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**A check list of the biota of lower Chesapeake Bay : with inclusions from the upper bay and the Virginian Sea**

Marvin L. Wass  
*Virginia Institute of Marine Science*

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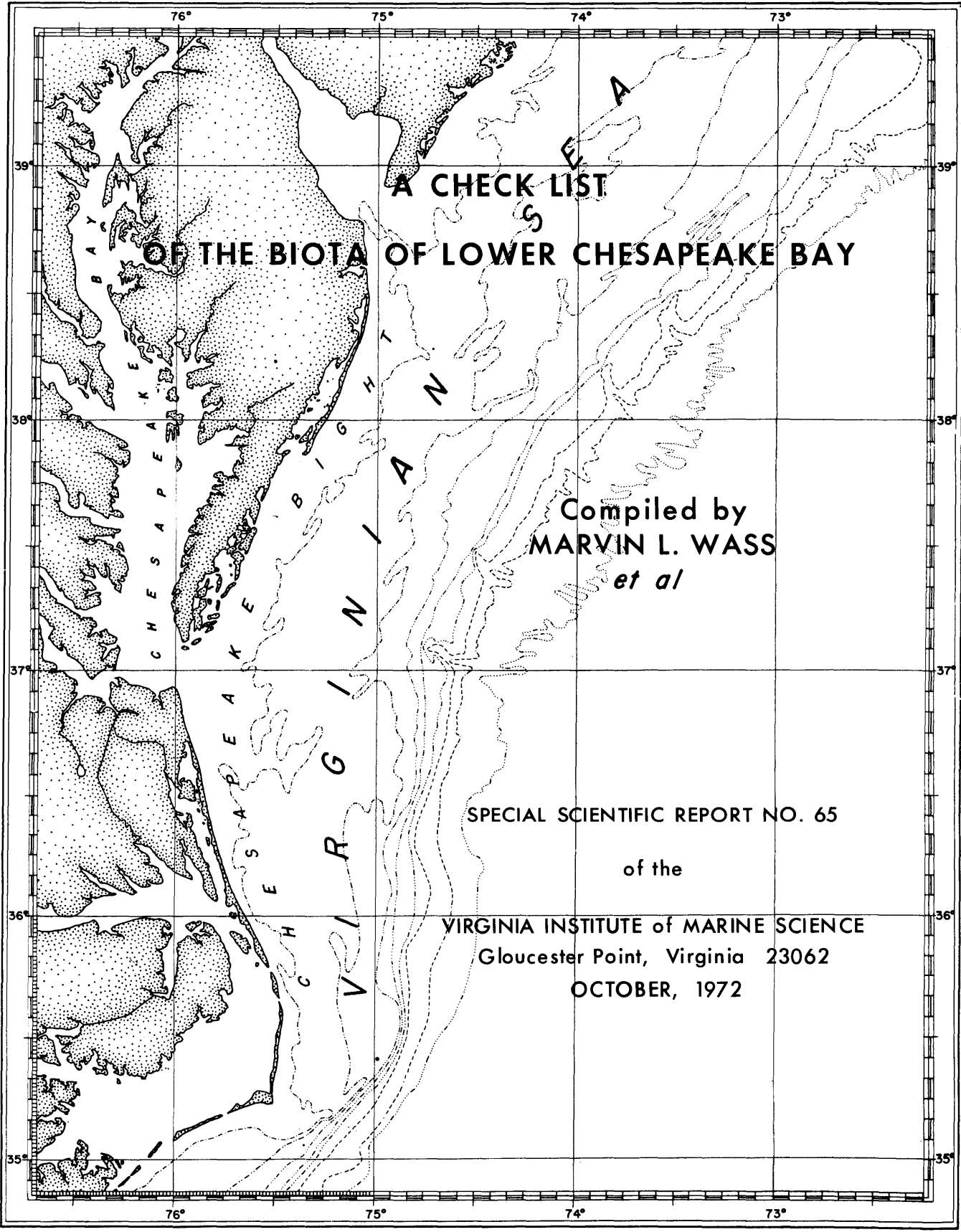
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**A CHECK LIST  
OF THE BIOTA OF LOWER CHESAPEAKE BAY**

Compiled by  
**MARVIN L. WASS**  
*et al*

SPECIAL SCIENTIFIC REPORT NO. 65

of the

**VIRGINIA INSTITUTE of MARINE SCIENCE**

Gloucester Point, Virginia 23062

OCTOBER, 1972

A CHECK LIST  
OF  
THE BIOTA OF LOWER CHESAPEAKE BAY  
With Inclusions from the Upper Bay and  
The Virginian Sea

Compiled by Marvin L. Wass  
with the assistance of several  
authorities and aides.

SPECIAL SCIENTIFIC REPORT NO. 65

Virginia Institute of Marine Science  
Gloucester Point, Virginia 23062

William J. Hargis, Jr.

Director

October 1972

## FOREWORD

Effective management of the marine areas of the world is an increasing necessity. Of all such areas, the world's Coastal Zones are under greatest pressure from many sources and for a multitude of reasons. Many and complex demands are being imposed upon the environments and useful resources of coastal regions, especially in the technologically advanced countries and developing coastal nations.

Complexity in use and demands is equalled by that in natural features. The physical, chemical, and geological activities in this zone - where sea, sea bottoms, intertidal zones and highland meet the growing hordes of men, are myriad, producing interactions which are difficult to understand and predict. Biological phenomena also are many and varied, involving numerous ecosystems, communities, species, and individuals.

In the waters, bottoms, shallows, wetlands, and on the beaches of the coastal zone coningle species from truly marine waters, fresh water, and brackish waters and from land and air. Natural and man-made chemicals from land, sea, and air also enter in confusing complexity and, at times, to the detriment of the biota.

Demands for access to and use of the environments and resources of the coastal areas multiply and, since uses are wholly or partially incompatible, conflicts grow. Often two users seek access to the same plot of shoreline, bottom, or water surface. Additionally, the impacts of the larger projects and the numberless smaller ones grow and interact and complement, magnify, or diminish each other.

To cope effectively, improved planning and management is required. Enhancement of decision-making abilities demands increasingly detailed data and knowledge of the natural and the human activities comprising the Nature-Man (or Man-Nature - depending upon personal orientations or preference) systems in the coastal zone. Improved and new techniques of study, evaluation, decision-making, and of manipulation and control of the natural and human segments of coastal areas are needed.

To the aid of the managers in sympathetic, oriented, and disciplined fashion must come the natural and human scientists and their engineering companions bearing gifts of knowledge, technical capability, and relevant and timely advice and assistance.

A necessary tool of managers and their scientific advisors is assimilated and integrated knowledge of natural systems presented in abbreviated and useful form.

Baseline knowledge of the complex biota may be presented in several forms. Perhaps the most abbreviated and yet comprehensive is the annotated checklist such as that presented herein.



This improved, ecologically-annotated checklist, intended to provide a baseline against which to measure the present and future distribution, abundance, and conditions of species and communities, was begun at my request in 1970-71 during the NSF Sea Grant-IRRPOS-supported study of research needs for Chesapeake Bay. Activity continued under support of the Corps of Engineers and the NSF RANN programs for 1971-72 as part of the activities which VIMS continued in concert with the other members of the Chesapeake Research Consortium. Hopefully, it will assist us to evaluate the current status of the biota and provide a baseline against which future developmental projects and research activities can be developed and judged.

It is our hope that it will be useful to managers and scientists, and we will welcome constructive criticism of this effort. For future editions, we would appreciate suggestions for improvements and participation in addition of new taxa and ecological data.

William J. Hargis, Jr. Ph.D.  
Program Director and Director  
Virginia Institute of Marine Science

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## PREFACE

This list is a sequel to the "Check-list of Marine Invertebrates of Virginia" last revised in 1965. The biota of Chesapeake Bay seems generally less known than that of New England and much of our West Coast. The present work attempts to mollify this discrepancy. The compilation has been revised and expanded to include plants and vertebrates. Inclusion of creatures not strictly aquatic but which may occasionally find their areas flooded by tidal waters has necessitated subjective decisions of limitation. Thorough study will be needed to decide which plants and animals of freshwater creeks, marshes, swamps and saline beaches justify inclusion in future works, which should include more physical data.

The only major groups excluded from this list are the insects and spiders. Minor groups ignored, or as yet not known to occur, include the lichens, bryophytes, rotifers, gnathostomulids and kinorhynchans. Unfortunately, coverage of the often ecologically underrated protists is scant. These deficiencies will hopefully be reduced in a future work which it is hoped will also give much better coverage to the upper Bay. Fishes, invertebrates and algae are reasonably covered for Maryland, but higher plants, birds and mammals are not. Oceanic shelf data is provided for decapod crustacea.

In general, large animals are better known than small ones, especially if they are eaten by man. Vertebrates have established common names which are often widely used and usually more stable than scientific names; for example the striped bass, hard clam, Virginia oyster and ribbed mussel are abundant species which have had their generic names changed in recent decades. Birds are the most conspicuous and easily censused vertebrates; however, among birds and fish a "curiosity phenomenon" operates and rare species often receive more attention than common ones of greater economic import.

Chesapeake Bay is famous for its production of seafood. The great harvests of croakers in the 1950's is an oft-recounted memory. The menhaden fluctuates in a slow decline while still making up two-thirds of the total tonnage. Far behind are alewives and other clupeids obviously affected now by oceanic fishing pressure. But all is not gloom, the summer of 1970 brought banner catches of spot and trout. Striped bass seem most successful and once ignored fish receive increasing catch effort. Eels are air-freighted live to Holland; catfish trucked north and west. Difficult to estimate is the poundage of all those species of finfish and shellfish taken by sport fishermen or the value of the bull minnows, clams, worms, squid and other invertebrates they use for bait.

Blue crabs reach their acme in the Chesapeake Bay and catching is most proficient. Oysters are taken in less volume but are of great value. Oyster culture in lowered salinities promises a continuing supply of this gourmet bivalve. Hydraulic dredging has put Maryland ahead in soft clams. Long lived but poorly recruited hard clams sustain a sizable fishery in the lower Bay. In the face of continued coastal urbanization, some edible seafoods may be of most value for the recreation provided in their catching and pleasurable eating.

Sampling has been conducted most intensively near research centers, in the most accessible sites and in the milder seasons. Thus, angiosperms of wetlands are quite well known near the coast, poorly so between the York and Potomac rivers. Some plankters, including scyphozoans, ctenophores, the Acartia copepods, Neomysis, the diatom, Skeletonema costatum, and the flagellate, Prorocentrum micans, have been reasonably studied, but hundreds of other holoplankters are little understood. The meroplankton have been taxonomically studied for most decapod crustaceans but vast knowledge gaps exist for polychaetes and other groups. The macrobenthos is taxonomically known in general but our awareness of distribution, life history and ethology of most species is inadequate. Some groups, e.g. the organisms from 0.1-1.0 mm have barely been touched in the Bay, for some communities it is already too late to study the effects of disturbance.

An early list of plankton was provided by Wolfe *et al* in 1926 (see p. 72). Hildebrand and Schroeder (1928) compiled the broadest work on bay biota in their "Fishes of Chesapeake Bay". Cowles (1930) provided the most ecologically comprehensive treatment in his "Biological Survey of the Offshore Waters of Chesapeake Bay", a study based largely on collections made by the "Fish Hawk" from 1915 to 1922. He listed 250 organisms by at least generic names, however coverage of some groups was sketchy or wanting. The only plants listed were 42 diatoms, only five protozoans were included, pericaridan coverage was meager, and no mollusks were reported. Dr. Willis G. Hewatt produced the first checklist of marine invertebrates at VIMS, in 1959, although Dr. Jay D. Andrews had compiled one for mollusks earlier.

The Chesapeake Bay is the largest of the hundreds of estuaries found in North America. It is subjected to broad ranges of temperature, wind, turbulence, and dissolved oxygen. Salinities range from rather constant at the mouth to an ecotone, or area of change-over, with fresh water that may move over a distance of 90 river miles in a year. Gradient zones, points of greatest salinity change, occur in each tributary river and the Upper Bay at about the 10-12 ppt. isohalines. These tend to delimit the lower boundaries of nursery grounds, or critical zones. Turbidity increases up-estuary and a somewhat controversial flocculation zone occurs near the head of salinity.

Organisms range from specialists, largely biologically controlled by predation and competition, near the Bay mouth, to generalists, or fugitive species, which accommodate to physical factors, in the upper reaches. Diversity is high in the lower bay, often greater in the lower James and York than near the Bridge-Tunnel at the mouth, perhaps a result of greater sediment variations. In the Chesapeake system, faunistic break points seem more likely to occur near 10 and 25 ppt. than at the "Venice system" levels of 5 and 18 ppt. Seasonal variations in salinity, with lows typically in April and highs in October, may be considerable in the tributary rivers. Superimposed on these are longer cycles, as in the dry years of the late 1960's.

Motile species, such as amphipods, are able to move with the salinity change however sessile forms may establish colonies in summer, only to be wiped out in winter. A very few species, usually abundant ones such as the menhaden and some amphipods, reproduce all year. Others, such as barnacles, *Mya*, and *Mulinia* exhibit bimodal spawning behavior; the fall reproduction of some bivalves often seems more successful than the spring set, presumably because of blue crab and demersal fish depredations in late spring. The most striking vernal phenomena are the spawning of *Polydora ligni* and the attendant mud accretions by newly set worms in March and April, closely followed by the mating gyrations of the ubiquitous *Nereis succinea*. The blue mussel, highly prized by epicures, usually survives the summer at the bay mouth and has occasionally produced large sets at VIMS in winter. In January and February, 1959, this mussel became a pest by setting on blue crabs so heavily that extra hands were hired to remove them. At this time W. A. Van Engel found 196 mussels on a single female crab.

The oligo- and low-mesohaline sectors have become known as "nursery grounds" because of the larval and juvenile fishes transported there from the ocean or fresh water by currents and self-propulsion. In these murky waters the detritus food-chain is maximized and young fishes grow large enough to cope with increasing biotic hazards down-estuary and in the ocean. Biomass per unit of area, particularly of marsh plants and fishes, is vastly greater on these nursery grounds than it is seaward. Three resident fishes, the white catfish, white perch and hogchoker compose over 95% of the fish volume here. Mysids, amphipods and wedge clam, *Rangia cuneata*, predominate in the biomass of invertebrates. The large

marshes bordering the nursery waters are rich in angiosperm species, including some rare ones, but support only a few species of birds and fishes, in contrast to the Eastern Shore seaside with its great variety of ichthyo- and avifauna seen against vast cordgrass marshes and mud-flats.

Sediments typically become coarser toward the sea. Although deep holes and channels may bear gravel, deeper areas usually contain silts and clays. Fresh and oligohaline shallows may support valued Potamogeton or Vallisneria waterweeds or be choked by Ceratophyllum, Zannichellia or Myriophyllum spicatum (Eurasian water milfoil). In saltier water, Zostera marina (eel grass) beds support an amazing epifauna, abundant infauna and shelter for many species of juvenile fishes in summer.

Communities or organisms are often dominated by a single species in low salinities (e.g., Macoma balthica) while those in the lower Bay may lack dominants. A similar event seems to occur from channels to the outlying shoals, where cirratulids may predominate in channels and diverse psammofauna may exist in the sandy sublittoral region. Sand beaches are most barren, although giant amphipods may torment the nocturnal stroller. Oyster "rocks" are species-rich habitats worthy of more study.

The oligohaline marshes have changed rather precipitously from being dominated by giant cordgrass to producing mostly succulent forbs which often begin dying back in summer and are laid low by killing frosts. Wild rice also seems to have been reduced. The reason for this change is unknown, but the 13-inch rise of sea level locally in the last 50 years may have been a contributing factor if sediment aggradation is inadequate.

Brackish and freshwater zones exhibit various seasonal phenomena including "red tides", the sensory manifestations of a few species of opportunistic dinoflagellates. Silt-laden flood waters following Hurricane Camille destroyed thousands of bushels of oysters, but fattened the survivors. More sinister are the cyanophycean blooms which reduce ecosystem stability and complexity in the upper tidal James and Potomac rivers, often raising the photosynthetic compensation point to the surface. Low summer DO's plague blue crabs in 1971, after summer rains. Perhaps attracting most concern among the public is that bane of bathers, the stinging nettle Chrysaora, a species possibly benefited by the increasing practice of culturing oysters in low salinity areas. Polyps of this pest occur typically on oyster shells, although man's litter also provides increasing durable surfaces which serve as substrates.

