common.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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67. SCHLOSSER'S BOTRYLLUS *Botryllus schlosseri* Pallas

Phylum: Chordata
Class: Ascidiacea
Order: Pleurogona
Family: Styelidae

Description: Mass up to 10 centimeters wide, usually much less. Surface smooth, fleshy. Zooids arranged in small round groups. Color much varied, from olive-green to purple with lighter lines edging zooids (Van Name, 1945).

Present Range: Very wide distribution on both sides of Atlantic.

Distribution in Virginia: Comes and goes with salinity changes. Probably also affected by oil spills.

Habitat and Mode of Life: Sets and grows on pilings and eelgrass. Common in summer with favorable sites and salinity. A pest at Gloucester Point on oyster trays and eelgrass in mid-1960's (dry period).

Reproduction: Increases in warm months by larvae and growth of colonies.

Status: *Special Concern.* Now apparently absent from lower York River.

Protective Measures Proposed: None feasible; species likely abundant elsewhere.

Author: Marvin L. Wass.

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68. GREEN PEROPHORA *Perophora viridis* Verrill

Phylum: Chordata
Class: Ascidiacea
Order: Enterogona
Family: Perophoridae

Description: Zooids 2-4 millimeters in diameter. Forms slender stolons creeping like carpet grass over rocks and pilings. Zooids ovoid; colorless to bright green. Individual transparent, making observation of reversing heartbeat easily seen (Van Name, 1945).

Present Range: Cape Cod to Gulf of Mexico; Bermuda and West Indies.

Distribution in Virginia: Polyhaline. Occurs in lower Bay and lower parts of rivers. Common on oyster trays at Gloucester Point prior to low salinity of 1971-74.

Habitat and Mode of Life: On solid structures. Filters food from ambient water.

Reproduction: By larvae in summer.

Status: *Special Concern.* Depleted by lowered salinity and possibly oil spills.

Protective Measures Proposed: Probably none feasible.

Remarks: Very rare now in lower York River. Useful for classroom purposes when alive.

Author: Marvin L. Wass.

STATUS UNDETERMINED (31)

1. POTATO SPONGE — *Craniella crania* (Muller)

Phylum: Porifera — Order: Choristida
Class: Demospongiae — Family: Craniellidae

Description: Colonies consist of upright, circular masses up to 5 centimeters high and attaching to solid substrates. Many individuals tend to occur at a site. Colonies are hard with color gray-green to tan (Wells, Wells, and Gray, 1960).

Present Range: North Carolina coast at least to Chesapeake Bay.

Distribution in Virginia: Off Indian Creek, Kilmarnock, Virginia, probably to mouth of Bay.

Habitat and Mode of Life: On hard sand bottom; loosely colonial.

Reproduction: Unknown.

Status: *Undetermined.* Apparently rare on western shore of Bay. Unknown from eastern shore of Bay.

Protective Measures Proposed: None.

Remarks: Interesting classroom animal, if it were not so rare.

Author: Marvin L. Wass.

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2. DERSTED'S RIBBON-WORM — *Oerstedia dorsalis* (Abildgaard)

Phylum: Rhynchocoela — Order: Haplonemertini
Class: Anopla — Family: Prosorochmidae

Description: Body cylindrical, both ends sharp-pointed. Length 10 millimeters, width 2 millimeters. Four ocelli form a square. Color variable but with distinct pigment patches forming diffuse circling bands. Background ochre, pigment color dark brown (McCaul, 1963; Gosner, 1971).

Present Range: North coast of Europe to Spain; Atlantic Coast, Nova Scotia to Florida and Mexico.

Distribution in Virginia: York River on eelgrass; also from sandy mud at 20 meters in mid-Chesapeake Bay.

Habitat and Mode of Life: Evidently adaptable to various habitats.

Reproduction: Unknown.

Status: *Undetermined.* Reason for scarcity unknown.

Remarks: Further studies using fine screens needed.

Author: Marvin L. Wass.

3. "WHITE NEMERTEAN"

Phylum: Rhynchocoela
Class: Anopla
Order: Unknown
Family: Unknown

Description: Slender, white; about 15 times as long as wide. Small species.

Present Range: Known only from Virginia in oligomesohaline sites, but certainly must be found in other mid-Atlantic estuaries.

Distribution in Virginia: As above.

Habitat and Mode of Life: Occurs in fine sediments.

Reproduction: Unknown.

Status: *Undetermined*. Relatively scarce.

Protective Measures Proposed: None.

Remarks: There seem to be no systematists working on rhynchocoels in North America.

Author: Marvin L. Wass.

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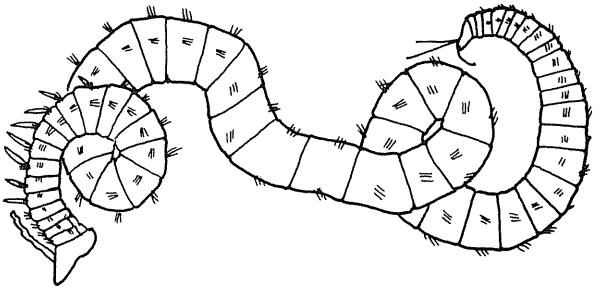
4. POLYCHAETE — *Aricidea wassi* Pettibone

Phylum: Annelida
Class: Polychaeta
Order: Orbiniida
Family: Paraonidae



Description: Body elongate, slender, threadlike, wide anteriorly, tapering posteriorly. Branchiae begin on setiger 4; 9 to 18 on longer worm. Notopodia and neuropodia have thick bundles of setae in several rows. Length to 30 millimeters, width to 0.5 millimeter, segments to 200 (Pettibone, 1965).