Several species seem to have been reduced, either in numbers or range, in the last 20 years. Examples include the sand dollar Mellita, the starfish Asterias, the shrimp Ogyrides and most notably, the increasingly restricted areas in which oysters can be grown commercially. Most mourned is the croakers decrease in abundance. Record of great numbers of sturgeon and some shorebirds before our time seem legendary.

Introduced species are more prominent: Rangia, in all major rivers except the York, contributes most to the biomass. Minchinia nelsoni, presumed by some to be exotic, is the more economically important by its impact on oyster culture. Loxothylacus panopeae from the Gulf of Mexico markedly reduced Eurypanopeus and possibly Rhithropanopeus; a doubtful benefit to oyster culture and decreasing a food source for diving ducks. Ecteinascidia, if still present, should be welcomed by teachers because of its see-through test. Among vertebrates, the cattle egret, glossy ibis and nutria are highly successful newcomers, with an ecological impact yet to be assessed. Eurasian watermilfoil tops the plant introductions although it has inexplicably become reduced in speed and density recently. The Asiatic Anellema keisak dominates some swamp floors. Russian thistle does a bit to retard barrier beach erosion and Carex kobimugi may ultimately be the best defense of back dunes.

The Corps of Engineers' study of the Chesapeake Bay is obviously hastening censuses of biotic information by providing support to this and coordinated projects. Identification of material is paramount in any study. To this end, many keys have been constructed by VIMS scientists and some have been reasonably tested but all suffer from lack of illustrations. Of course, keys are often available from other areas but Chesapeake Bay merits its own.

The length of the list has made it advisable to divide it into chapters which could be issued separately to those with specific interests. Each chapter has an index and one or more lists of references. Common names are provided for some higher plants and all vertebrates. Salinity categories are those of the "Venice system". Sediment preferences for invertebrates are generalizations.

Corrections and additions for this list have accrued during this compilation, not all of which could be included. The compiler would appreciate knowledge of new records and name changes, particularly those appearing in journal papers and theses. We also seek criticism of the format and discovery of errata. Since several chapters have been contributed by others, format varies somewhat. New Chesapeake Bay records are included in some chapters, particularly that on Parasites. Without the participation of the individuals listed below, compilation time would have been extended immeasurably.

Macroalgae: Franklyn D. Ott, VIMS  
 Marine Fungi: Fred Kazama, VIMS  
 Ciliata: Jesse C. Thompson, Roanoke College, Roanoke, Va.  
 Disease Organisms: Frank O. Perkins, VIMS  
 Bacteria: Rita R. Colwell, University of Maryland  
 Parasites: David E. Zwerner and Adrian R. Lawler, VIMS  
 Cnidaria: Dale R. Calder, VIMS  
 Pycnogonida: Willard A. Van Engel, VIMS  
 Crustacea (Copepoda): Victor G. Burrell, Jr., Marine Research  
 Division, South Carolina  
 Crustacea (Cephalocarida, Branchiopoda, Cirripedia, Cumacea,  
 Decapoda): Willard A. Van Engel, VIMS  
 Fishes: John A. Musick, VIMS  
 Amphibians: John A. Musick, VIMS  
 Reptiles: John A. Musick, VIMS

The information in this list has been gathered over many years, much of that on benthic invertebrates by my students. Other scientists and students at VIMS, the Chesapeake Biological Laboratory, the National Museum of Natural History, and elsewhere have contributed significantly. Finally, there was the exhausting task of data compilation and typing: Pamela Townsend and Mary Dudley gathered data on diatoms, flagellates and higher plants and birds during the summer. Mrs. Mary Emory typed the lower plants and drafts of other sections. Most of the final typing and the compilation of indices has been by Mrs. Marion Hart, with Mrs. Donna Farmer doing fishes and birds. Funding was provided in early 1971 by NOAA (Sea Grant No. 1-36032) and NSF (IRRPPOS #GI-27323) and ran mid 1971 through completion by NSF RANN (#29909) and U. S. Army Corps of Engineers through the Chesapeake Research Consortium. To all who have labored and to the funding agencies, I am most grateful for the opportunity to synthesize this knowledge of the great Bay ecosystem.

Marvin L. Wass, Editor

## DIVISION CHRYSOPHYTA

Several works involving long lists of species have been published on Chesapeake Bay phytoplankton. Probably much other work has been done but never published. The amount of ecological information available remains meager, except on the dominant forms. Many misidentifications may have accumulated in the several lists but considerable future expertise will be needed to determine this--assuming that pollution has not altered basic compositions.

Information is mainly from Mulford (RAM); Patten (1961), and Patten, Mulford and Warinner (1963), the latter two papers cited as BCP. Other information comes from Morse (DCM), Marshall (HGM), Gibson (VG), Griffith (REG), and Wolfe et al (JJW).

## Class Xanthophyceae

## Order Heterochloridales

## Family Heterochloridaceae

- Nephrochloris sp. Elizabeth River, HGM.  
Olisthodiscus carterae Hulbert. Elizabeth River, HGM.  
Olisthodiscus luteus Carter. Elizabeth River, HGM.  
Olisthodiscus magnus Hulbert. Elizabeth River, HGM.

## Order Vaucheriales

## Family Vaucheriaceae

- Vaucheria piloboloides Thuret. Zaneveld (1966-67).

## Class Chrysophyceae

## Order Ochromonadales

## Family Dinobryaceae

- Dinobryon sertularia Ehrenberg. Polyhaline, lower CB, Y-7, 19-XII-60, rare, BCP.

## Order Dictyochales

## Family Dictyochaceae

- Dictyocha fibula Ehrenberg. CB, JJW.  
Dictyocha pons CB, JJW.  
Distephanus rotundus CB, JJW.  
Distephanus speculum Baeck. CB, JJW.

## Class Haptophyceae

## Order Prymnesiales

## Family Prymnesiaceae

- Prymnesium sp. Polyhaline, CB (York Spit Light - Y-7), 14-XI-60, rare, BCP.

## Class Cryptophyceae

## Order Cryptomonadales

## Family Cryptomonadaceae

- Chilomonas sp. Polyhaline, lower CB - Y-7, abundant III-60 - XI-60, BCP. Elizabeth R., HGM.  
Chroomonas salina (Wislouch) Butcher. Elizabeth R., HGM.  
Chroomonas vectensis N. Carter. JR (HR), HGM.  
Cryptomonas sp. Polyhaline, lower CB - Y-7, abundant III-6- - XI-60, BCP. Elizabeth R., HGM.  
Cryptomonas stigmatica Wislouch. Elizabeth R., HGM.  
 Species of uncertain relationships (Butcher, 1967)  
Rhodomonas amphioxela Conrad. Elizabeth R., HGM.  
Rhodomonas minuta Skuja. Elizabeth R., HGM.  
Rhodomonas sp. Polyhaline. Y-7, 3-VI-60, rare, BCP.

## Class Prasinophyceae

## Order Pyramimonadales

## Family Polyblepharidaceae

- Pyramimonas sp. Polyhaline, VG. Summer (dominant).

## Class Bacillariophyceae

## Order Bacillariales

## Suborder Discineae

## Family Coscinodiscaceae

- Actinocyclus alienus Rattray. CB, REG.  
Actinocyclus octonarius Ehrenberg. (A. ehrenbergii Ralfs and Pritchard). Meso- and polyhaline (14-19 ppt) Y-0 - Y-10, II & IV, 2-10C, RAM.



- Coscinodiscus asteromphalus Ehrenberg. Euryhaline (2-31 ppt), lower CB - Y-20, I-XII, abundant late IV-VI, 2-29C, BCP. Patuxent River, autumn, DCM.
- Coscinodiscus centralis Ehrenberg. Meso- and polyhaline (8-24 ppt), lower CB - P-30, VIII-XII, 5-28C, common, RAM. Patuxent R., rare, DCM.
- Coscinodiscus concinnus (W. Smith). Meso- to euhaline (7-31 ppt), lower CB, Y-0, IX-XII, 8-27C, rare, RAM. CB, REG.
- Coscinodiscus curvatulus Grunow and Schmidt. CB, REG.
- Coscinodiscus decoratus Brun. CB, REG.
- Coscinodiscus decresens Grunow. Polyhaline (19 ppt), CB-0, VI, 25C, RAM.
- Coscinodiscus excentricus Ehrenberg. Meso- and polyhaline (14-21 ppt), lower CB - Y-0, III-X, 8-27C, RAM. GP, 12-XII-69, VG. Patuxent R., rare, DCM.
- Coscinodiscus granii Gough. Oligo- and mesohaline (2-17 ppt), Y-10 - P-30, IV-VI (abundant IV & V), 10-29C, RAM. CB, REG.
- Coscinodiscus lineatus Ehrenberg. Meso- to euhaline (15-31 ppt), CB-10 - Y-7, IV-VIII, 8-29C, RAM. CB, REG.
- Coscinodiscus marginatus Ehrenberg. Oligo- to polyhaline (0-19 ppt), Y-0 - P-30, II, VI, VII, 6-26C, RAM. CB, REG.
- Coscinodiscus nitidulus Grunow. CB, REG.
- Coscinodiscus nitidus Gregory. CB, REG.
- Coscinodiscus nobilis Grunow. CB, REG.
- Coscinodiscus oculus iridis Ehrenberg. Oligo- to polyhaline (0-21 ppt), CB - Y-20, P-30, I-V, VIII, X, 3-29C, RAM. Patuxent R., autumn, DCM.
- Coscinodiscus perforatus Ehrenberg. Oligo- to polyhaline (0-25 ppt), CB - P-30, I-VI, VIII-XI (dominant in VI & IX) 2-28C, RAM. Patuxent R., DCM.
- Coscinodiscus radiatus Ehrenberg. Meso- and polyhaline (13-23 ppt), CB-10 - P-30, I, IV, VI, IX, XI, 4-29C, RAM. Lower CB, Bridge Tunnel, 29-IX-69, GP, 12-XII-69, VG. Patuxent R., DCM.
- Coscinodiscus rothii (Ehrenberg) Grunow. CB, REG.
- Coscinodiscus senarius A. Schmidt. CB, REG.
- Coscinodiscus subconcauus Grunow. CB, REG. Patuxent R., rare, DCM.
- Coscinodiscus subtilis Ehrenberg. Oligo- to polyhaline (0-24 ppt), CB - P-30, V-VII, XII, 4-26C, rare, RAM. CB, REG.
- Coscinodiscus waillesii Gran. Meso- and polyhaline (12-22 ppt), Y-0 - Y-14, IV, IX-XII, 10-29C, RAM. CB, RAM.
- Coscosira polychorda Gran. Mesohaline (16-18 ppt), Y-0, III, 8-12C, RAM. Patuxent R., rare, DCM.
- Cyclotella kutzingina Thwaites. Oligo- to polyhaline (0-19 ppt); P-30, P-40, CB-0, II, VI, XII, 3-25C, RAM. CB, REG.
- Cyclotella meneghiniana Kutzing. Oligo- and mesohaline (0-13 ppt), P-30, P-40, X, XI, 11-23C, RAM.
- Cyclotella operculata var. antiqua Heribaud. CB, REG.
- Cyclotella stelligera Bailey. Oligo- and mesohaline (0-18 ppt), Y-0 - P-30, III, VI, 9-26C, RAM.
- Cyclotella striata (Kutzing) Grunow. Oligo- to polyhaline (4-30 ppt), CB - Y-20, II, III, VIII, X, 2-29C, RAM. Patuxent R., rare, DCM.
- Cyclotella stylorum Brightwell. CB, REG.
- Hyalodiscus stelliger Bailey. CB, REG.
- Melosira borreri Greville. Meso- and polyhaline (8-22 ppt), CB - Y-7, IX, XI, 13-27C, RAM. 12-XII-69, 1-VI-70, VG. Patuxent R., rare, DCM.
- Melosira granulata (Ehrenberg) Ralfs. Oligo- and mesohaline (0-8 ppt), P-30, P-40, I, VI-VIII (abundant VI, VII), 3-28C, RAM.
- Melosira hyperborea (Grunow) Schutt. CB, REG.
- Melosira islandica Muller. Oligo- to polyhaline (0-20 ppt), Y-0 - P-40, III-V, VIII-XII, 5-28C, RAM.
- Melosira jurgensii Agardh. Meso- and polyhaline (8-30 ppt), CB - Y-20, I-XII, 2-29C, RAM. CB, REG. HR and WB, HGM.
- Melosira lineata Agardh. Polyhaline (19-20 ppt), Y-7 & Y-14, VIII, 27C, RAM.
- Melosira lirata (Ehrenberg) Kutzing. Lower CB, I-60, RAM.

- Melosira nummuloides (Dillwyn) Agardh. Polyhaline (20 ppt), Y-7, IX, 22C, RAM. CB, REG.
- Melosira octogona A. Schmidt. CB, REG.
- Melosira roeseana Rabenhorst. Oligo- and mesohaline (2-9 ppt), P-30 - P-40, I, 2-4C, RAM.
- Melosira setosa Greville. Polyhaline. Lower CB, 21-III-60, BCP.
- Melosira solida Eulenstein. Mesohaline. Patuxent R., rare, DCM.
- Melosira sulcata (Ehrenberg) Kutzing. Oligo- and polyhaline (4-33 ppt), lower CB, P-30, I-XII, 2-29C, RAM. Patuxent R., rare, DCM. HR & WB, winter (20-XI to 20-III), HGM.
- Melosira undulata (Ehrenberg) Kutzing. Mesohaline. Patuxent R., rare, DCM.
- Paralia sulcata (Ehrenberg) Cleve. CB, REG.
- Planktoniella sol (Wallich) Schutt. Polyhaline (30 ppt), lower CB, VIII-60, 24C, RAM. CB, REG.
- Skeletonema costatum (Greville) Cleve. Oligo- to polyhaline (0-26 ppt), lower CB - P-40, I-III, V-XII, (among 3 dom. diatoms I-X & XII), 2-24C, RAM. Lower CB, I-XII; Y-7, I-IV and VII-XII; Y-0, I-IV, VI-XII; BCP. JR (JOO), 13-II-64, max. pop. 21,915,000 cells/l. at 1300 hours, 12 m., ebb tide. Most abundant plankter, VIII-XII, VI & VII, VG. Patuxent R., autumn, winter, abundant, DCM. Elizabeth R., most abundant diatom 1-V-64 - 13-VIII-65, HGM.
- Skeletonema subsalsum (Cleve) Bethge. Meso- and polyhaline (7-22 ppt), Y-0, Y-7, III & XII, 1961, 8-12C, RAM.
- Stephanodiscus astraea (Ehrenberg) Grunow. Mesohaline (15 ppt), Y-0, V, 13C, RAM.
- Stephanopyxis palmeriana (Greville) Grunow. Polyhaline. CB, VG.
- Stephanopyxis turgida (Greville) Ralfs. CB, REG.
- Stephanopyxis turris (Greville) Ralfs and Pritchard. Polyhaline (24 ppt), CB-0, XI, 12C, RAM. CB, REG. HR and WB, HGM.
- Thalassiosira aestivalis Gran and Angst. Oligo- and polyhaline (4-20 ppt), lower CB, Y-7, II-IV, 2-14C, RAM.
- Thalassiosira balticus Grunow. Oligo- to polyhaline (4-24 ppt), lower CB - Y-14, I-IV, VII, X, XI, 2-29C, RAM.
- Thalassiosira condensata Cleve. Polyhaline (24 ppt), Y-0, X, 18C, RAM. Lower CB, IV, VII, & IX, BCP.
- Thalassiosira decipiens (Grunow) Jorgensen. Meso- and polyhaline (7-22 ppt), Y-0, Y-14, III & XII, 2-13C, rare, RAM.
- Thalassiosira gravida Cleve. Meso- and polyhaline. Patuxent R., rare, DCM. GP, 2-XII-69 (3rd in abundance), 28-VII-70, VG.
- Thalassiosira kryophila (Grunow) Jorgensen. Oligo- and polyhaline (4-24 ppt), lower CB, Y-0, Y-7, I-IV, 2-12C, RAM.
- Thalassiosira nana Lohmann. Meso- and polyhaline (16-30 ppt), lower CB - Y-7, I, V, VII- IX, 15-27C, BCP.
- Thalassiosira nordenskioldii Cleve. Polyhaline (19-25 ppt), lower CB, II, III, IV, 2-6C, RAM.
- Thalassiosira rotula Meunier. Meso- and polyhaline (11-26 ppt), CB - Y-20, II, IX, X, 2C, RAM.
- Thalassiosira spp. Mesohaline. Patuxent R., rare, DCM.
- Thalassiosira subtilis (Ostenfeld) Gran. Elizabeth R., HGM.
- Family Actinodiscaceae
- Actinoptychus splendens (Shadbolt) Ralfs & Pritchard. Oligohaline, (2 ppt), P-30, I, 4C, RAM.
- Actinoptychus undulatus (Bailey) Ralfs. Oligo- and polyhaline (0-25 ppt), CB-10, P-30, II=III, V-VII, IX, XI-XII, 2-26C, RAM. Patuxent R., rare, DCM.
- Suborder Aulacodiscineae
- Family Eupodiscaceae
- Aulacodiscus argus (Ehrenberg) A. S. Schmidt. Lower polyhaline (16-23 ppt), lower CB, II, VI & XI, 4-24C, RAM.
- Suborder Auliscineae
- Family Auliscaceae
- Auliscus caelatus Bailey. Meso- and polyhaline, lower CB -Y-0, II, IV, V, VII-XII, 2-8C, RAM.
- Auliscus punctatus Schmidt. Upper mesohaline (16 ppt), Y-14, XI, 15C, RAM.

Auliscus radiatus Janisch. CB, REG.

Auliscus sculptus (W. Smith) Ralfs & Pritchard. CB, REG.

Suborder Biddulphiineae

Family Biddulphiaceae

Anaulus scalaris Ehrenberg. CB, REG.

Bellerochea malleus (Brightwell) V. Heurck. Polyhaline (28 ppt), lower CB, VIII, 27C, rare, RAM.

Biddulphia aurita (Lyngbye) Brebisson. CB, REG.

Biddulphia favus (Ehrenberg) V. Heurck. Poly- and euhaline (12-32 ppt), lower CB - Y-7, II through XII, X, 8-27C, RAM.

Biddulphia granulata Roper. Oligo- to polyhaline (4-30 ppt), lower CB - Y-14, II, IV - VII, X, 2-23C, RAM. Patuxent R., rare, DCM.

Biddulphia laevis Ehrenberg. Oligohaline (3 ppt), P-30, VII, 28C, RAM.

Biddulphia longicruris Greville. Polyhaline (19-30 ppt), CB - Y-7, VIII, 27C, rare, RAM.

Biddulphia mobiliensis (Bailey) Grunow & Van Heurck. Meso- and polyhaline (8-24 ppt), CB-0 - P-30, II, IX - XII, (dominant IX, X) 4-24C, RAM. Patuxent R., rare, DCM.

Biddulphia pulchella Gray (= biddulphiana (Smith) Boyer). Polyhaline (24 ppt), CB-0, IV, 7C, RAM.

Biddulphia regia (Schultze) Ostenfeld. Mesohaline. Patuxent R., rare, DCM. CB, REG.

Biddulphia rhombus (Ehrenberg) W. Smith. Oligo- to polyhaline (2-30 ppt), lower CB - P-30, I-V, IX-XII, eurythermal, RAM.

Biddulphia sinensis Greville. Oligo- to polyhaline (2-24 ppt), lower CB - Y-20, I-II, VII-XII, eurythermal, RAM.

Biddulphia turgida Ralfs. Oligo- and mesohaline (4-23 ppt), lower CB - Y-14, II, IV, V, XI, XII, 3-21C, RAM.

Cerataulina pelagica (Cleve) Hendey (= C. bergonii Peragallo). Polyhaline (18-24 ppt), CB-0, Y-0, III-IV, VII-IX (abundant), 5-26C, RAM. Lower CB (Bridge Tunnel), 22-IV-70, most abundant plankter;

Patuxent R., abundant in spring, DCM. GP, V-VII, VG.

Cerataulus smithii (= Biddulphia smithii). CB, REG.

Cerataulus turgidus Ralfs. CB, REG.

Ditylum brightwelli (West) Grunow. Oligo- to polyhaline (0-26 ppt), CB - P-40, I-III, V-XIII, (dominant I, VIII- XI), 2-24C, RAM.

Lower CB (Bridge Tunnel), 25-IX-69, abundant. Patuxent R., rare, DCM.

Eucampia cornuta (Cleve) Grunow. Polyhaline (20-30 ppt), lower CB, VIII & IX, 24-27C, RAM.

Eucampia zoodiacus Ehrenberg. Meso- and polyhaline (13-25 ppt), lower CB - Y-20, III, X & XI, 5-20C, RAM.

Hemiaulus hauckii Grunow. Meso- and polyhaline (13-28 ppt), CB - Y-20, VII, IX, X, 24-27C, RAM.

Hemiaulus sinensis (Greville). Polyhaline (28 ppt), lower CB - Y-7, VIII, 27C, RAM.

Lithodesmium undulatum Ehrenberg. Meso- and polyhaline (13-22 ppt), CB - Y-20, IV, XI, 5-20C, RAM. Patuxent R., rare, DCM.

Streptotheca thamesis Shrubsole. CB, REG.

Terpsinoe americana (Bailey) Ralfs. Mesohaline (16 ppt), Y-7, VI, 21C, RAM.

Family Chaetoceraceae

Chaetoceros aequatorialis Cleve. Polyhaline (19-21 ppt), lower CB, 19-IV-60, 11-12C, BCP.

Chaetoceros affinis Lauder. Meso- and polyhaline (13-24 ppt), lower CB - P-30, I-III, V, VII-XII (dominant XII), Y-0, RAM. Abundant lower CB, Y-0, I, II, III, BCP. Elizabeth R., abundant I-IV-64, HGM. Patuxent R., rare, DCM.

Chaetoceros affinis willei Hustedt. Polyhaline (20 ppt), Y-7, IX-61, 28C, RAM.

Chaetoceros atlanticus Cleve. Meso- and polyhaline (13-28 ppt), lower CB - P-30, III-V, VII-XII, 5-29C, RAM.

Chaetoceros brevis Schutt. Polyhaline (16-21 ppt), (Y-0 & Y-7) VI, VIII, IX-XI, 10-28C, RAM. Patuxent R., rare, DCM.

Chaetoceros ceratosporus Ostenfeld (= Chaetoceros gracilis Apstein). Mesohaline (11-16 ppt), lower CB - Y-7, I-IV, 2-12C, RAM.

- Chaetoceros compressus Lauder. Meso- and polyhaline (10-24 ppt), lower CB - Y-20, I, IV-XII, (abundant lower CB, VIII and IX), 3-26C, RAM.
- Chaetoceros constrictus Gran. Meso- and polyhaline (14-21 ppt), lower CB - Y-10, VI, VIII, IX, X, 17-27C, RAM. Patuxent R., rare, DCM.
- Chaetoceros convolutus Castracane. Mesohaline. Patuxent R., summer, DCM. CB, REG.
- Chaetoceros crinitus Schutt. Lower CB (Bridge Tunnel), 22-IV-70 (abundant); Y-6, 28-VII-70, V. G.
- Chaetoceros criophilum Hustedt. Polyhaline (18 ppt), Y-0, VII, 29C, RAM.
- Chaetoceros dadayi (?) Pavillard. Polyhaline (19 ppt), CB-0, VI, 25C, RAM.
- Chaetoceros danicus Cleve. Oligo- to polyhaline (2-26 ppt), lower CB - P-30, I-III, V-VII, IX-XI, (abundant Y-0, VII; Y-7, XI-61, 3-26C, RAM. Patuxent R., summer, DCM.
- Chaetoceros debilis Cleve. Meso- and polyhaline (14-24 ppt), lower CB - Y-20, XI, XII, 5-13C, RAM. Patuxent R., rare, DCM.
- Chaetoceros decipiens Cleve. Oligo- to polyhaline (2-25 ppt), lower CB - P-30, II-IV, IX, X (abundant Y-10 and Y-20, IV - Y-10, X) 3-24C, RAM. Lower CB - Y-7, III, VII-X, "somewhat rare - easily confused with C. lorenzianus", RAM. Patuxent R., autumn, DCM.
- Chaetoceros densus Cleve. Polyhaline. Lower CB - Y-7, XII, I, RAM.
- Chaetoceros didymus Ehrenberg. Meso- and polyhaline (10-26 ppt), lower CB - Y-20, II, IV, V, 2-18C, RAM. Patuxent R., rare, DCM.
- Chaetoceros eibenii (Grunow) Meunier. Polyhaline (19-20 ppt), Y-0, IX, 26-27C, RAM. Patuxent R., rare, DCM.
- Chaetoceros filiformis (?) Meunier. Polyhaline. Lower CB, Y-0, VIII, X, BCP.
- Chaetoceros fragilis (?) Meunier. Polyhaline (20-28 ppt), Y-0 and lower CB, VIII, 26-27C, BCP.
- Chaetoceros lacinosus Granville. Meso- and polyhaline (18-24 ppt), VI, VII (abundant lower CB, VI), 2-4C, RAM.
- Chaetoceros lorenzianus Grunow. Meso- and polyhaline (13-24 ppt), lower CB - P-30, VI-XI, (abundant lower CB and Y-0, X, XI), 10-26C, RAM.
- Chaetoceros pandulus Karsten. Meso- and polyhaline (10-18 ppt), Y-0, Y-7, III, IV, IX, XII, 12-15C, RAM, BCP.
- Chaetoceros convexicorne Mangin (C. peruvianus). Meso- and polyhaline (11-24 ppt), lower CB - P-30, II, III, V-VII, IX, XII, 2-26C, RAM. CB, REG.
- Chaetoceros pseudocrinitus Ostenfeld. Mesohaline. Patuxent R., rare, DCM.
- Chaetoceros pseudocurvisetus Mangin. Oligo- to polyhaline (3-26 ppt), lower CB - P-30, II (abundant), III, X, 2-18C, RAM.
- Chaetoceros septentrionalis Oestrup. Meso- and polyhaline (8-21 ppt), lower CB - Y-14, I-IV, 2-12C, RAM. Abundant Y-7, VI, XI, IX, BCP. Patuxent R., DCM.
- Chaetoceros sericanthus Gran. CB, REG.
- Chaetoceros similis Cleve. Meso- and polyhaline (14-31 ppt), lower CB - Y-14, II-IV, VII, XI, eurythermal, RAM.
- Chaetoceros simplex Ostenfeld. CB, VG.
- Chaetoceros socialis Lauder. Polyhaline (21-22 ppt), Y-0, Y-7, XII, I, 6-11C, RAM. Lower CB, VII, BCP. Patuxent R., autumn, abundant, DCM.
- Chaetoceros spp. Mesohaline. Patuxent R., all year (abundant, autumn), DCM.
- Chaetoceros subsecundus (Grunow) Hustedt (= C. ralfsii Schutt). Meso- and polyhaline (14-24 ppt), CB - Y-10, VI, IX, 21-26C, RAM.
- Chaetoceros subtilis Cleve. Oligo- to polyhaline (0-20 ppt), Y-0 - P-40, I, IV-VII, IX-XII, 3-24C, abundant Y-0, VI - VIII, RAM. Lower CB (Bridge Tunnel), 22-IV-70, VG. Patuxent R., rare, DCM.
- Chaetoceros teres Cleve. Polyhaline (20 ppt), Y-0, VII, 26C, RAM. Patuxent R., rare, DCM.
- Chaetoceros wighami Brightwell. Mesohaline. Patuxent R., rare, DCM.

## Family Bacteriastreae

Bacteriastrea delicatulum Cleve. Meso- and polyhaline (14-32 ppt), lower CB - Y-10, II, VII-XI (dominant VII, VIII) 6-29C, RAM.

Bacteriastrea hyalinum Lauder. Polyhaline (24 ppt), Y-0, X, 18C, RAM.

Bacteriastrea varians (Lauder). CB, REG.

## Suborder Soleniineae

## Family Corethronaceae

Corethron criophilum Castracane (= C. hystrix Hensen). Polyhaline (18-26 ppt), lower CB - Y-7, XI, XII, 8-15C, RAM.

## Family Leptocylindraceae

Dentonula confervacea (Cleve) Gran. (= D. cystifera Gran). Patuxent R., rare, DCM.

Lauderia borealis Gran. Polyhaline (19-24 ppt), CB-10 - Y-10, II & X, 2-20C, RAM.

Leptocylindrus danicus Cleve. Meso- to euhaline (11-33 ppt), lower CB - Y-14, I-IV, VII-XI, eurythermal, RAM. HR, IV-IX, HGM. Patuxent R., summer, abundant, DCM.

Leptocylindrus minimus Gran. CB, REG. Lower CB (Bridge Tunnel), 22-IV-70; Y-6, 28-VII-70 and 17-IX-70 (abundant), V.G.

Schroderella delicatula (Peragallo) Pavillard. Meso- and polyhaline (13-24 ppt), lower CB & Y-20, X & XII, 10-21C, RAM. Patuxent R., rare, DCM.

Schroderella schroderi (Bergon). Polyhaline. CB, VG.

## Family Rhizosoleniaceae

Guinardia flaccida (Castracane) Peragallo. Oligo- and polyhaline (2-24 ppt), lower CB - Y-10, IV-VI, IX-XI (dominant V, VI), 10-20C, RAM. Lower CB (Bridge Tunnel), 22-IV-70, 3rd most abundant plankter, VG.

Rhizosolenia alata Brightwell. Meso- and polyhaline (9-26 ppt), lower CB - Y-20, II, III, VII, IX, XI-XII, 2-25C, RAM. HR, common all seasons (absent, spring), HGM.

Rhizosolenia calcar avis Schultze. Oligo- and polyhaline (3-26 ppt), lower CB - Y-20, III, VI, XII, (among 3 dominant diatoms II-IV 1960), 5-26C, RAM. Patuxent R., spring, autumn, winter, DCM.

Rhizosolenia delicatula Cleve. Mesohaline (11-18 ppt), Y-0 and Y-7, III & IV, 8-12C, RAM.

Rhizosolenia faeroense Ostenfeld. GP, 1-VI-70, 17-IX-70, (most abundant plankter), VG.

Rhizosolenia fragilissima Bergon (= R. faeroense Ostenfeld). Meso- and polyhaline (14-25 ppt), CB-0, Y-0, III, VI, XII, (dominant III), 2-26C, RAM. II-IV, VI, VII (abundant) XI (abundant IV) BCP. Lower CB (Bridge Tunnel), 22-IV-70, 2nd most abundant plankter), VG.

Rhizosolenia hebeta (Bailey). Mesohaline. Patuxent R., rare, DCM.

Rhizosolenia imbricata Brightwell. Meso- and polyhaline (9-25 ppt), lower CB - Y-20. I-IV (abundant lower CB & Y-0, IX, X, XI at Y-10) 5-20C, RAM.

Rhizosolenia imbricata shrubsolei Cleve. Meso- and polyhaline (16-27 ppt), lower CB - Y-7, I-IV, 2-6C, RAM.

Rhizosolenia obtusa Hensen. CB, REG.

Rhizosolenia semispina Hensen. CB, REG.

Rhizosolenia setigera Brightwell. Oligo- and polyhaline (2-26 ppt), lower CB - P-30, I-III, V-XII, lower CB - Y-14, I-IV & X-XII), RAM. Patuxent R., rare, DCM.

Rhizosolenia shrubsolei Cleve. CB, REG.

Rhizosolenia stolterfothii Peragallo. Meso- and polyhaline (17-28 ppt), lower CB - Y-10, I, II, VII-XI, eurythermal, RAM. CB, REG. HR & WB, a dominant, 24-IX-64, HGM.

Rhizosolenia stricta Karsten. CB, REG.

Rhizosolenia styliiformis Brightwell. Lower CB - Y-7, I-III, V, IX, RAM. Patuxent R., rare, DCM.