Present Range: Chesapeake Bay, Virginia, off Eastern Shore.

Distribution in Virginia: As above.

Habitat and Mode of Life: Occurred in mud and sand with some shells.

Reproduction: Unknown.

Status: *Undetermined*. Not seen in Virginia waters since described. Two individuals collected off Cape Charles in 1978.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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5. POLYCHAETE *Autolytus prolifer* O. F. Muller

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Syllidae

Description: Stem form to 20 millimeters; segments to 70; nuchal epaulettes inconspicuous. Body pale yellow to peach colored (Pettibone, 1965). Sex buds produced in unisexual chains of two to eight and proliferated after setigers 32-38 (range 19-65).

Present Range: Gulf of St. Lawrence to Georgia; low water to 30 fathoms.

Distribution in Virginia: Barren Island and Bay mouth, *fide* Marian Pettibone.

Habitat and Mode of Life: In low water among algae and sessile animals on rocks and in sediment.

Reproduction: Two to eight sexual buds formed in unisexual chains. Parapodia enlarge with sex products; 5 to 10 ovigerous segments proliferate from a few cells which enlarge.

Status: *Undetermined.* Not found by VIMS personnel.

Protective Measures Proposed: None.

Remarks: Usually found among sessile organisms where fouling occurs.

Author: Marvin L. Wass.

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6. SCALE WORM *Harmothoe acanellae* Verrill

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Polynoidae

Description: Elytra 15 pairs, easily loses scales. Large worm, up to 90 millimeters long and 25 millimeters wide. Prostomium with four large eyes. Notosetae few; neurosetae has long spinous areas and bare hooked tips. Proboscis large, dark purple (Pettibone, 1963).

Present Range: Off Nova Scotia, Grand Banks, Massachusetts, Rhode Island and North Carolina from 23 to 1230 fathoms.

Distribution in Virginia: In Chesapeake Bay, coral association must have been with *Leptogorgia.*

Habitat and Mode of Life: Associates with horny coral and sea pens.

Reproduction: Unknown.

Status: *Undetermined.*

Protective Measures Proposed: None.

Author: Marvin L. Wass.

7. SCALE WORM *Lepidonotus squamatus* Linne

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Polynoidae

Description: Length to 50 millimeters but much less in Virginia. Elytra much varied in color: mottled amber, reddish and greenish (Pettibone, 1963).

Present Range: One of most abundant polynoids in northern hemisphere.

Distribution in Virginia: Not found in Chesapeake Bay. One specimen found at Rogues Island, Hog Island Bay, on seaside of Eastern Shore, May 23, 1960 by Sewell Hopkins, determined by Marian H. Pettibone.

Habitat and Mode of Life: Slow-moving polynoid that clings to stones and lives in crevices between sessile animals; also on man-made structures. Rolls up like pill bug when disturbed. Scales not easily lost.

Reproduction: Breeding at Woods Hole from mid-April to end of May.

Status: *Undetermined.*

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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8. POLYCHAETE *Marphysa sanguinea* (Montagu)

Phylum: Annelida
Class: Polychaeta
Order: Eunicida
Family: Eunicidae

Description: Long worm; up to 600 millimeters (24 inches) long by 11 millimeters wide. Front segments narrow, cylindrical, then much flattened, tapering posteriorly; fragile. Branchia begin on setiger 20. Color striking, yellow-orange, red-brown, pinkish gray, with brilliant opalescent iridescence; branchiae bright red; acicula black (Pettibone, 1963).

Present Range: Virginian Province, littoral to 91 meters.

Distribution in Virginia: Only three specimens found on western side of Bay; more numerous on eastern side.

Habitat and Mode of Life: Evidently usually in sand; also in *Zostera* bed at Chincoteague.

Reproduction: Unknown.

Status: *Undetermined.*

Protective Measures Proposed: None.

Remarks: Fairly large; quite colorful in life. More sampling in sand bottoms needed.

Author: Marvin L. Wass.

9. POLYCHAETE *Microphthalmus sczelkowii* Mecznikow

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Hesionidae

Description: Tiny worm; segments to 40; 6 millimeters long, 0.5 millimeter wide. Notosetae simple, curved, lyrate. Body brown-pigmented dorsally and ventrally; transverse and lengthwise bands occur (Pettibone, 1963).

Present Range: Ireland, North Sea, Cape Cod, northern Japan Sea.

Distribution in Virginia: One found at Piney Point at mouth of Potomac River by Virnstein in 1975.

Habitat and Mode of Life: Found in shallow water over sand and muddy water.

Reproduction: Eggs laid in "oval, sticky mucous mass" (Rasmussen, 1956).

Status: *Undetermined.*

Protective Measures Proposed: None.

Remarks: More searching with meiofaunal collecting techniques is needed.

Author: Marvin L. Wass.

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10. POLYCHAETE *Notocirrus spiniferus* Moore

Phylum: Annelida
Class: Polychaeta
Order: Eunicida
Family: Arabellidae

Description: Length to over 110 millimeters, width 4 millimeters; segments over 220. Prostomium subconical, with four eyes on posterior border. Parapodia small; notopodia distinct. Proboscis has dark mandibles (Pettibone, 1963). Parasitic in *Diopatra.*

Present Range: Massachusetts to North Carolina.

Distribution in Virginia: Found in Hampton Roads by D. F. Boesch in 1969; only two specimens.

Habitat and Mode of Life: Parasitic in *Diopatra cuprea,* but not reported by C. Mangum in her study of *Diopatra.* More than 50 have been found parasitizing one *Diopatra.*

Reproduction: Unknown.

Status: *Undetermined.* Not found as parasite in Chesapeake Bay.

Protective Measures Proposed: None.

Remarks: Niche likely small in Chesapeake Bay.

Author: Marvin L. Wass.

11. POLYCHAETE *Proceraea cornuta* Agassiz

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Syllidae

Description: Stem form length to 18 millimeters, width 0.7 millimeter; segments to 78. Nuchal epaulettes indistinct; body flesh-colored; bases of parapodia forming faint lateral brownish bands. Female and male with prenatatory, natatory and postnatatory setigers in varying numbers (Miner, 1950; Pettibone, 1963).

Present Range: New England to Virginia.

Distribution in Virginia: Taken off New Point Comfort in January, 1921 (Cowles, 1930).

Habitat and Mode of Life: On seaweed and shells.

Reproduction: Unknown.

Status: *Undetermined.* Never found again in the Bay, a hiatus of 57 years, until Dauer took one off Lynnhaven Roads in 1977.

Protective Measures Proposed: None.

Remarks: May be extirpated from earlier sites.

Author: Marvin L. Wass.

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12. POLYCHAETE *Sthenelais limicola* (Ehlers)

Phylum: Annelida
Class: Polychaeta
Order: Phyllodocida
Family: Sigalionidae

Description: Length to 100 millimeters, width to 4 millimeters, segments to 200 or more. Elytra translucent, colorless (Pettibone, 1963).

Present Range: Gulf of St. Lawrence to North Carolina, Norway to Mediterranean and South Africa.

Distribution in Virginia: Oyster ground at Wachapreague, Eastern Shore.

Habitat and Mode of Life: Apparently occurs on both mud and sand bottoms near the coast. Food of bottom fish in Massachusetts.

Reproduction: Unknown.

Status: *Undetermined.* Only one found.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

13. BERMUDA SAND-SHORE WORM *Pontodrilus bermudensis* Beddard

Phylum: Oligochaeta
Class: Clitellata
Order: Haplotaxida
Family: Tubificidae

Description: Mature worms to 72 millimeters long by 3 millimeters diameter. Small spermathecal pores located on lateral-most setae of ventral bundles. Dorsal setae of posterior segments in regular ranks. Transverse genital marks on ventral surface between segments 19 and 20 (Cook and Brinkhurst, 1973).

Present Range: Chesapeake Bay and Bermuda, probably in most Carolinian Province estuaries at salinities above 10 parts per thousand.

Distribution in Virginia: Cape Charles and Gloucester Point.

Habitat and Mode of Life: Burrows in beach sand where wave action is moderate. Probably polyeuhaline.

Reproduction: Unknown.

Status: *Undetermined.* May be threatened by oil spills. Population densities unknown.

Protective Measures Proposed: Control oil spills.

Remarks: Census needed.

Author: Marvin L. Wass.

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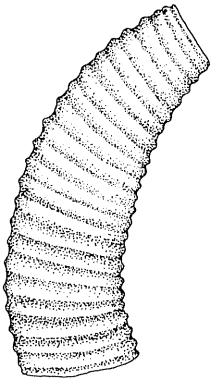
14. BEAUTIFUL LITTLE CAECUM *Caecum pulchellum* Stimpson

Phylum: Mollusca
Class: Gastropoda
Order: Mesogastropoda
Family: Caecidae

Description: Minute curved snail with 20-30 circular ribs; length about 2 millimeters (Abbott, 1974).



Present Range: New Hampshire to Brazil.

Distribution in Virginia: Found only at one place, off Rappahannock River in hard sand, depth 30 feet.

Habitat and Mode of Life: Food unknown, probably plankton. Obviously prefers sand.

Reproduction: Protect sand areas if investigations show species to be scarce.

Status: *Undetermined.* Lack of specimens may be due to too large screen sizes.

Protective Measures Proposed: None.

Remarks: Smaller screens should used often to collect meiofauna.

Author: Marvin L. Wass.

15. ERCOLANIAN NUDIBRANCH *Ercolania* sp.

Phylum: Mollusca Order: Sacoglossa
Class: Gastropoda Family: Hermaeidae

Description: Adult 3 millimeters; aeolidiform; rhinophores cylindrical, lacking oral tentacles. Cerata single, eight on each side of dorsum, with orange digestive-gland diverticulae in each. Dorsum with black spots (Abbott, 1974).

Present Range: Mouth of Rappahannock River, two specimens taken - one in 1971, a second in 1972 (Vogel, 1977).

Distribution in Virginia: As above.

Habitat and Mode of Life: Unknown.

Reproduction: Unknown.

Status: *Undetermined.*

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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16. TENELLIAN NUDIBRANCH *Tenellia* sp.

Phylum: Mollusca Order: Nudibranchia
Class: Gastropoda Family: Cuthonidae

Description: Small, 3 to 5 millimeters. Head small, rounded; body longer, oval. Rhinophores simple cylinders. Cerata clumped on either side of dorsum. Eyes behind rhinophores. Foot narrow, less than one-third of body width. Tail short, broad and pointed. Adult high as wide. Dorsum has dark melanophores (Abbott, 1974).