## Suborder Araphidineae

## Family Fragilariaceae

Asterionella formosa Hassall. Fresh water (0-3 ppt), P-30, P-40, II, VI, 3-26C, RAM. Y-7, VIII, BCP.

Asterionella japonica Cleve and Muller & Gran. Meso- and polyhaline (10-25 ppt), lower CB - P-30, I-V, VII, X-XII (abundant II-III), RAM. Elizabeth R., abundant, XI-II, HGM. GP, abundant, 28-VII-70, VG. Patuxent R., winter, abundant, DCM.

Diatoma hiemale (Lyngbye) Heiberg. Oligo- to polyhaline (4-21 ppt), lower CB - Y-14, I-III, 1960-61, 2-15C, RAM.

Campylosira cymbelliformis (Schmidt) Grunow and Van Heurck. Meso- and polyhaline (11-21 ppt), lower CB - Y-0, II, V, X, and XI, 2-22C, RAM.

Fragilaria crotonensis (Edward) Kitton. CB, REG.

Fragilaria pinnata Ehrenberg. Mesohaline (18 ppt), Y-0, III, RAM.

Opephora marina (Greg) Petit. CB, REG.

Plagiogramma sp. CB, REG.

Plagiogramma vanheurckii Grunow. Oligo- and polyhaline (4-21 ppt), YR, (Y-0 - Y-14), II, III, IV, & VI, 2-28C, RAM.

Rhaphoneis amphiceros Ehrenberg. Meso- and polyhaline (16-30 ppt), I-V & VIII-XII, X, 2-17C, RAM.

Rhaphoneis belgica Grunow. Oligo- and polyhaline (16-28 ppt), lower CB, II, VI, VIII, X, XI, XII, 4-27C, RAM.

Rhaphoneis sp. Patuxent R., rare, DCM.

#### Family Tabellariaceae

Grammatophora marina (Lyngbye) Kutzing. Meso- and polyhaline (8-25 ppt), CB - Y-7, I-III, VIII, X, 2-27C, RAM. Patuxent R., rare, DCM.

Grammatophora oceanica var. macilenta (W. Smith) Grunow. CB, REG.

Grammatophora serpentina Ehrenberg. Mesohaline. Patuxent R., rare, DCM.

Grammatophora subtilissima (Bailey) De Toni. CB, REG.

Licmophora abbreviata Agardh. Oligo- and polyhaline (4-22 ppt), Y-0 - Y-14, II-VIII, 2-29C, RAM.

Licmophora ehrenbergii (Kutzing) Grunow. CB, REG.

Licmophora flabellata (Carmichael) Agardh. Mesohaline. Patuxent R., rare, DCM.

Licmophora gracilis (Grunow). Mesohaline. Patuxent R., rare, DCM.

Licmophora lyngbyei (Kutzing) Grunow and Van Heurck. Oligo- and polyhaline (4-22 ppt), Y-0 - Y-14, I, II, IV-V, X-XII, 2-23C, RAM.

Licmophora paradoxa (Lyngbye) Agardh. CB, REG.

Licmophora tineta Grunow. Mesohaline. Patuxent R., rare, DCM.

Meridion circulare (Greville) Agardh. CB, REG.

Rhabdonema adriaticum Kutzing. Mesohaline. Patuxent R., rare, DCM.

Striatella interrupta (Ehrenberg) Heiberg. Meso- and polyhaline (12-21 ppt), Y-0, Y-14, II, IV, VII, VIII, 6-29C, RAM.

Striatella unipunctata (Lyngbye) Agardh. Meso- and polyhaline (15-22 ppt), lower CB - Y-7, III, XI, XII, 2-13C, RAM.

Synedra crystallina (Agardh) Kutzing. CB, REG.

Synedra undulata Bailey. CB, REG.

Tabellaria fenestriata (Lyngbye). Fresh water (0 ppt), P-40, VI, 26C, RAM.

Thalassionema nitzschioides Grunow. Oligo- and polyhaline (3-26 ppt), CB-0 - P-30, (abundant VI-VIII), 2-23C, RAM. GP, all year, abundant 17-IX-70, VG.

Thalassiothrix frauenfeldii (Grunow) Cleve & Grunow. Meso- and polyhaline (8-35 ppt), CB - Y-7, I-III, IX, X, XII, 2-27C, RAM.

Thalassiothrix longissima Cleve and Grunow. CB, REG.

Thalassiothrix mediterranea Pavillard. Polyhaline (20-28 ppt), lower CB, VII, 26-27C, BCP.

#### Suborder Monoraphidineae

##### Family Achnantheaceae

Achnanthes brevipes Agardh. Mesohaline (16 ppt), YR, (Y-7), III, 9C, RAM.

Achnanthes clevei Grunow. Oligo- and mesohaline (0-18 ppt), Y-0 - P-40, I, III-VI, X-XII, 2-26C, RAM.

Achnanthes curvirostrum Brum. Polyhaline (18 ppt), (Y-7), II, 4C, RAM.

Achnanthes danica? (Flogel) Grunow. Oligohaline (2 ppt), P-30, II, 24C, RAM.

Achnanthes hauckiana Grunow. Mesohaline (15-15 ppt), YR, (Y-0 - Y-14), III, IV, VI, 8-23C, RAM.

Achnanthes longipes Agardh. Mesohaline. Patuxent R., rare, DCM.

- Achnanthes sp. Oligohaline (0-3 ppt), P-30, P-40, I, X-XII, 2-23C, RAM.
- Cocconeis costata Gregory. Mesohaline (16 ppt), Y-0, IV, 10C, RAM.
- Cocconeis disculoides Hustedt. Meso- and polyhaline (12-25 ppt), CB-0 & Y-20, IV, VI, 10-19C, RAM.
- Cocconeis scutellum Ehrenberg. Euryhaline (0-32 ppt), Y-0 - P-30, I-VIII, X-XII, eurythermal, RAM. GP, 1-VI-70, abundant, VG.
- Cocconeis thomasiana Brun. Mesohaline (7 ppt), Y-14, III, 12C, RAM.
- Suborder Biraphidineae
- Family Naviculaceae
- Amphiplura ruitans (Trentepohl) Cleve. CB, REG.
- Amphiprora alata (Ehrenberg) Kutzing. Oligo- and polyhaline (1-23 ppt), Y-0 - P-40, V, VII, X-XII, 11-28C, RAM.
- Amphiprora decussata Grunow. Mesohaline. Patuxent R., rare, DCM.
- Amphiprora gigantea (O'Meara) Cleve. Oligo- to polyhaline (3-21 ppt), Y-0 - P-30, II, VI, X, 3-23C, RAM.
- Amphiprora nereis Lewis. CB, REG.
- Amphiprora ornata Bailey. Mesohaline. Patuxent R., rare, DCM.
- Amphiprora paludosa W. Smith. Upper meso- and polyhaline (13-20 ppt), YR, Y-0 - Y-14, III, IV, VI, VIII & XI, 8-27C, RAM.
- Amphiprora similis Hustedt. Mesohaline (11-15 ppt), Y-10 & Y-20, II, 3C, RAM.
- Amphiprora sp. Lower CB (Bridge Tunnel, IV, rare), Y-6, VI, IX, common, VG.
- Amphiprora sulcata O'Meara. Polyhaline (19 ppt), Y-0, VIII, 26C, RAM.
- Diploneis bombus minor Cleve. Oligo- to polyhaline (4-21 ppt), lower CB - Y-7, II, III, VIII, eurythermal.
- Diploneis crabo Ehrenberg. CB, REG.
- Diploneis puella (Schumann) Cleve. Oligo- to polyhaline (0-24 ppt), CB - P-40, II, IV-VI, IX, XI, eurythermal, RAM.
- Diploneis sejuncta (A. Schmidt) Jorgensen. Polyhaline (19-21 ppt), lower CB, 19-IV-60, 11-12C, BCP.
- Diploneis suborbicularis intermedia Cleve-Euler. Meso- and polyhaline (19-22 ppt), Y-0 & Y-14, VIII & XII, 8-27C, RAM.
- Donkinia carinata (Donkin) Ralfs. Polyhaline. CB, VG.
- Donkinia recta Grunow. CB, JJW.
- Frustulia vulgaris (Thwaites) De Toni. Mesohaline (17 ppt), Y-9, VI, 20C, RAM.
- Gyrosigma balticum (Ehrenberg) Cleve. CB, REG.
- Gyrosigma diaphanum Cleve. Mesohaline (15-17 ppt), Y-0, Y-7, IV-VI, 10-24C, RAM.
- Gyrosigma fasciola (Ehrenberg) Cleve. Oligo- and polyhaline (0-22 ppt), Y-0 - P-40, II-XII, 2-29C, RAM.
- Gyrosigma rectum (Donkin) Cleve. CB, REG.
- Gyrosigma simile Grunow. Meso- and polyhaline (13-22 ppt), lower CB - Y-14, V-VIII, IX, XII, 8-29C, RAM.
- Gyrosigma spenceri (Quekett) Cleve. Oligo- and polyhaline, (4-20 ppt), lower CB - Y-14, II, III, IV-V & VIII, eurythermal, RAM.
- Gyrosigma wansbeckii (Donkin) Cleve. Mesohaline (18 ppt), Y-0, III, 9C, RAM.
- Mastogloia brauni Grunow. Polyhaline. Lower CB, 23-IV-60, BCP.
- Mastogloia lanceolata Thwaites. Polyhaline (19 ppt), Y-0, VII, 26C, RAM.
- Navicula arenaria Donkin. CB, REG.
- Navicula brevis Gregory. CB, REG.
- Navicula bombus (Ehrenberg) Kutzing. Mesohaline. Patuxent R., rare, DCM.
- Navicula borealis (Ehrenberg) Kutzing. CB, REG.
- Navicula cancellata Donkin. CB, REG.
- Navicula directa Ehrenberg. CB, REG.
- Navicula gracilis Ehrenberg. CB, REG.
- Navicula gracilis schizonemoides V. Heurck. CB, REG.
- Navicula humerosa Brebisson. CB, REG.
- Navicula inflexa Gregory. Polyhaline (15-22 ppt), lower CB, III, 3C, RAM.
- Navicula irrorata Greville. Meso- and polyhaline (16-20 ppt), lower CB - Y-7, II & V, 2-21C, RAM.

- Navicula lyra dilatata A. Schmidt. Meso- and polyhaline (17-30 ppt), lower CB, V, VIII, X, 14-27C, RAM.
- Navicula maculata (Bailey) Cleve. Polyhaline. Lower CB, 23-IV-60, BCP.
- Navicula punctata W. Smith. Upper meso- and polyhaline (17-21 ppt), lower CB, 21-IV-60, 3C, BCP.
- Navicula salinarum Grunow. CB, REG.
- Navicula smithii Brebisson. Mesohaline. Patuxent R., rare, DCM.
- Navicula spp. Bory. Patuxent R., rare, DCM.
- Navicula spicula (Hicks) Cleve. Polyhaline. Lower CB, 26-I-60, BCP.
- Navicula sp. I. GP. 12-XII-69, abundant, VG.
- Navicula tumida Brebisson. Oligohaline (1 ppt), P-30, P-40, IX, XI, 11-25C, RAM.
- Navicula yarrensii Grunow. CB, REG.
- Pinnularia cruciformis (Donkin) Cleve. CB, REG.
- Pinnularia nobilis Ehrenberg. CB, REG.
- Pinnularia sp. Oligo- and mesohaline (0-9 ppt), P-30, P-40, VII-IX, 25-28C, RAM.
- Pinnularia viridis (Nitzsch) Ehrenberg. CB, REG.
- Pleurosigma aestuarii (Brebisson) W. Smith. CB, REG.
- Pleurosigma affine Grunow. CB, REG.
- Pleurosigma angulatum W. Smith. CB, REG.
- Pleurosigma attenuatum W. Smith. Mesohaline. Patuxent R., rare, DCM.
- Pleurosigma balticum (Ehrenberg) Rabenhorst. Oligo- and polyhaline (2-30 ppt), Y-7, P-30, I-VI, VIII-XII, eurythermal, RAM.
- Pleurosigma elongatum W. Smith. Mesohaline. Patuxent R., rare, DCM.
- Pleurosigma fasciola (W. Smith). Mesohaline. Patuxent R., rare, DCM.
- Pleurosigma formosum (W. Smith). Oligo- and polyhaline (0-26 ppt), lower CB, P-40, I-XII, eurythermal, RAM.
- Pleurosigma nubecula W. Smith. Mesohaline (13 ppt), Y-14, III, 9C, RAM.
- Pleurosigma sp. Mesohaline. Patuxent R., rare, DCM.
- Pleurosigma spenceri (W. Smith). Mesohaline. Patuxent R., rare, DCM.
- Tropidoneis lepidoptera (Gregory) Cleve. Mesohaline (9 ppt), Y-14 - Y-20, III, 9C, RAM. Lower CB, VIII, BCP.
- Family Phaeodactylaceae
- Phaeodactylum tricorutum Boklin. Fresh water (0 ppt), P-40, X, 23C, RAM. This record is probably erroneous since this species is a tidepool organism.
- Family Cymbellaceae
- Amphora acutiuscula Kutzing. Mesohaline (4-18 ppt), Y-0 - Y-7, II & III, 2-12C, RAM.
- Amphora angusta var. ventricosa (Gregory). CB, REG.
- Amphora bigibba Grunow. CB, REG.
- Amphora clevia Grunow. CB, REG. Patuxent R., rare, DCM.
- Amphora coffaeiformis (Agardh) Kutzing. CB, REG.
- Amphora granulata Gregory. CB, REG.
- Amphora lineolata Ehrenberg. Upper mesohaline (16 ppt), Y-14, II, 4C, RAM.
- Amphora obtusa Gregory. CB, REG.
- Amphora ocellata Donkin. CB, REG. Patuxent R., rare, DCM.
- Amphora ostrearia Brebisson. CB, VG.
- Amphora ovalis Kutzing. Meso- and polyhaline (10-21 ppt), lower CB - Y-14, II, III, XI & XII, 4-10C, RAM.
- Amphora proteus Gregory. CB, REG. Patuxent R., rare, DCM.
- Amphora robusta Gregory. Mesohaline (16 ppt), YR, Y-7, VI, 21C, RAM.
- Amphora sublaevis Hustedt. Polyhaline (22 ppt), Y-0, XII, 8C, RAM.
- Family Gomphonemaceae
- Gomphonema sp. CB, REG.
- Family Epithemiaceae
- Epithemia sp. CB, REG.
- Rhopalodia gibberula (Ehrenberg) O. Muller. Meso- and polyhaline (8-21 ppt), Y-0 - Y-7, II-III, 2-12C, RAM.
- Family Bacillariaceae
- Bacillaria paxillifer (Muller) (= B. paradoxa (Gmel.). Patuxent R., rare, DCM. CB, JJW.