Present Range: Cherrystone Creek and Wachapreague Channel, Virginia (Vogel, 1977).

Distribution in Virginia: As above.

Habitat and Mode of Life: Feeds on hydroids.

Reproduction: Approximately 20-50 eggs in one egg mass.

Status: *Undetermined.* Due to undescribed status and lack of knowledge of range.

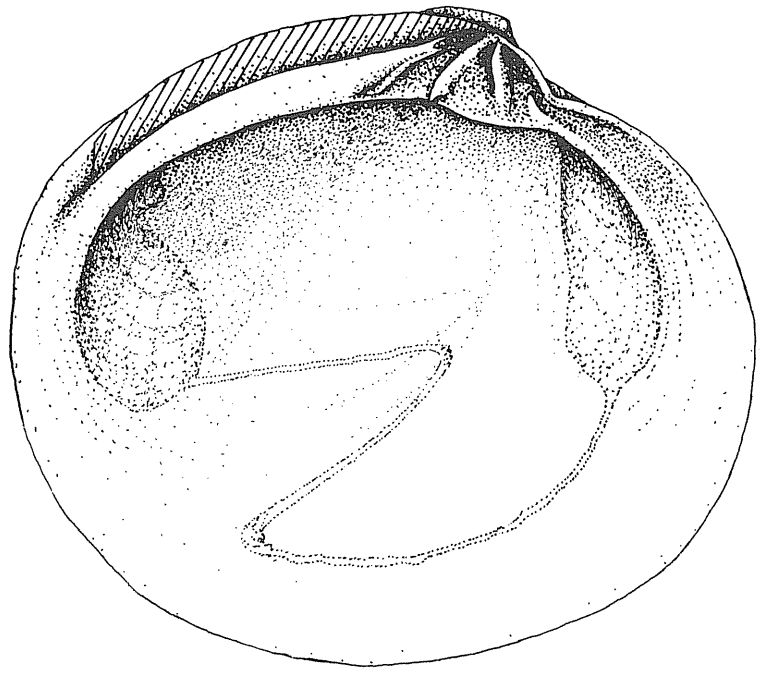
Protective Measures Proposed: Protect water quality in the area.

Author: Marvin L. Wass.

17. DISK DOSINIA

Dosinia discus Reeve

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Veneridae



Description: Length to 90 millimeters. Shell subcircular, rather fragile, compressed; beaks anterior to midline. Escutcheon narrow, weak. Sculpture fine, concentric ridges. Shell white (Abbott, 1974).

Present Range: Virginia to Florida, Texas and the Bahamas.

Distribution in Virginia: Taken once near Sarah's Creek, near Gloucester Point. A few others from lower Bay.

Habitat and Mode of Life: Burrows deeply into sand-silt bottoms. Ploughs through bottoms in submerged position.

Reproduction: Unknown.

Status: *Undetermined.* Some likely disturbed by dredging in lower Bay.

Protective Measures Proposed: None.

Remarks: Not commercially harvestable.

Author: Marvin L. Wass.

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18. WEDGE-SHAPED MARTESIA *Martesia cuneiformis* Say

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Pholadidae

Description: Wedge clam approximately 16 millimeters long. Transverse groove passes straight from umbo to shell margin, dividing shell; anterior area resembles rasp. Anterior rounded and inflated; valves having rasping effect. Siphons protrude through gaping ends. Umbones and shell plates form boring tool (Abbott, 1974).

Present Range: Virginia to Texas and Brazil.

Distribution in Virginia: Very rare in lower Bay.

Habitat and Mode of Life: Burrows in driftwood.

Reproduction: Unknown.

Status: *Undetermined.* Probably becoming even more scarce due to flotsam differences in Bay, with more petroleum-derived products, plywood, and treated lumber being jettisoned and less unadulterated wood put overboard.

Protective Measures Proposed: None.

Remarks: Probably decreased with the onset of the oil era.

Author: Marvin L. Wass.

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19. ATLANTIC FLAT LEPTON *Mysella planulata* (Stimpson)

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Montacutidae

Description: Length 5 millimeters. Shell oval; fragile, compressed, equivalve, posterior beaks almost touching. Sculpture of fine lines. Cardinal teeth lacking. Two prominent laterals in each valve. Siphons lacking (Abbott, 1974).

Present Range: Nova Scotia to Texas and West Indies.

Distribution in Virginia: Chesapeake Bay off Rappahannock River.

Habitat and Mode of Life: Reported attached to buoys, eelgrass, and pilings.

Reproduction: Unknown.

Status: *Undetermined.* Found only once in Chesapeake Bay. Taken in benthic grab.

Protective Measures Proposed: None.

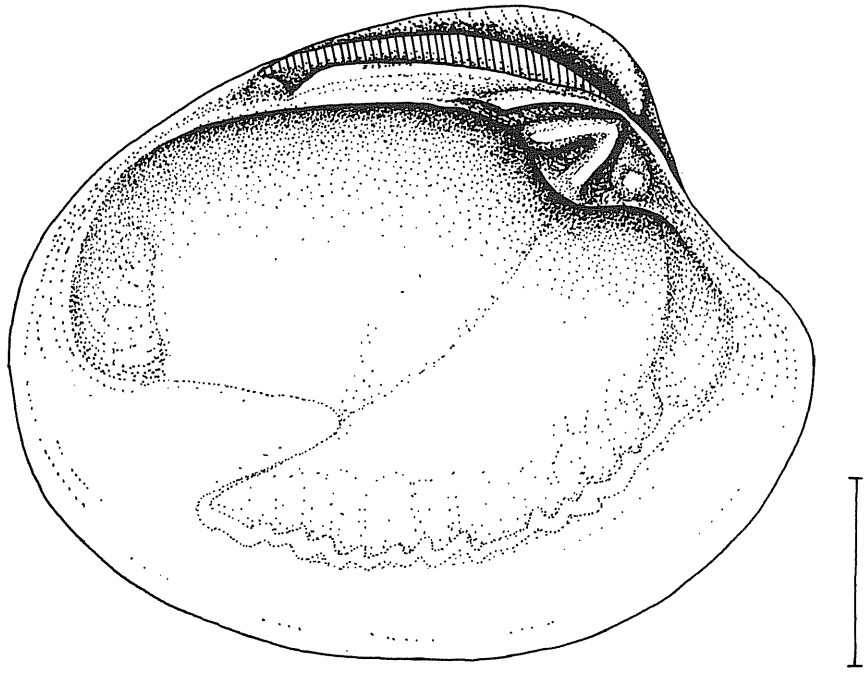
Remarks: Commensal host, if any, seems not to be known.

Author: Marvin L. Wass.

20. MORRHUA VENUS

Pitar morrhuanus Linsley

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontidae
Family: Veneridae



Description: Length to 50 millimeters. Shell subovate; heavy, thick, inflated; equivalve, umbones anterior. Lunule spade-shaped, sculpture heavy growth lines. Each valve has three cardinal teeth. Pallial line wide, corrugated; sinus deep, triangulate. Margin smooth. Siphons united. Periostracum rust to gray-brown (Abbott, 1974).

Present Range: Gulf of St. Lawrence to North Carolina.

Distribution in Virginia: Lower York River, one specimen; Eastern Shore, oceanic, in seaside bays.

Habitat and Mode of Life: Burrows in bottom.

Reproduction: Unknown.

Status: *Undetermined.* Perhaps far south of optimal habitat. Offshore shelf species.

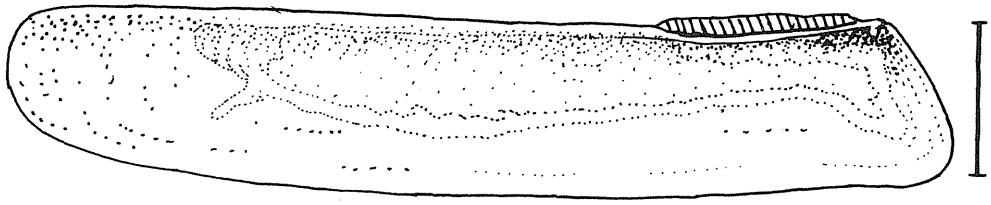
Protective Measures Proposed: None.

Remarks: Never more than one found at a time.

Author: Marvin L. Wass.

21. GREEN JACKKNIFE CLAM — *Solen viridis* Say

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Solenidae



Description: Length to 53 millimeters. Shell elongate-rectangular, upper and lower margins straight, both ends truncate and gaping; thin, fragile, compressed; equivalve. Periostracum thin, shiny, pale green, gray or brown. Shell interior white (Abbott, 1974).

Present Range: Rhode Island to Florida and the Gulf States.

Distribution in Virginia: Never taken in Chesapeake Bay. Found in patches only off Cedar Island in shallow sand.

Habitat and Mode of Life: Burrows like other jackknife or razor clams.

Reproduction: Unknown.

Status: *Undetermined.* Optimal habitats must be investigated.

Protective Measures Proposed: None.

Remarks: Could be plentiful in places, but none have been found in recent years.

Author: Marvin L. Wass.

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22. CLADOCERAN — *Ilyocryptus sordidus* (Lieven)

Phylum: Arthropoda
Class: Crustacea
Order: Cladocera
Suborder: Cladocera
Family: Daphnidae

Description: Length of male to 1 millimeter. Post-abdomen has margin where anus opens. Long spines occur on periphery. Color normally red but often opaque with debris (Edmondson, 1959).

Present Range: Widely distributed, but uncommon.

Distribution in Virginia: Known only from Pamunkey River (Van Engel, 1972).

Habitat and Mode of Life: Planktonic, with resting stages. In weeds on muddy bottoms.

Reproduction: Unknown.

Status: *Undetermined.* Obviously rare.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

23. CLADOCERAN — *Simocephalus exspinosus* (Koch)

Phylum: Arthropoda
Class: Crustacea
Order: Cladocera
Suborder: Cladocera
Family: Daphnidae

Description: Length to 3 millimeters in female, 1.3 millimeters in male. Eye large, elongate. Post-abdomen narrowed toward apex; up to 12 anal spines (Edmondson, 1959).

Present Range: Ranging over most of continent, but uncommon.

Distribution in Virginia: Taken only in Pamunkey River, 15 miles above West Point (Van Engel, 1972).

Habitat and Mode of Life: Planktonic.

Reproduction: Unknown.

Status: *Undetermined.* Rare; taken only in June.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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24. MANTIS SHRIMP — *Squilla empusa* Say

Phylum: Arthropoda
Class: Crustacea
Order: Stomatopoda
Family: Squillidae

Description: Length to approximately 14 centimeters. Carapace membranous with median ridge and groove complex. Posterior border has three lobes. Eyes on narrow stalks forming a V. Maxillipeds form raptorial claws able to hold prey securely. Caudal appendages also armed. Color pale or yellow green; tail rose-mottled and black. Eyes bright emerald green (Miner, 1950).