- Denticula subtiles Grunow. CB, REG.
- Family Eunotiaceae
- Eunotia sp. CB, REG.
- Family Achnanthaceae
- Hantzschia amphioxys (Ehrenberg) Grunow. Oligo- and mesohaline (0-13 ppt), P-30, P-40, I, II, X, XII, 3-23C, RAM.
- Hantzschia marina (Donkin) Grunow. CB, REG.
- Nitzschia acicularia (Kutzing) W. Smith. Oligo- and mesohaline (2-15 ppt), Y-7, P-30, I, III, 4-9C, RAM.
- Nitzschia acuminata (W. Smith) Grunow. CB, REG.
- Nitzschia adducta Hustedt. Polyhaline (20 ppt), Y-7, II, 4C, RAM.  
Lower CB, 23-IV-69, BCP.
- Nitzschia apiculata (Gregory) Grunow. CB, REG.
- Nitzschia circumsuta (Bailey) Grunow. Oligo- and polyhaline (0-22 ppt), Y-0 - P-40, I-III, X-XII, 2-15C, RAM.
- Nitzschia closterium (Ehrenberg) W. Smith. Oligo- and euhaline (0-32 ppt), CB - P-40, I-VI, VIII-XII, eurythermal, RAM. GP, 29-VII-69, 17-IX-70, abundant, VG. Patuxent R., rare, DCM.
- Nitzschia constricta (Gregory) Grunow. CB, REG.
- Nitzschia linearis (Agardh) W. Smith. Oligohaline (3 ppt), P-30, II, 3C, RAM.
- Nitzschia litoralis Grunow. CB, REG.
- Nitzschia litoralis delawarensis Grunow. Oligo- and polyhaline (4-21 ppt), Y-0 - P-30, II, VIII, 2-10C, RAM.
- Nitzschia longissima (Brebisson) Ralfs. Oligo- and polyhaline (0-25 ppt), lower CB, P-30 - P-40, II, V, VII, IX, XI, (abundant II), 2-29C, RAM. Patuxent R., rare, DCM.
- Nitzschia macilenta Gregory. CB, REG.
- Nitzschia panduriformis Gregory. Mesohaline (12-13 ppt), Y-7 - P-30, VI, VII, X, 9-29C, RAM.
- Nitzschia paradoxa Gmelin. Oligo- and polyhaline (0-30 ppt), CB - I-30, I-XII, 2-29C, RAM.
- Nitzschia paxillifera (F. Muller) Heibaud. Oligo- and euhaline (0-4 ppt), P-30, P-40, VII-VIII, 27-28C, RAM.
- Nitzschia plana W. Smith. CB, REG.
- Nitzschia punctata (W. Smith) Grunow. Polyhaline (22 ppt), Y-0, XII, 8C, RAM.
- Nitzschia pungens atlantica Cleve. Oligo- and polyhaline (0-26 ppt), lower CB - P-40, I-VII, IX-XII, (abundant II, VI), eurythermal, RAM. HR, all year except X, (abundant XII, VI), HGM. CB (Bridge Tunnel), 25-IX-69, abundant. Elizabeth R., abundant I-III-64, 4-V-65.
- Nitzschia reversa W. Smith. Fresh Water (0 ppt), P-40, II, 3C, RAM.
- Nitzschia schweinfurthii Grunow. Mesohaline. Patuxent R., rare, DCM.
- Nitzschia seriata (Cleve) Peragallo. Meso- and polyhaline (13-22 ppt), lower CB - P-30, IX, X, XII, 5-21C, RAM. Patuxent R., abundant all year except autumn, DCM. HR, abundant XI-VI, HGM.
- Nitzschia sigma (Kutzing) W. Smith. Meso- and polyhaline (9-24 ppt), lower CB - Y-20, I-IV, 2-25C, RAM.
- Nitzschia sigma curvula (Ehrenberg) Grunow. Mesohaline. Patuxent R., rare, DCM.
- Nitzschia sigmatella Gregory. CB, REG.
- Nitzschia sigmoidea (Ehrenberg). Oligo- and polyhaline (4-22 ppt), Y-0 - Y-14, XI-IV, 2-27C, RAM.
- Nitzschia sp. Mesohaline. Patuxent R., abundant all year except autumn, DCM.
- Nitzschia spectabilis var. americana Grunow. Oligohaline (3 ppt), P-30, II, 3C, RAM.
- Nitzschia tryblionella Hantzsch. CB, REG.
- Nitzschia valida Cleve and Grunow. CB, REG.
- Nitzschia vermicularis Hantzsch. Mesohaline. Patuxent R., rare, DCM.
- Suborder Surirella
- Family Surirellaceae
- Campylodiscus echeneis Ehrenberg. Oligo- and mesohaline (0-21 ppt), lower CB - P-40, I-III, V, VII, IX, XII, eurythermal, RAM.
- Surirella anceps Lewis. Mesohaline. Patuxent R., rare, DCM.
- Surirella elegans Ehrenberg. Oligohaline (0-4 ppt), P-30, P-40, II, III, V-VII (abundant VI), eurythermal, RAM.

- Surirella fatuosa Ehrenberg. Mesohaline. Patuxent R., rare, DCM.  
Surirella fluminensis Grunow. Mesohaline. Patuxent R., rare, DCM.  
Surirella gemma (Ehrenberg) Kutzinger. Oligo- to polyhaline (4-30 ppt), lower CB - Y-20, I, II, IV-VIII, XI, XII, 2-27C, RAM. Patuxent R., rare, DCM.  
Surirella gracilis Grunow. Freshwater (0-2 ppt), P-30, P-40, I, 2-4C, RAM.  
Surirella guatemalensis Ehrenberg. Oligo- to polyhaline (0-18 ppt), Y-10 - P-40, II, IX, XI, XII, 3-25C, RAM.  
Surirella inducta A. Schmidt. Oligo- and mesohaline (3-11 ppt), Y-20, P-30, II, 3C, RAM.  
Surirella intermedia Lewis. CB, REG.  
Surirella litoralis Hustedt. Mesohaline (8-16 ppt), Y-0, Y-7, II, III, 2-6C, RAM.  
Surirella ovalis Brebisson. Oligohaline (0-3 ppt), P-30, P-40, II, VI, VII, XI, eurythermal, RAM.  
Surirella robusta Ehrenberg. Oligohaline (3 ppt), P-30, II, 30C, RAM.  
Surirella robusta marginata (Ehrenberg) Cleve. Oligo- and mesohaline (4-16 ppt), Y-7 - Y-14, II, III, IV, 3-10C, RAM.  
Surirella sp. Turpin. Patuxent R., rare, DCM.

## DIVISION EUGLENOPHYTA

Class Euglenophyceae G. M. Smith

Order Euglenales Engler

Family Euglenaceae Stein orth. mut. Klebs

Eutreptia sp.

Fide:

VIRGINIA: Patten, Mulford and Warinner (1963), lower CB.

Phacus sp.

Fide:

Virginia: Patten, Mulford and Warinner (1963), lower CB.

Eutreptia marina da Cunha

Fide:

MARYLAND: Morse (1947), mouth of Patuxent River.

## DIVISION PYRROPHYTA

Data for this phylum were taken mainly from the thesis done by Mackiernan and these are prefaced by GP ( Gloucester Point). The great diversity, as well as the lack of our knowledge, of this group is exemplified by the 118 taxa found by Mackiernan, only 84 of which could be placed to species. The remaining 34 were assigned to the following genera: Gymnodinium (10), Gyrodinium (8), Cochlodinium (2), Glenodinium (3), Peridinium (8), and Gonyaulax (3). Further information is from the works of Patten, Mulford, and Warriner (BCP), Mulford (RAM), Morse (DCM), Gibson (VG), Griffith (REG), Marshall (HGM), and Wolfe, Cunningham, Wilkerson and Barnes (JJW). Taxa identified only to genus were not included unless significant ecological data were given.

## Class Dinophyceae

## Subclass Desmophycidae

## Order Prorocentrales

## Family Prorocentraceae

Exuviella apora Schiller. Mesohaline. Patuxent R., rare, DCM.

Exuviella baltica Lohmann. CB, REG.

Exuviella compressa (Bailey and Ostenfeld). Polyhaline. GP, rare. CB, REG.

Exuviella lima (Ehrenberg) Butschli. Polyhaline. GP, common, VI-67, 20-26C.

Exuviella marina Cienkowski. Polyhaline. Lower CB, 23-II - 19-IV, scarce, BCP.

Exuviella perforata Gran. CB, REG.

Oxyrrhis marina Dumardin. Polyhaline (18 ppt), Y-0, 14-XI-60, 12C, RAM. GP, rare.

Pronoctiluca pelagica Fabre-Domergue. Meso- and polyhaline (15-19 ppt). Y-0, Y-7, 7-III, 2-4C, RAM, BCP.

Prorocentrum micans Ehrenberg. Meso- and polyhaline (14-24 ppt), lower CB, Y-0, Y-7, I-XII, abundant 5-VII, 7-27C, RAM, BCP. GP, dominant in most samples, especially in cooler months, eurythermal. Patuxent R., autumn, frequent, DCM.

Prorocentrum minimum (Pavillard). Polyhaline. GP, often a dominant, eurythermal.

Prorocentrum redfieldi Bursa. YR, (mouth), 27-IX-63, dominant (Sarah Creek red-water bloom), 7-IX-66. Lower CB (Bridge Tunnel), 25-IX-69, VG.

Prorocentrum triangulatum Martin. Meso- and polyhaline (15-30 ppt), lower CB, Y-0, Y-7, I-IX (abundant IX), RAM, BCP.

## Subclass Dinophycidae

## Order Gymnodiniales

## Family Gymnodiniaceae

Amphidinium carteri Polyhaline. GP, rare.

Amphidinium flexum C. Herdman. Meso- and polyhaline. GP, rare. Patuxent R., autumn, DCM.

Amphidinium fusiforme Martin. Polyhaline (19-30 ppt), lower CB - Y-7, 3-VI (abundant) - 14-XI, XII, 16-26C, RAM, BCP.

Amphidinium operculatum Claparede and Lachmann. Polyhaline. GP, rare. CB, REG.

Amphidinium ovum C. Herdman. Polyhaline. GP, rare.

Amphidinium pellucidum C. Herdman. Polyhaline. GP, rare.

Amphidinium scissoides Lebour. CB, REG.

Amphidinium sphenoides Wulff. Polyhaline (22-24 ppt), lower CB, 19-IV (rare), I-61, RAM, BCP.

Cochlodinium achromaticum Lebour. Polyhaline. GP, rare.

Cochlodinium heterolobatum Sousa e Silva. Polyhaline. GP, VIII-67, most abundant phytoplankton, 25-27C.

Cochlodinium schuetti Kofoid and Swezy. Mesohaline. Patuxent R., rare, DCM.

Cochlodinium vinctum Kofoid and Swezy. Mesohaline (14-16 ppt), lower CB 0 Y-7, 3-VI, rare, 23-25C, RAM, BCP.

Gymnodinium lunula Schutt. Mesohaline. Patuxent R., rare, DCM.

Gymnodinium punctatum Pouchet. CB, REG.

- Gymnodinium nelsoni Martin. Meso- and polyhaline (16-30 ppt), lower CB - Y-7, 19-IV - 26-VIII, common, 14-26C, RAM, BCP. Patuxent R., summer, DCM.
- Gymnodinium pygmaeum Lebour. Polyhaline. GP, rare.
- Gymnodinium simplex (Lohmann). Meso- and polyhaline (14-25 ppt), lower CB - Y-0, 19-IV - 14-XI, rare, 11-25C, RAM, BCP. GP, all year, frequent, 8-23C. Patuxent R., rare, DCM.
- Gymnodinium splendens Lebour. Polyhaline. GP, 27-VI-67, major redwater component; JR, VII-66 and 67, chief bloom component, 18-27C, GM.
- Gymnodinium subrufescens Martin. CB, REG.
- Gymnodinium variabile C. Herdman. Polyhaline. GP, rare.
- Gyrodinium aureolum Polyhaline. GP, rare.
- Gyrodinium aureum (?) (Conrad) Schiller. Meso- and polyhaline (16-30 ppt), lower CB, 5-VII - 1-VIII (abundant), 24-27C, RAM, BCP.
- Gyrodinium calyptoglyphe Lebour. Meso- and polyhaline (15-25 ppt), lower CB - Y-7, 21-III and 14-XI, rare, 2-13C, RAM, BCP.
- Gyrodinium capsulatum Kofoid and Swezy. Polyhaline. GP, rare.
- Gyrodinium dominans (?) Hulburt. Meso- and polyhaline (15-24 ppt), lower CB - Y-7, 19-IV and 23-V, rare, 7-21C, RAM, BCP.
- Gyrodinium lebourae C. Herdman. Polyhaline. GP, rare.
- Gyrodinium pellucidum (Wulff). Polyhaline. GP, rare.
- Gyrodinium pingue (Schutt) Kofoid and Swezy. Polyhaline. GP, a dominant in redwater, 20-25C.
- Gyrodinium spirale Bergh. Meso- and polyhaline (16-24 ppt), lower CB, 26-I - 23-V, common, 21C, RAM, BCP.
- Gyrodinium stratissimum Polyhaline. GP, rare.
- Katodinium glaucum (Lebour). Polyhaline. GP, frequent in autumn, 4-18C.
- Katodinium rotundatum (Lohman). Polyhaline. GP, 3 - 5-VI-68, cause of extensive red water, 5-27C, BCP.
- Massartia (?) asymmetrica (Mass.) Schiller. Mesohaline (19 ppt), Y-7, 23-V, rare, 21C, RAM, BCP.
- Massartia rotundata (Lohmann). Meso- and polyhaline (17-24 ppt), lower CB - Y-7, (abundant VI, VII, and 28-XI), 2-26C, RAM, BCP.
- Family Polykrikaceae
- Polykrikos kofoidi Chatton. Meso- and polyhaline. Patuxent R., autumn, DCM. GP, rare.
- Family Noctilucaceae
- Noctiluca miliaris Suriray. CB, JJW.
- Noctiluca scintillans Macartney. Polyhaline. GP, prominent, fall of 66.
- Family Warnowiaceae
- Nematodinium armatum (Dogiel) Kofoid and Swezy. Polyhaline. GP, present V - IX-67, 16-27C.
- Warnowia panamensis Polyhaline. GP, rare.
- Warnowia parva (Lohman). Polyhaline. GP, frequent, 6-26C.
- Order Dinophysiales
- Family Dinophysiaceae
- Dinophysis acuminata Claparede and Lachmann. Polyhaline (18-25 ppt), lower CB - Y-7, V-67, (dominant), unrecorded again until XI-67, 13C, RAM. Patuxent R., rare, DCM.
- Dinophysis acuta Ehrenberg. Polyhaline. GP, rare.
- Dinophysis caudata Saville-Kent. Mesohaline. Patuxent R., rare, DCM.
- Dinophysis homunculus Stein. CB, JJW.
- Dinophysis lenticula Pavillard. Mesohaline. Patuxent R., rare, DCM.
- Dinophysis ovum Schutt. Mesohaline. Patuxent R., rare, DCM.
- Phalachroma kofoidi C. Herdman. Polyhaline. GP, rare.
- Phalachroma rotundatum (Claparede and Lachmann). CB, JJW, REG.
- Order Peridinales
- Family Pyrophacaceae
- Pyrophacus horologicum Stein. CB, JJW.
- Pyrophacus noctiluca. CB, JJW.
- Family Glenodiniaceae
- Glenodinium danicum Paulsen. Polyhaline. GP, rare.

Glenodinium foliaceum Stein. Polyhaline. GP, cause of intense local bloom, mid VIII-67, 20-26C.

Glenodinium gymnodinium Penard. Polyhaline. GP, rare.

Glenodinium spp. Polyhaline. GP, a dominant VI - VIII; most numerous form in red water, 27-VI-67, 17-26C.

Family Peridiniaceae

Diplopeltopsis minor Lebour. Upper meso- and polyhaline. GP, prominent plankter, I to mid IV-67, 1-27C. CB, REG.

Diplopsalis asymmetrica (Mangin). CB, rare, REG.

Diplopsalis lenticula Bergh. Mesohaline. Patuxent R., rare, DCM.

Diplopsalis rotundata (Lebour). Polyhaline. GP, often numerous in red water, feeds on other dinoflagellates.

Diplopsalis orbicularis Paulsen. Polyhaline. GP, frequent, autumn 66, 2-19C.

Peridinium achromaticum Levander. Polyhaline. GP, present mid IV - 11-V-67 (abundant 3rd week-IV), 12-16C.

Peridinium brevipes Paulsen. Meso- and polyhaline. Lower CB, 19-XII, rare, BCP. Patuxent R., rare, DCM.

Peridinium bulla Meunier. Mesohaline. Patuxent R., rare, DCM.

Peridinium cerasus Paulsen. CB, REG.

Peridinium claudicans Paulsen. Polyhaline. GP, sporadic 12-X to 8-XII-66 (a dominant 3-XI-66), 8-25C. CB, REG. GP, 28-VIII-70, VG.

Peridinium conicoides Paulsen. CB, REG.

Peridinium conicum (Gran) Ostenfeld and Schmidt. Polyhaline. GP, 4-X - XII-66 (Important mid X) late VI to 3-X-67, 8-24C.

Peridinium curtipes Jorgensen. Polyhaline. GP, 14-IX-66 to late XI-66, local dominant 4-X-66, unrecorded in 67, 7-26C.

Peridinium deficiens Meunier. Polyhaline. GP, common, VIII-IX-67, 5-25C.

Peridinium depressum Bailey. Upper CB, 26-I - 4-IV, common, BCP. Polyhaline. GP, 14-IX-66 - late XI-66; IV to mid V-67 (abundant 8-IV-67, 5-26C).

Peridinium divericatum Meunier. Meso- and polyhaline (17-28 ppt), lower CB, 7-III and 26-VIII, rare, 2-27C, RAM, BCP.

Peridinium excentricum Paulsen. Polyhaline. GP, 8-XI-66 - 8-XII-66; abundant late XI-66, not seen in 67, 7-14C.

Peridinium faeroense Paulsen. Mesohaline. Patuxent R., rare, DCM.

Peridinium islandicum Paulsen. Mesohaline. CB, REG.

Peridinium leonis Pavillard. Mesohaline. Patuxent R., summer, DCM.

Peridinium leonis f. matzenauri Polyhaline. GP, rare.

Peridinium mariebourae (Karsten). Polyhaline. GP, abundant autumn 66, early 67, eurythermal.

Peridinium monospinum Paulsen. Polyhaline. GP, rare.

Peridinium oblongum (Aurivillius) (var. "A"). Polyhaline. GP, scarce early X to early XII, 12-20C. CB, REG.

Peridinium oblongum (Aurivillius) (var. "B"). Polyhaline. GP, present early I to early IV, abundant late I, early II-67, 3-13C.

Peridinium obtusum Karsten. Mesohaline. Patuxent R., rare, DCM.

Peridinium oceanicum Vanhoffen. Polyhaline. Lower CB, 23-V, rare, BCP.

Peridinium pallidum Ostenfeld. Polyhaline. GP, rare.

Peridinium pellucidum (Bergh) Schutt. Polyhaline. GP, frequent 12-X to early XII-66; 5-IX - early X-67, abundant 19-IX), 8-14C.

Peridinium pentagonum Gran. Meso- and polyhaline, GP, autumn 66, 67, abundant late X, 7-20C. Patuxent R., rare, DCM.

Peridinium pentagonum v. latissimum (Kofoid). Polyhaline. GP, dominant, autumn 66, 7-26C.

Peridinium perbreve Balech and Soares. Polyhaline. GP, occasional early autumn, 17-22C.

Peridinium punctulatum Paulsen. Polyhaline. GP, rare.

Peridinium pyriforme Paulsen. Mesohaline (15 ppt), Y-0, 7-III, rare, 9C, RAM.

Peridinium quinquecorne Abe. Polyhaline. GP, in red water X-66, scarce late summer 67, 20C.

Peridinium steinii Jorgensen. Polyhaline. GP, rare.

- Peridinium subinerme Paulsen. Polyhaline. GP, mid IX - end of V (peak IV - early V), 1-23C. CB, REG.
- Peridinium triquetra (Stein). Meso- and polyhaline (16-22 ppt), lower CB & Y-7, V, VI, 16-25C, RAM. Mesohaline. Patuxent R., 19% of plankton 18-XI-43, scarce 44, 38% 21-VI-45, 94% 13-VIII-45, DCM.
- Peridinium triquetrum (Stein). Polyhaline. Lower CB, 28-XI - 17-VI abundant 21-III - 19-IV), BCP. GP, cool months, a dominant mid XII to mid III; JR, major water bloom component 65, 66, 67, GM.
- Peridinium trochoideum (Stein) Lemmermann. Meso- and polyhaline (15-22 ppt), lower CB - Y-7, 66, dominant in red water late VI - early VII; 11-VIII and 28-XI, rare, RAM, BCP. Patuxent R., rare, DCM.
- Peridinium willei Huitfeldt-Daas. Mesohaline. Patuxent R., rare, DCM.
- Family Gonyaulaceae
- Gonyaulax alaskensis. Polyhaline. GP, rare.
- Gonyaulax catenella Whedon-Kofoid. Mesohaline. Patuxent R., rare, DCM.
- Gonyaulax diacantha (Meunier). Polyhaline. GP, 7-II - early VII (peak in early V), 6-25C.
- Gonyaulax "diegensis-digitale". Polyhaline. GP, most numerous
- Gonyaulax encountered, peaked early XI, 12-27C. 28-VII-70, abundant, VG.
- Gonyaulax digitale (Pouchet) Kofoid. Mesohaline. Patuxent R., autumn, DCM.
- Gonyaulax monilata Howell. Polyhaline. GP, dominant dinoflagellate 7-IX - XI-66, 19-26C.
- Gonyaulax monocantha Pavillard. Polyhaline. GP, a dominant 27-VI and 1-VIII-67, 19-27C.
- Gonyaulax orientalis Lindemann. Meso- and polyhaline (16-25 ppt), lower CB, III, V, XI, 6-21C, RAM. GP, rare.
- Gonyaulax polyedra Stein. Meso- and polyhaline. GP, late VIII - early IX. Ames Pond, by Ware River, dominant in red water bloom, 66, 23-26C. Patuxent R., rare, DCM.
- Gonyaulax polygramma Stein. Meso- and polyhaline. Patuxent R., rare, DCM. GP, rare.
- Gonyaulax scrippsae Kofoid. Mesohaline. Patuxent R., rare, DCM.
- Gonyaulax spinifera (Claparede and Lachmann). Meso- and polyhaline. GP, scarce, eurythermal. Lower CB, 26-I - 7-III, scarce, BCP. 10-III-64, common, HGM. Patuxent R., rare, DCM.
- Gonyaulax triacantha Jorgensen. Polyhaline. GP, rare.
- Gonyaulax unicornis Lebour. Mesohaline. Patuxent R., rare, DCM.
- Family Protoceratiaceae
- Protoceratium reticulatum (Claparede and Lachmann). Meso- and polyhaline (12-25 ppt), CB - Y-7, XI - V, 2-21C, RAM. GP, rare.
- Family Ceratiaceae
- Ceratium arcticum (Ehrenberg) Cleve. Meso- to euhaline (16-35 ppt), lower CB, 3-27C, RAM.
- Ceratium furca (Ehrenberg) Claparede and Lachmann. Meso- to euhaline (16-35 ppt), lower CB, a dominant in fall blooms, eurythermal, RAM. GP, present all year, often important. Most abundant at mouth of Potomac, VII-16, RPC. Patuxent R., abundant summer, DCM.
- Ceratium fusus (Ehrenberg) Dujardin. Meso- to euhaline (14-35 ppt), lower CB, abundant III - V-60, eurythermal, RAM. Patuxent R., rare, DCM.
- Ceratium hircinella (O. F. Muller) Bergh. CB, REG.
- Ceratium lineatum (Ehrenberg). Meso- to euhaline (16-35 ppt), lower CB, III-VI, 3-27C, RAM. GP, (abundant 18-IV-67).
- Ceratium longipes (Bailey) (Gran). Polyhaline. GP, abundant mid IV-67, 14-17C.
- Ceratium macroceros (Ehrenberg) Cleve. Polyhaline (16-35 ppt), lower CB, 2-24C, RAM. GP, scarce, IV & V-67.
- Ceratium massiliense (Gourret) Jorgensen. Meso- to euhaline (16-33 ppt), lower CB, 16-27C, RAM.
- Ceratium trichoceros (Ehrenberg) Kofoid. Meso- to euhaline (21-33 ppt), lower CB, 16-27C, RAM.

Ceratium tripos (O. F. Muller) Nitzsch. Polyhaline (16-35 ppt), lower CB, 1 - VIII-60, 20-27C, RAM. Polyhaline. GP, dominant.

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Plant Divisions Chlorophyta  
Phaeophyta, Rhodophyta, and Cyanophyta

Franklyn D. Ott

In the compilation which follows the names of the above plant divisions have been taken from Bold (1967). Other taxa, down to and including family, have been drawn, with a single minor exception, from Papenfuss (1955). In the division Cyanophycophyta no attempt has been made to relegate to synonymy the algal names as determined by the classical, standard works with those names recently proposed by Drouet and Daily (1965) and Drouet (1968), nor does it seem desirable to do so in view of the fact that these authors have not given detailed opinions for their reduction of literally thousands of taxa to less than 20 genera. By not attempting to relegate to synonymy taxa which have been determined by two completely different points of view, several algae have been entered into this compilation under two different names. This situation is, however, compatible with the basic aim of this compilation, namely a summation of the algal taxa reported for the area. A monograph on these algae is being prepared by Dr. Harold J. Humm and this should clarify some of the taxonomy.

With few exceptions, in the present state of our knowledge there is insufficient information to cogently indicate, for the area under study, the seasonal periodicity of the algal flora. Where the periodicity is known with some degree of assurance, it is indicated in parentheses following the geographical distribution citations.

The following abbreviations are used: CB-Chesapeake Bay, ES-Eastern Shore, GP-Gloucester Point, and YR-York River. Since an attempt has been made to avoid duplication, many literature records are not included.

DIVISION CHLOROPHYTA

Class Chlorophyceae Kützing

Order Zygnematales Borge et Pascher

Family Zygnemataceae (Meneghini) Kützing orth. mut. Engler

Spirogyra sp.

Fide:

GENERAL: Griffith (1961), CB, sine locus, Leg. R. C. Whaley. (A typical fresh-water alga, no active dividing populations will be found in the higher salinities; it should be encountered only in slightly brackish areas.)

Family Desmidiaceae Kützing ex Ralfs orth. mut. Stizenberger

Closterium gracile Brébisson

Fide:

GENERAL: As for Spirogyra sp.

Staurastrum sp.

Fide:

GENERAL: As for Spirogyra sp.

Order Ulotrichales Borzi

Family Ulotrichaceae Kützing orth. mut. Rabenhorst

Ulothrix sp.

Fide:

GENERAL: Griffith (1961), CB, sine locus, Leg. R. C. Whaley.

Ulothrix sp.

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, York River (GP) and throughout the immediate general area.

Ulothrix flacca (Dillwyn) Thuret

Fide:

VIRGINIA: Wulff (1967), YR (GP). Wulff and Webb (1969), YR (GP).  
MARYLAND: Mathieson and Fuller (1969), pilings at Ches. Biol. Lab. boathouse, mouth of Patuxent River at Drum Point, abandoned Cedar Point Light House.

Ulothrix subflaccida Wille

Fide:

VIRGINIA: VIMS in Herbarium: Leg. S. Ramsey, YR (GP).

Family Chaetophoraceae Harvey orth. mut. Stizenberger

Entocladia viridis Reinke

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, on Grinnellia americana from the northern end of Willoughby Spit near Hampton Roads.Entocladia wittrockii Wille

Fide:

VIRGINIA: VIMS in Herbarium: Leg. J. Vogel et H. J. Humm, on Fucus vesiculosus from salt marshes along Hummock Channel, Wachapreague, ES.Protoderma marinum Reinke

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (Guinea Marshes).

Pseudodendroclonium marinum (Reinke) Aleem et Schulz

Fide:

MARYLAND: Mathieson and Fuller (1969), abandoned Cedar Point Light House, beach between Cedar Point and Point No Point south of Patuxent River mouth.

Family Monostromaceae Kuntze ex Suneson

Monostroma leptodermum Kjellman

Fide:

VIRGINIA: Wulff (1967), YR (GP). Wulff and Webb (1969), YR (GP). (abundant summer and autumn)

Monostroma oxyspermum (Kützting) Doty

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).

MARYLAND: Mathieson and Fuller (1969), shore of Patuxent River on rocks of retaining wall of Naval Base Property. (abundant summer and autumn)

Monostroma sp.

Fide:

VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague, ES.

Family Ulvaceae Lamouroux orth. mut. Dumortier

Enteromorpha clathrata (Roth) J. Agardh

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (near GP). Mangum, Santos and Rhodes (1968), YR (Sandy Point).

Enteromorpha compressa (Linnaeus) Greville

Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Lynch, YR (GP); Leg. B. L. Wulff, YR (Yorktown). Mangum, Santos and Rhodes (1968), YR (Sandy Point).

MARYLAND: VIMS in Herbarium: Leg. J. K. Lowry, B. H. Robison and B. L. Wulff, north jetty, Ocean City.

Enteromorpha erecta (Lyngbye) J. Agardh

Fide:

VIRGINIA: Wulff (1967), YR (GP). Mangum, Santos and Rhodes (1968), YR (Sandy Point).

Enteromorpha intestinalis (Linnaeus) Link

Fide:

VIRGINIA: Zaneveld and Barnes (1965), lower CB. Wulff (1967), YR (GP). Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Wulff et al (1968), jetty, Ocean City; Mathieson and Fuller (1969), 13 locations in Patuxent River, and CB. (perennial)

Enteromorpha lingulata J. G. Agardh

Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Wass, YR (GP).

Enteromorpha linza (Linnaeus) J. Agardh

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP). Zaneveld and Barnes (1965), lower CB. Rhodes (1970), Barton's Bay near Wachapreague, ES.

- MARYLAND: Wulff et al (1968), jetty, Ocean City. (perennial)  
Enteromorpha marginata J. Agardh  
 Fide:  
 VIRGINIA: Zaneveld (1966-67), sine locus.  
 Enteromorpha micrococca Kützling  
 Fide:  
 MARYLAND: VIMS in Herbarium: Leg. J. K. Lowry, B. L. Wulff, and B. H. Robison, north jetty, Ocean City. Wulff et al (1968) jetty, Ocean City.  
Enteromorpha minima Nägeli  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP). Zaneveld and Barnes (1965), lower CB; Zaneveld (1966-67), sine locus; Wulff and Webb (1969), YR (GP).  
 MARYLAND: Wulff et al (1968), jetty, Ocean City. Mathieson and Fuller (1969), Patuxent R., mouth at Drum Point, shore at Naval Base. (probably perennial)  
Enteromorpha plumosa Kützling  
 Fide:  
 VIRGINIA: Marsh (1970), YR (Mumfort Is.); Rhodes (1970), Burton's Bay near Wachapreague, ES.  
Enteromorpha prolifera (Müller) J. Agardh  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, Hummock Channel near Wachapreague, ES. Zaneveld (1966-67), sine locus. Wulff (1967), YR (GP).  
 MARYLAND: Wulff et al (1968), jetty at Ocean City, Mathieson and Fuller (1969), Kent Narrows and Piney Narrows Marina.  
Percursaria percursa (C. Agardh) J. Agardh  
 Fide:  
 MARYLAND: Zaneveld (1966-67), sine locus.  
Ulva lactuca Linnaeus  
 Fide:  
 VIRGINIA: Zaneveld and Barnes (1965). Lower CB, Wulff (1967), YR (GP). Rhodes (1970), Burton's Bay near Wachapreague, ES.  
 MARYLAND: Wulff et al (1968), jetty, Ocean City. (perennial) Fuller (1969), 14 locations in Patuxent R., and CB. (perennial)  
Ulva lactuca Linnaeus var. latissima (Linnaeus) de Candolle  
 VIRGINIA: VIMS in Herbarium: Leg. K. M. S. Aziz, YR (GP).  
 MARYLAND: Zaneveld (1966-67), sine locus.  
Ulva lactuca Linnaeus var. rigida (C. Agardh) Le Jolis  
 Fide:  
 VIRGINIA: Zaneveld (1966-67), sine locus.  
 Order Chlorococcales Marchand orth. mut. et emend. Pascher  
 Family Chlorellaceae (Wille) Brunthaler  
Chlorella sp.  
 Fide:  
 MARYLAND: Morse (1957), mouth of Patuxent R.  
 Family Gonomtiaceae Bornet et Flahault ex De Toni  
Gomontia polyrhiza (Lagerheim) Bornet et Flahault  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).  
 MARYLAND: VIMS in Herbarium: Leg. B. H. Robison, J. K. Lowry and B. L. Wulff, north jetty, Ocean City.  
 Family Hydrodictyacea (S. F. Gray) Dumortier orth. mut. Cohn  
Pediastrum boryanum (Turpin) Meneghini (Genus mainly freshwater).  
 Fide:  
 GENERAL: Griffith (1961), CB, sine locus, Leg. R. C. Whaley. (as with Spirogyra)  
Pediastrum duplex Meyen  
 Fide:  
 GENERAL: Griffith (1961), CB, sine locus, Leg. R. C. Whaley. (as above).  
Pediastrum simplex Meyen  
 Fide:  
 GENERAL: Griffith (1961), CB, sine locus, Leg. R. C. Whaley. (as above).

Family Scenedesmaceae Oltmanns (Members mainly freshwater).

Actinastrum sp.