Present Range: Cape Cod to Florida and northern Gulf of Mexico.

Distribution in Virginia: Lower bay and up rivers to about 15 parts per thousand salinity.

Habitat and Mode of Life: Burrows into suitable bottom; in mud in the Cape Cod area (Miner, 1950).

Reproduction: Eggs hatched in burrows.

Status: *Undetermined.* Likely intolerant to low dissolved-oxygen levels and certain oil fractions. Rarely taken in benthic grabs.

Protective Measures Proposed: None.

Remarks: Population may be assessed by numbers found in striped bass stomachs.

Author: Marvin L. Wass.

25. OPOSSUM SHRIMP *Heteromysis formosa* (S. I. Smith)

Phylum: Arthropoda
Class: Crustacea
Order: Mysidacea
Family: Mysidae

Description: General form rather robust. Carapace short and broad dorsally. Abdomen not tapered posteriorly. Antennular peduncle strong and well-developed, reaching distal end of antennal scale. Males semi-translucent, colorless. Females greenish-yellow; caudal appendages rose, joints violet (Lochhead *In:* Brown, 1950).

Present Range: Canada to Chesapeake Bay.

Distribution in Virginia: Cedar Island (M. Roberts); Hampton Roads (D. F. Boesch).

Habitat and Mode of Life: Lives in dead intact bivalve shells, such as *Mactra* and *Spisula*.

Reproduction: Unknown.

Status: *Undetermined*. Apparently quite scarce.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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26. ISOPOD *Chiridotea almyra* Bowman

Phylum: Arthropoda
Class: Crustacea
Order: Isopoda
Family: Idoteidae

Description: Sides of head creased, eyes dorsal, body broad, telson pointed; sides curved; second antenna longer than third. Single spine back of terminal claw on finger of first large gnathopod. Uropods ventral, invisible dorsally, turned inwards to form cover enclosing pleopods (Schultz, 1969).

Present Range: Cape Cod to Georgia.

Distribution in Virginia: West Point and lower Pamunkey River.

Habitat and Mode of Life: Unknown. Taken in plankton.

Reproduction: Unknown.

Status: *Undetermined*.

Protective Measures Proposed: None.

Remarks: Not taken in other rivers.

Author: Marvin L. Wass.

27. AMPHIPOD *Corophium aquafuscum* Heard and Sikora

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Corophiidae

Description: Medium-sized species (length 4-7 millimeters), heavily setose; urosome fully segmented. Rostrum lacking in male, present in female. Both sexes have two strong teeth on distoventral margin of segment 4. Single spine on segment 1 of antenna 1 in female; lacking in male (Heard and Sikora, 1972).

Present Range: Chesapeake Bay to Georgia.

Distribution in Virginia: Mattaponi River; probably also in other oligohaline waters. Robert Diaz.

Habitat and Mode of Life: Tube-dwelling amphipod living in oligohaline marshes. Eaten by white catfish and mummichogs.

Reproduction: Females ovigerous June to September.

Status: *Undetermined.* Probably threatened in some places by industrial and domestic effluents.

Protective Measures Proposed: Help keep oligohaline waters free of toxic pollutants and low dissolved oxygen values.

Remarks: Should be sought in all oligohaline areas. Perhaps extinct in Hampton Roads area.

Author: Marvin L. Wass.

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28. AMPHIPOD *Idunella* sp.

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Liljeborgiidae

Description: Body smooth, sexual differences strong. Head has short rostrum, small eyes. Gnathopod large, subchelate. Seventh peraeopod longest and heaviest. Telson large, deeply cleft (Bousfield, 1973).

Present Range: Chesapeake Bay and North Carolina (Fox and Bynum, 1975).

Distribution in Virginia: York River, Gloucester Point; Hog Island Bay, Eastern Shore (Feeley and Wass, 1971).

Habitat and Mode of Life: Commensal in burrows of the polychaete *Amphitrite ornata* and the mud shrimp *Upogebia affinis*.

Reproduction: Most likely from May to September.

Status: *Undetermined.* Remains undescribed and poorly known as to habits and commensal hosts.

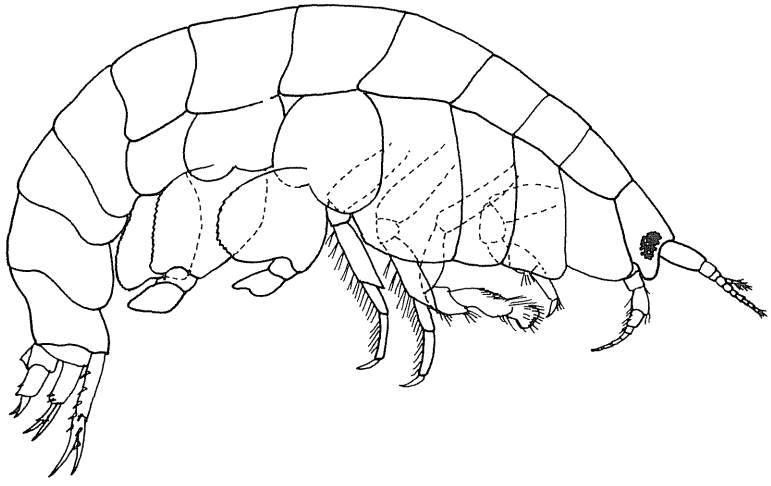
Protective Measures Proposed: Valid description and further studies needed.

Remarks: Should extend to Florida; possibly to Gulf Coast.

Author: Marvin L. Wass.

29. AMPHIPOD *Lysianassa alba* (Holmes)

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Lysianassidae



Description: Length 8-10 millimeters. Antennae short. Eye kidney-shaped, smallish. Body surface smooth. Coxal plates deep; coxa 5 large. Antenna 1, peduncle 2 longer than 3. Gnathopod 1 simple, peraeopod 7 longest. Telson wide as long; rounded (Bousfield, 1973).

Present Range: Cape Cod to northern Florida; eastern Gulf of Mexico.

Distribution in Virginia: Polyhaline; apparently only abundant in eelgrass beds. York River - Chesapeake Bay (Feeley and Wass, 1971).

Habitat and Mode of Life: Burrower in mud-sand substrates.

Reproduction: May-September.

Status: *Undetermined.*

Protective Measures Proposed: None.

Author: Marvin L. Wass.

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30. AMPHIPOD *Microprotopus raneyi* Wigley

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Isaeidae

Description: Tiny species, 2-4 millimeters. Antennae 1 & 2 subequal. Gnathopod 1 subchelate. Gnathopod 2 very large; segment 6 subovate. Segment 5 with plumose setae. Uropods 1 and 2 exceeding 3. Ramus of uropod 3 slender, lacking lateral spines, but has 2 apical spines (Bousfield, 1973).

Present Range: Cape Cod Bay, Vineyard Sound and Buzzards Bay to north Florida and Gulf of Mexico (Lowry, 1972).

Distribution in Virginia: Abundant at Wachapreague Inlet. Not seen elsewhere in Virginia.

Habitat and Mode of Life: Builds tubes in sandy substrates.

Reproduction: Females ovigerous May to September.

Status: *Undetermined.* Probably at all inlets on outer beaches along Eastern Shore.

Protective Measures Proposed: None likely needed.

Remarks: Further surveys of psammofauna needed on outer beaches.

Author: Marvin L. Wass.

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31. AMPHIPOD — *Parapleustes aestuarius* Watling and Maurer

Phylum: Arthropoda
Class: Crustacea
Order: Amphipoda
Family: Pleustidae

Description: Length of male 3 to 4 millimeters, female 3.5 to 6 millimeters. Gnathopods strong, body dorsally smooth. Antenna 1 as long as first 5 pereonites; posterior lobe on fifth article of gnathopods; three spine clusters delimit gnathopod palms (Watling and Maurer, 1973).

Present Range: Delaware Bay to Georgia.

Distribution in Virginia: Known only from York River (Feeley and Wass, 1971).

Habitat and Mode of Life: Lives among hydroids and ectoprocts. Mesopolyhaline.

Reproduction: Unknown.

Status: *Undetermined.*

Protective Measures Proposed: None

Author: Marvin L. Wass.

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RECENTLY EXTINCT OR EXTIRPATED (5)

1. COMMON AMERICAN AUGER — *Terebra dislocata* Say

Phylum: Mollusca
Class: Gastropoda
Order: Neogastropoda
Family: Terebridae

Description: Small slender auger; elongate spire tapers to fine point. Shell has 15 whorls sculpted with spiral grooves and vertical ribs. Aperture small (Abbott, 1974).

Present Range: Maryland to Florida, Texas and the West Indies; Brazil; California to Panama.

Distribution in Virginia: Formerly to York Spit in lower Chesapeake Bay when Willis Hewatt found a shell two decades ago.

Habitat and Mode of Life: Creeps over sand bottoms and drills bivalves.

Reproduction: Unknown.

Status: *Extirpated* in Virginia waters as far as we can discern. No shells found on Virginia coast beaches recently.

Protective Measures Proposed: None.

Remarks: No probable reason for extirpation, except possibly colder weather or loss of food sources.

Author: Marvin L. Wass.

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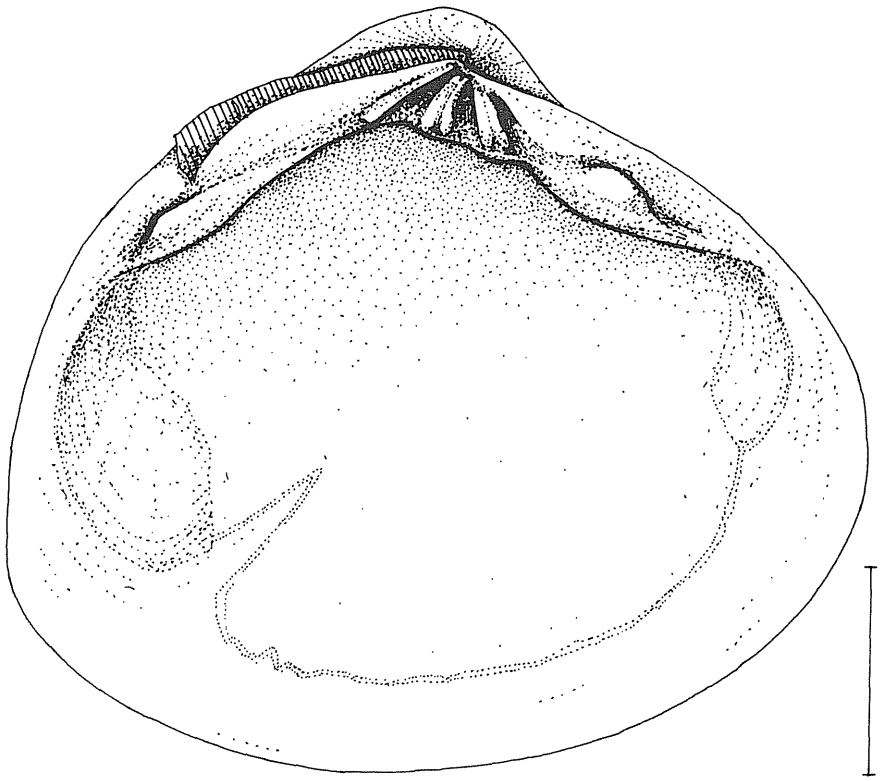
2. CAROLINA MARSH CLAM — *Polymesoda caroliniana* Bosc