Fide:

GENERAL: Griffith (1961), CB, sine locus, Leg. R. C. Whaley. (as above)

Scenedesmus acuminatus (Lagerheim) Chodat

Fide:

GENERAL: Griffith (1961), CB, sine locus, Leg. R. C. Whaley. (as above)

Scenedesmus opaliensis P. Richter

Fide:

GENERAL: Griffith (1961), CB, sine locus, Leg. R. C. Whaley. (as above)

Scenedesmus quadricauda Marshall (1967), Elizabeth R., (as above).

Order Cladophorales West

Family Cladophoraceae (Hassell) Cohn

Chaetomorpha aerea (Dillwyn) Kützing

Fide:

MARYLAND: Wulff et al (1968), jetty, Ocean City.

Chaetomorpha linum (Müller) Kützing

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (Guinea Marshes);  
Leg. B. L. Wulff, YR (off Wormley Creek), Marsh (1970),  
YR (Mumfort Is.)

Cladophora albida (Hudson) Kützing

Fide:

VIRGINIA: Zaneveld (1966-67), sine locus.

Cladophora crystallina (Roth) Kützing

Fide:

VIRGINIA: Zaneveld (1966-67), sine locus.

Cladophora expansa (Mertens) Kützing

Fide:

VIRGINIA: Zaneveld (1966-67), sine locus.

Cladophora fascicularis (Mertens) Kützing

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, Hampton Roads, Norfolk;  
Leg. M. Wass, YR (GP)

Cladophora flexuosa (Dillwyn) Harvey

Fide:

VIRGINIA: Zaneveld and Barnes (1965), lower CB.

MARYLAND: Mathieson and Fuller (1969), Patuxent R. (Broomes Is.)  
(perennial)

Cladophora flexuosa (Dillwyn) Harvey forma densa Collins

Fide:

VIRGINIA: Zaneveld (1966-67), sine locus.

MARYLAND: Mathieson and Fuller (1969), abandoned Cedar Point Light  
House.

Cladophora gracilis (Griffith ex Harvey) Kützing

Fide:

VIRGINIA: Zaneveld and Barnes (1965), lower CB. Marsh (1970), YR.

MARYLAND: Mathieson and Fuller (1969), Cove Point just north of  
Patuxent R. mouth, beach north of Cove Point, midchannel  
in Broad Creek connecting Little Annessex R. and Pocomoke  
Sound.

Cladophora magdalenae Harvey

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (Guinea Marshes).

Cladophora rupestris (Linnaeus) Kützing

Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Wass, YR (GP).

Rhizoclonium kockianum Kützing

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).

Rhizoclonium riparium (Roth) Harvey

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).

- MARYLAND: Mathieson and Fuller (1969), pilings at Ches. Biol. Lab. boathouse  
Rhizoclonium tortuosum Kützing  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, Hummock Channel at Wachapreague  
 Order Siphonales Wille in Warming orth. mut. Blackman et Tansley  
 Family Bryopsidacea Bory de Saint-Vincent orth. mut. De Toni  
Bryopsis hypnoides Lamouroux  
 Fide:  
 VIRGINIA: Zaneveld and Barnes (1965), lower CB. Zaneveld (1966-67), sine locus. Mangum, Santos and Rhodes (1968), YR (Sandy Point).  
 MARYLAND: Zaneveld (1966-67), sine locus. (reported abundant in summer but also abundant in winter)  
Bryopsis plumosa (Hudson) C. Agardh  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. W. Dillon, YR (GP). Leg. P. E. Hargraves, YR (GP). Zaneveld and Barnes (1965), lower CB, Wulff (1967), YR (GP). Zaneveld (1966-67), sine locus. Wulff and Webb (1969), YR (GP). Marsh (1970), YR. Rhodes (1970), Burton's Bay near Wachapreague, ES.  
 MARYLAND: Zaneveld (1966-67), sine locus, (perennial)

## DIVISION PHAEOPHYTA

## Class Phaeophyceae De Bary

## Order Ectocarpales Setchell et Gardner

## Family Ectocarpaceae (C. Agardh) Kützing orth. mut. Harvey

Ectocarpus confervoides (Roth) Le Jolis

## Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Wass, Sarah's Creek (below GP). Zaneveld (1966-67), sine locus. Wulff (1967), YR (GP).

MARYLAND: Zaneveld (1966-67), sine locus. (abundant during colder months)

Ectocarpus elachistaeformis Heydrich

## Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP)

Ectocarpus penicillatus (C. Agardh) Kjellman

## Fide:

VIRGINIA: Mangum, Santos and Rhodes (1968), YR (Sandy Point)

Ectocarpus siliculosus (Dillwyn) Lyngbye

## Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Wass, YR (Sandy Point). Rhodes (1970), Burton's Bay near Wachapreague, ES. (very abundant during colder months)

Giffordia duchassaingiana (Grunow) Taylor

## Fide:

MARYLAND: VIMS in Herbarium: Leg. Wulff et al (1968), jetty, Ocean City.

Pylaiella littoralis (Linnaeus) Kjellman

## Fide:

VIRGINIA: Zaneveld (1966-67), sine locus; Mangum, Santos and Rhodes (1968), YR, (Sandy Point).

MARYLAND: Zaneveld (1966-67), sine locus.

## Order Sphacelariales Oltmanns

## Family Sphacelariaceae J. Agardh orth. mut. Cohn

Sphacelaria fusca (Hudson) C. Agardh

## Fide:

MARYLAND: Mathieson and Fuller (1969), Patuxent R. 200 yards west of Broomes Island.

## Order Dictyotales Kjellman

## Family Dictyotaceae Lamouroux orth. mut. Dumortier

Dictyota dichotoma (Hudson) Lamouroux

## Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, Hummock Channel near Wachapreague. Rhodes (1970), Burton's Bay near

- Wachapreague, ES. (abundant during warmer months)
- Order Chordariales Setchell et Gardner
- Family Myrionemataceae (Nägeli) Foslie orth. mut. Skottsberg
- Ascocyclus orbicularis Magnus
- Fide:
- VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP). Mangum, Santos and Rhodes (1968), YR (Sandy Point).
- Myrionema stragulans Greville
- Fide:
- VIRGINIA: Mangum, Santos and Rhodes (1968), YR (Sandy Point).
- Family Elachistaceae Kjellman
- Elachistea facicola (Vellely) Areschoug
- Fide:
- VIRGINIA: VIMS in Herbarium: Leg. J. L. Wood, adrift and epiphytic on Fucus vesiculosus, collected ca. 60 miles offshore from the mouth of the CB.
- Elachistea sp.
- Fide:
- VIRGINIA: Marsh (1970), YR (Mumfort Is.).
- Family Corynophlaeaceae Oltmanns
- Leathesia difformis (Linnaeus) Areschoug
- Fide:
- VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague, ES. (abundant late spring and early summer on Atlantic Coast)
- Family Spermatochnaceae Kjellman
- Stilophora rhizodes (Ehrhart) J. Agardh
- Fide:
- VIRGINIA: VIMS in Herbarium: Leg. B. H. Wulff, YR (GP).
- Order Dictyosiphonales Setchell et Gardner
- Family Striariaceae Kjellman
- Striaria attenuata (C. Agardh) Greville
- Fide:
- VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague. (abundant during spring)
- Family Myriotrichiaceae Kjellman
- Myriotrichia subcorymbosa (Farlow emend. Holden) Blomquist
- Fide:
- VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).
- Family Punctariaceae (Thuret) Kjellman
- Desmotrichum undulatum (J. Agardh) Reinke
- Fide:
- VIRGINIA: Mangum, Santos and Rhodes (1968), YR (Sandy Point). Rhodes (1970), Burton's Bay near Wachapreague. (abundant during the colder months)
- Petalonia fascia (O. F. Müller) Kuntze
- Fide:
- VIRGINIA: Zaneveld and Barnes (1965), lower CB. Zaneveld (1966-67), sine locus.
- MARYLAND: Wulff et al (1968), jetty, Ocean City. (abundant during colder months on Atlantic Coast)
- Punctaria latifolia Greville
- Fide:
- VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague. (very abundant during winter months)
- Punctaria plantaginea (Roth) Greville
- Fide:
- VIRGINIA: Zaneveld and Barnes (1965), lower CB.
- MARYLAND: Zaneveld (1966-67), sine locus. (abundant during warmer months)
- Family Scytosiphonaceae (Thuret) Hauck
- Scytosiphon lomenarius (Lyngbye) C. Agardh
- Fide:
- VIRGINIA: Zaneveld and Barnes (1965), lower CB. Marsh (1970), YR (Mumfort Is.). Rhodes (1970), Burton's Bay near Wachapreague, ES.
- MARYLAND: Wulff et al (1968), jetty, Ocean City. (very abundant during colder months)

Family Dictyosiphonaceae Kützing orth. mut. Kjellman

Dictyosiphon foeniculaceus (Hudson) Greville

Fide:

VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague, ES.

Order Fucales Kylin

Family Fucaceae Lamouroux orth. mut. Dumortier

Fucus vesiculosus Linnaeus

Fide:

VIRGINIA: VIMS in Herbarium: Leg. J. Vogel, Haven Beach, just south of Milford Haven facing CB. Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Wulff et al (1968), jetty, Ocean City. (perennial)

Fucus vesiculosus Linnaeus var. sphaerocarpus J. Agardh

Fide:

MARYLAND: Zaneveld (1966-67), sine locus.

Ascophyllum nodosum (Linnaeus) Le Jolis

Fide:

VIRGINIA AND MARYLAND: Zaneveld (1966-67), sine locus.

Ascophyllum nodosum (Linnaeus) Le Jollis forma scorpioides (Hornemann)

Reike

Fide:

MARYLAND: VIMS in Herbarium: Leg. J. K. Lowry and B. H. Robison, found attached to the north jetty, Ocean City.

Family Sargassaceae (Decaisne) Kützing orth. mut. De Toni

Sargassum natans (Linnaeus) J. Meyen

Fide:

VIRGINIA AND MARYLAND: Zaneveld (1966-67), sine locus.

Sargassum hystrix J. Agardh var. buxifolium (Chauvin) J. Agardh

Fide:

VIRGINIA: Zaneveld (1966-67), sine locus.

#### DIVISION RHODOPHYTA

Class Rhodophyceae Ruprecht

Order Goniotrichales Skuja

Family Goniotrichaceae Skuja

Goniotrichum alsidii (Zanardini) Howe

Fide:

VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Wulff et al (1968), jetty, Ocean City. (summer)

Order Bangiales Engler

Family Erythropeltidaceae Skuja

Erythrocladia subintegra Rosenvinge

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP). (summer)

Erythrotrichia rhizoides Cleland

Fide:

VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague, ES. (summer)

Family Bangiaceae (S. F. Gray) Nägeli

Bangia ciliaris Carmichael

Fide:

MARYLAND: VIMS in Herbarium: Leg. B. L. Wulff, J. K. Lowry and B. H. Robison, north jetty, Ocean City, mixed in with herbarium sample of Acrochaetium trifilum.

Bangia fuscopurpurea (Dillwyn) Lyngbye

Fide:

VIRGINIA: Zaneveld and Barnes (1965), lower CB. Wulff (1967), YR (GP)

MARYLAND: Wulff et al (1968), jetty, Ocean City. (most abundant in spring and autumn)

Porphyra leucostricta Thuret

Fide:

VIRGINIA: VIMS in Herbarium: Leg. K. de Witt, Lynnhaven Inlet. Leg. P. E. Hargraves, YR (GP). Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Wulff et al (1968), jetty, Ocean City. (abundant colder months)

- Porphyra miniata (Lyngbye) C. Agardh  
 Fide:  
 VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague, ES.
- Porphyra umbilicalis (Linnaeus) J. Agardh  
 Fide:  
 VIRGINIA: Zaneveld and Barnes (1965), lower CB. Wulff (1967), YR (GP).  
 MARYLAND: Wulff et al (1968), jetty, Ocean City. Zaneveld (1966-67), sine locus. (abundant during colder months)
- Order Nemalionales Schmitz in Engler  
 Family Acrochaetiaceae Fritsch
- Acrochaetium alcyonidii Jao  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. K. M. S. Aziz, YR (GP)
- Acrochaetium dasyae Collins  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. D. Dilliman, James R. above Gum Rock.
- Acrochaetium flexuosum Vickers  
 Fide:  
 MARYLAND: Mathieson and Fuller (1969), Patuxent R., west of Broomes Island.
- Acrochaetium radiatum Jao  
 Fide:  
 MARYLAND: VIMS in Herbarium: Leg. B. L. Wulff, J. K. Lowry and B. H. Robison, jetty, Ocean City.
- Acrochaetium trifilum (Buffham) Batters emend. Aziz  
 Fide:  
 MARYLAND: Wulff et al (1968), jetty, Ocean City.
- Acrochaetium virgatulum (Harvey) J. Agardh  
 Fide:  
 MARYLAND: Wulff et al (1969), jetty, Ocean City.
- Acrochaetium virgatulum (Harvey) J. Agardh forma luxurians (J. Agardh) Collins  
 Fide:  
 VIRGINIA: VIMS in Herbarium, Leg. M. Wass YR (GP).
- Acrochaetium spp.  
 Fide:  
 MARYLAND: Wulff et al (1968), jetty, Ocean City
- Family Helminthocladiaceae  
Nemalion multifidum (Weber et Mohr) J. Agardh  
 Fide:  
 MARYLAND: VIMS in Herbarium: Leg. J. K. Lowry and B. H. Robison, north jetty, Ocean City.
- Family Bonnemaisoniaceae  
Asparagopsis hamifera (Hariot) Okamura  
 Fide:  
 It has been established that the two independently described algae, Asparagopsis hamifera and Trailliella intricata, are respectively the gametophytic and tetrasporophytic plants of an alga having a heteromorphic alternation of generations. While the gametophytic Asparagopsis hamifera has not been recorded for the geographical area under study, the tetrasporophytic Trailliella intricata has been found. This plant has been entered in this compilation under the Ceramiaceae where it was assigned prior to the establishment of its relationship with Asparagopsis hamifera.
- Order Gelidiales Kylin  
 Family Gelidiaceae  
Gelidium crinale (Turner) Lamouroux  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. M. Lynch, jetty, Little Creek, Norfolk. Leg. H. J. Humm, YR (Yorktown). Zaneveld and Barnes (1965), lower CB. Rhodes (1970), Burton's Bay near Wachapreague, ES. (warmer months)
- Order Cryptonemiales Schmitz in Engler  
 Family Corallinacea (Lamouroux) Harvey



Fosliella farinosa (Lamouroux) Howe

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).

Fosliella lejolisii (Rosanoff) Howe

Fide:

VIRGINIA: Marsh (1970), YR (Mumfort Is.)

Order Gigartinales Schmitz in Engler

Family Solieriaceae (Harvey) Hauck

Agardhiella tenera (J. Agardh) Schmitz

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP). Zaneveld and Barnes (1965), lower CB. Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Zaneveld (1966-67), sine locus. (abundant, especially in winter)

Family Hypneaceae J. Agardh

Hypnea musciformis (Wulfen) Lamouroux

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (Yorktown), Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Zaneveld (1966-67), sine locus. (summer)

Family Gracilariaceae (Nägeli) Kylin

Gracilaria foliifera (Forsskal) Børgesen

Fide:

VIRGINIA: Zaneveld and Barnes (1965), lower CB. Mangum, Santos and Rhodes (1968), YR (Sandy Point). Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Wulff et al (1968), jetty, Ocean City. (perennial)

Gracilaria verrucosa (Hudson) Papenfuss

Fide:

VIRGINIA: Zaneveld and Barnes (1965), lower CB; Zaneveld (1966-67), sine locus; Mathieson and Fuller (1969), Mobjack Bay off Guinea Marsh, Gwynn Is. 300 yards inshore of #1 beacon; Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Zaneveld (1966-67), sine locus; Mathieson and Fuller (1969), 16 locations in Patuxent R., and CB. (perennial)

Family Gigartinaceae Bory de Saint-Vincent orth. mut. Cohn

Chondrus crispus Stackhouse

Fide:

VIRGINIA: Zaneveld (1966-67), sine locus.