Phylum: Mollusca
Class: Bivalvia
Order: Heterodontida
Family: Cycladidae

Description: Length to 48 millimeters. Shell triangulate; strong, inflated, equivalve; beaks ahead of midline, facing forward. Sculpture concentric undulating lines; growth lines clear. Both valves with three cardinal teeth. Left valve with 21 large, knoblike laterals, one anterior, one posterior. Pallial line narrow. Margin smooth. External ligament dark brown. Shell interior white to iridescent purple (Abbott, 1974).

Present Range: Lavaca Bay, Texas through Gulf of Mexico and north along western Atlantic Coast to James River, Virginia.

Distribution in Virginia: Jamestown Island to Mulberry Island in James River (Andrews and Cook, 1951). Presumed to be endemic.



Habitat and Mode of Life: Low intertidal zone in marshes, grassy shores and ripraps where protection from wave action is provided (Andrews and Cook, 1951). Usually an abundance of detritus and organic matter in niches. Siphons short, hence is a presumed filter feeder on plankton and organic particles. Shells formerly common on shores.

Reproduction: Unknown.

Status: *Extirpated*. Not found for 10 to 15 years in James River.

Protective Measures Proposed: Marshes are polluted by industry and military bases along this stretch of river. Much of shoreline is in Jamestown area of National Historical Park where swimmers and picnickers frequent eroding shore and collect molluscs. Riprap on military bases is most probable future habitat of this species. Effect of Kepone unknown.

Remarks: Scarce or extinct in Virginia. Except riprap niche, habitat limited in area and subject to man-induced deterioration and destruction.

Author: Jay D. Andrews.

3. DECAPOD *Ogyrides alphaerostris* Kingsley

Phylum: Arthropoda
Class: Crustacea
Order: Decapoda
Family: Alpheidae

Description: Length 27 millimeters. Rostrum depressed, tipped with setae. Eyestalks long. First legs scarcely reach antennal scale. Second legs exceed antennal scale by full chela length; fingers pointed. Uropods with exopods falciform, curvature greatest distally (Williams, 1965).

Present Range: Eastern Shore of Virginia to St. Simons Island, Georgia; Alligator Harbor, Florida to Horn Island, Mississippi.

Distribution in Virginia: Taken on seaside of Northampton County in 1879 and never collected in Virginia again.

Habitat and Mode of Life: Euhaline.

Reproduction: Likely in July.

Status: *Extirpated.* Possibly because of cooler water since late 1800's or because of loss of eelgrass.

Protective Measures Proposed: None realistic.

Author: Marvin L. Wass.

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4. LITTLE SPINY BRITTLE-STAR *Ophiothrix angulata* Say

Phylum: Echinodermata
Class: Ophiuroidea
Order: Ophiurida
Family: Ophiothricidae

Description: Disc 10 millimeters, anus 6 centimeters. Top disc covered with sharp spines, except for radial shields. Arms with two to six slender, blunt spines. Arm segments much broader than long. Thorn-tipped scale on each segment of arm from base to tip. Almost every color occurs (Miner, 1950).

Present Range: Chesapeake Bay to Rio de Janeiro.

Distribution in Virginia: Tangier Sound, 2 to 13 fathoms (Koeler, 1914); lower mid-Chesapeake Bay, J. Whitcomb.

Habitat and Mode of Life: Moves over bottom to feed.

Reproduction: Unknown.

Status: *Extirpated.* Not seen since 1958. Miner (1950) reported it common from Chesapeake Bay south.

Protective Measures Proposed: None.

Author: Marvin L. Wass.

5. SEA SQUIRT *Ecteinascidia turbinata* Herdman

Phylum: Chordata
Class: Ascidiacea
Order: Enterogona
Family: Perophoridae

Description: Colony to 15 centimeters in favorable areas where they form around grass stems and mangrove roots in Florida. Zooids about 20 millimeters long. Test thicker at ends of body. Branchial sac long, barrel-shaped, with about 27 to 30 rows of small stigmata. Test transparent, colorless. Living zooids yellow, pinkish orange, or bright orange (Van Name, 1945).

Present Range: Chesapeake Bay (?) to Bermuda, Gulf of Mexico and West Indies.

Distribution in Virginia: If existing, at mouth of York River (Calder, Thornborough and Lowry, 1966).

Habitat and Mode of Life: Attaches to stable substrates, feeds on plankton.

Reproduction: Breeds August to September.

Status: *Extirpated*.

Protective Measures Proposed: None needed.

Remarks: Must have arrived in Chesapeake Bay through shipping. Ideal for classroom use.

Author: Marvin L. Wass.

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