Order Rhodymeniales Schmitz in Engler

Family Champiaceae Kützting orth. mut. Bliding

Champia parvula (C. Agardh) Harvey

Fide:

VIRGINIA: VIMS in Herbarium: Leg. K. M. S. Aziz, YR (GP). Leg. P. E. Hargraves, YR (GP). Leg. M. Wass YR (GP). Zaneveld and Barnes (1965), lower CB. Marsh (1970), YR. Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Mathieson and Fuller (1969), 5 locations in Patuxent R. and CB. (abundant during the warmer months)

Lomentaria baileyana (Harvey) Farlow

Fide:

VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague. (abundant during warmer months)

## Order Ceramiales Oltmanns

## Family Ceramiaceae (S. F. Gray) Harvey orth. mut. Rabenhorst

Antithamnion cruciatum (C. Agardh) Nägeli

Fide:

VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague, ES.

Callithamnion baileyi Arnott

Fide:

VIRGINIA: VIMS in Herbarium: Leg. B. L. Wulff, YR (GP).

MARYLAND: Wulff et al (1968), Jetty, Ocean City. (warmer months)

Callithamnion byssoides Arnott

Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Lynch, Jetty, Little Creek, Norfolk. Wulff (1967), YR (GP). Rhodes (1970), Burton's Bay near Wachapreague, ES. (warmer months)

Callithamnion corymbosum (Smith) C. Agardh

Fide:

VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague, ES. (warmer months)

Ceramium diaphanum (Lightfoot) Roth

Fide:

VIRGINIA: Zaneveld and Barnes (1965), lower CB. Marsh (1970), YR (Mumfort Is.)

MARYLAND: Zaneveld (1966-67), sine locus. (summer)Ceramium fastigiatum (Roth) Harvey

Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Wass, mouth of CB. Marsh (1970), YR. Rhodes (1970), Burton's Bay near Wachapreague.

MARYLAND: Wulff et al (1968), Jetty, Ocean City. (summer)

Ceramium rubriforme Kylin

Fide:

VIRGINIA: Marsh (1970), YR (Mumfort Is.). Rhodes (1970), Burton's Bay near Wachapreague, ES.

Ceramium rubrum (Hudson) C. Agardh

Fide:

VIRGINIA: Wulff (1967), YR (GP). Mangum, Santos and Rhodes (1968), YR (Sandy Point). Mathieson and Fuller (1969) Mobjack Bay off Guinea Marsh. Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Wulff et al (1968), Jetty, Ocean City. Mathieson and Fuller (1969) 16 locations in mid-CB area. (abundant perennial)

Ceramium strictum (Kützting) Harvey

Fide:

VIRGINIA: Zaneveld and Barnes (1965), lower CB. Wulff (1967), YR (GP). Mangum, Santos and Rhodes (1968), YR (Sandy Point). Mathieson and Fuller (1969), Mobjack Bay off Guinea Marsh.

MARYLAND: Wulff et al (1968), Jetty, Ocean City. Mathieson and Fuller (1969), 17 locations in mid-CB area. (abundant summer and autumn)

Griffithsia tenuis C. Agardh

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).

Spyridia filimentosa (Wulfen) Harvey

Fide:

VIRGINIA: Mangum, Santos, and Rhodes (1968), YR (Sandy Point). Mathieson and Fuller (1969), Mobjack Bay off Guinea Marsh. Pocomoke Sound near Red Nun # 6. Marsh (1970), YR. Rhodes (1970), Burton's Bay near Wachapreague, ES.

MARYLAND: Mathieson and Fuller (1969), 7 locations in mid-CB area. (spring and summer)

Trailliella intricata (J. Agardh) Batters

Fide:

MARYLAND: Mathieson and Fuller (1969), 6 locations in the mid-CB area.

## Family Dasyaceae Kützing orth. mut. Rosenberg

Dasya pedicellata (C. Agardh) C. Agardh

## Fide:

- VIRGINIA: Zaneveld and Barnes (1965), lower CB. Wulff (1967), YR (GP). Rhodes (1970), Burton's Bay near Wachapreague, ES.  
 MARYLAND: Mathieson and Fuller (1969), 7 locations in mid-CB area. (most abundant early spring)

## Family Delesseriaceae Bory de Saint-Vincent orth. mut. Nägeli

Caloglossa leprieurii (Montagne) J. Agardh

## Fide:

- VIRGINIA: Post (1968), James R. on shore of Mulberry Island above Nells Creek, Leg. R. Patrick, James R. at Cobham's Wharf, Leg. J. C. Strickland.  
 MARYLAND: Post (1968), at eastern shore of mouth of St. Leonard Creek near Solomon's Is., Leg. G. Papenfuss. (perennial)

Grinnellia americana (C. Agardh) Harvey

## Fide:

- VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, adrift at Norfolk end of Bridge of Hampton Roads. Leg. H. J. Humm, YR (GP). Leg. J. Vogel and K. M. S. Aziz, Haven Beach, Mathews County. Marsh (1970), YR (Mumfort Is.). Rhodes (1970), Burton's Bay near Wachapreague, ES. (perennial).

## Family Rhodomelaceae (J. Agardh) Harvey

Bostrychia radicans Montagne

## Fide:

- VIRGINIA: Post (1968), James R. on shore of Mulberry Is. above Nells Creek, Leg. R. Patrick (as Bostrychia rivularis); on the sea wall ca. 1/4 mile above the YR Bridge at Yorktown, Leg. H. J. Humm; James R. at Cobham's Wharf, Leg. J. C. Strickland; Old Plantation Creek ca. 2 miles south of Cape Charles, Leg. H. G. Richards.  
 MARYLAND: Post (1968), at Eastern Shore of mouth of St. Leonard Creek, near Solomon's Is., Leg. G. Papenfuss (as Bostrychia radicans forma moniliforme); at Patuxent R. opposite Solomon's Is. Bridge, Leg. G. Papenfuss. (perennial but well developed in late spring)

Bostrychia rivularis Harvey

## Fide:

- VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm; YR (Guinea Marshes). Rhodes (1970), Burton's Bay near Wachapreague

Chondria baileyana (Montagne) Harvey

## Fide:

- VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (Guinea Marshes). (late spring and summer)

Chondria sedifolia Harvey

## Fide:

- VIRGINIA: Rhodes (1970), Burton's Bay near Wachapreague. (late spring and summer)

Chondria tenuissima (Goodenough et Woodward) C. Agardh

## Fide:

- VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, jetty, Cape Charles. Rhodes (1970), Burton's Bay near Wachapreague. (late spring and summer)

Polysiphonia denudata (Dillwyn) Kützing

## Fide:

- VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP). Zaneveld and Barnes (1965), lower CB. Rhodes (1970), Burton's Bay near Wachapreague, ES.  
 MARYLAND: Wulff et al (1968), jetty, Ocean City. (abundant during warmer months)

Polysiphonia harveyi Bailey

## Fide:

- VIRGINIA: VIMS in Herbarium: Leg. M. Wass, YR (GP). Leg. J. Vogel, east side of Gwynn Is. near mouth of Rappahannock R. Mangum, Santos and Rhodes (1968), YR (Sandy Point). Mathieson and fuller (1969), Mobjack Bay off Guinea Marsh.

- Rhodes (1970), Burton's Bay near Wachapreague.  
 MARYLAND: Wulff et al (1968), jetty, Ocean City. Mathieson and Fuller (1969), 14 locations in mid-CB area. (probably perennial)
- Polysiphonia nigrescens (Hudson) Greville  
 Fide:  
 VIRGINIA: Wulff (1967), YR (GP). Rhodes (1970), Burton's Bay near Wachapreague, ES.
- MARYLAND: Zaneveld (1966-67), sine locus. (reported perennial but very abundant during winter, with only very small fragments during summer)
- Polysiphonia novae-angliae Taylor  
 Fide:  
 MARYLAND: Wulff et al (1968), jetty, Ocean City.
- Polysiphonia subtilissima Montagne  
 Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. J. Vogel, west side of Gwynn Is., near mouth of the Rappahannock R. Rhodes (1970), Burton's Bay near Wachapreague.
- MARYLAND: Zaneveld (1966-67), sine locus.
- Polysiphonia urceolata (Lightfoot) Greville  
 Fide:  
 MARYLAND: Wulff et al (1968), jetty, Ocean City.

## DIVISION CYANOPHYTA

## Class Cyanophyceae Sachs

## Order Chroococcales Wettstein

## Family Chroococcaceae Nägeli

Agmenellum quadruplicatum (Meneghini) Brébisson

## Fide:

GENERAL: Griffith (1961), CB, sine locus, Leg. R. E. Griffith, Leg. D. C. Morris.

Agmenellum thermale (Kützing) Drouet et Daily

## Fide:

MARYLAND: Drouet and Daily (1956), Potomac R. at Plummers Is. west of Cabin John, Leg. F. Drouet, E. P. Killip and D. Richards.

Anacystis cyanea Drouet et Daily

## Fide:

VIRGINIA: VIMS in Herbarium, Leg. B. L. Wulff, bloom in the Rappahannock between Tappahannock and Port Royal. Drouet and Daily (1956), York Co., Queens Creek at Haw Tree Landing, Leg. A. F. Chestnut.

Anacystis dimidiata (Kützing) Drouet et Daily

## Fide:

VIRGINIA: Zaneveld (1966), Chincoteague Is. in a ditch, Leg. L. C. Goldstein, E. S. Luttrell and J. C. Strickland.

MARYLAND: Zaneveld (1966), Smith Is. at Tylerton, Leg. P. W. Wolle.

Anacystis marina Drouet et Daily

## Fide:

VIRGINIA: Leg. H. J. Humm, YR (GP)

Anacystis montana (Lightfoot) Drouet et Daily forma montana (Lightfoot) Drouet et Daily

## Fide:

GENERAL: Griffith (1961), CB, sine locus.

Anacystis montana (Lightfoot) Drouet et Daily forma minor (Wille) Drouet et Daily

## Fide:

GENERAL: Griffith (1961), CB, sine locus.

Anacystis thermalis (Meneghini) Drouet et Daily forma thermalis (Meneghini) Drouet et Daily

## Fide:

GENERAL: Griffith (1961), CB, sine locus.

Chroococcus turgidus (Kützing) Nägeli

## Fide:

MARYLAND: Drouet (1939), in brackish waters: marsh pool at Chance,

marsh pool west of Ewell on Smiths Is., marsh pool at Tylerton on Smiths Is., Leg. P. W. Wolle.

Chroococcus sp.

Fide:

MARYLAND: Morse (1947), mouth of Patuxent R.

Coccochloris elabens (Brébisson) Drouet et Daily

Fide:

GENERAL: Griffith (1961), CB, sine locus, Leg. F. Drouet.

Coccochloris peniocystis (Kützing) Drouet et Daily

Fide:

GENERAL: Griffith (1961), CB, sine locus.

Coccochloris stagnina Sprengel

Fide:

VIRGINIA: Drouet and Daily (1956), Va. Beach in pool and on wet soil in the Back Bay National Wildlife Refuge, Leg. H. A. Bailey, E. S. Luttrell and J. C. Strickland.

MARYLAND: Zaneveld (1966), sine locus.

Gomphosphaeria aponina Kützing

Fide:

MARYLAND: Drouet (1939), in brackish water; marsh pool between Chance and Dames Quarter.

Gomphosphaeria lacustris Chodat

Fide:

GENERAL: Griffith (1961), CB, sine locus.

Johannesbaptistia pellucida (Dickie) Taylor et Drouet

Fide:

MARYLAND: Drouet (1939), brackish waters: marsh pool west of Ewell on Smiths Is., marsh pool between Chance and Dames Quarter, Leg. P. W. Wolle.

Merismopedia glauca (Ehrenburg) Nägeli

Fide:

MARYLAND: Morse (1947), mouth of Patuxent R.

Family Entophysalidaceae Geitler

Entophysalis conferta Drouet et Daily

Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Wass, YR (GP). Mangum, Santos and Rhodes (1968), YR, (Sandy Point)

MARYLAND: Wulff et al (1968), jetty, Ocean City.

Entophysalis deusta (Meneghini) Drouet et Daily

Fide:

VIRGINIA: Wulff and Webb (1969), YR (GP). Mangum, Santos and Rhodes (1968), YR (Sandy Point). Drouet and Daily (1956) YR (Yorktown).

MARYLAND: VIMS in Herbarium: Leg. B. H. Robison, J. K. Lowry and B. L. Wulff, north jetty, Ocean City. Drouet and Daily (1956), salt marsh flat at Chesapeake Beach, Leg. E. C. Leonard, in Patuxent R., at Solomons Is., Leg. F. Drouet, E. P. Killip and F. R. Forsberg, on mud at Wenona, Leg. P. W. Wolle and F. Drouet, on packed soil on the shore of Tangier Sound near Prickly Point, Leg. F. Drouet and P. W. Wolle; Zaneveld (1966), sine locus. Wulff et al (1968), jetty, Ocean City.

GENERAL: Griffith (1961), CB, sine locus, Leg. F. Drouet.

Order Hormogonales (Thuret) Marchand orth. mut. Atkinson

Family Oscillatoriaceae (S. F. Gray) Dumortier ex Kirchner

Arthrospira brevis (Kützing) Drouet

Fide:

VIRGINIA: Drouet (1968), culture from YR (Yorktown), Leg. J. C. Strickland.

MARYLAND: Drouet (1968), on mud and pilings at Wenona, Leg. P. W. Wolle and F. Drouet. Bank of Potomac R. above Point of Rocks, Leg. M. H. Hohn.

Hydrocoleum holdenii Tilden

Fide:

MARYLAND: Drouet (1939), in a salt marsh 1 mile south of Public Landing in Assateague Bay, Leg. P. W. Wolle. Marsh ditch at Tylerton on Smiths Is., Leg. P. W. Wolle.

GENERAL: Griffith (1961), CB, sine locus, Leg. F. Drouet and F. K. Dally.

Lyngbya aerugineo-coerulea (Kützing) Gomont

Fide:

GENERAL: Griffith (1961), CB, sine locus.

Lyngbya aestuarii (Mertens) Lyngbye in Liebman ex Gomont

Fide:

VIRGINIA: Strickland (1940), from a marine aquarium at West Point, Leg. J. W. Bailey and J. C. Strickland. Zaneveld (1966), Chincoteague Is., Leg. L. C. Goldstein, E. S. Luttrell and J. C. Strickland. At the old ferry landing at GP, on border of YR (GP), Leg. C. F. Rhyne.

MARYLAND: Drouet (1939), subaerial in brackish and marine waters: salt marsh at Public Landing in Assateague Bay, Leg. P. W. Wolle, brackish ditch at Ewell. Zaneveld (1966), Rattlesnake Landing at Chincoteague Bay, Leg. J. Zaneveld, W. D. Barnes and H. W. West.

Lyngbya confervoides C. Agardh ex Gomont

Fide:

VIRGINIA: Zaneveld (1966), sine locus.

MARYLAND: Drouet (1939), on rocks and wood in marine waters; on pilings of old wharf at Public Landing in Assateague Bay, Leg. P. W. Wolle, jetty on Upper Thoroughfare on Deal Is., on rocks at Wenona. Zaneveld (1966), Ocean City harbor on wooden pilings, Leg. J. Zaneveld, W. D. Barnes and H. W. West.

Lyngbya gracilis Gomont

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (Guinea Marshes).

Lyngbya lutea (C. Agardh) Gomont ex Gomont

Fide:

VIRGINIA: Strickland (1940), in brackish and salt water habitats; from pilings of West Norfolk Bridge in Portsmouth, on stump in James R. at Cobham's Wharf. Zaneveld (1966), Leg. J. C. Strickland, on stump in James R. at Cobham's Wharf, YR (Seaford), Leg. R. W. Menzel and J. C. Strickland.

MARYLAND: Drouet (1939), on rocks and wet soil on shores; on banks of Nanticoke R. opposite Sand Hill Beach at Tyaskin.

General: Griffith (1961), CB, sine locus, Leg. F. Drouet. Other sites for L. lutea are given under Drouet's proposed name of Oscillatoria lutea

Lyngbya semiplena (C. Agardh) J. Agardh

Fide:

VIRGINIA: Zaneveld (1966), from sites at Chincoteague Is., Wachapreague Va. Beach, Norfolk, Chesapeake, Cape Charles, and YR (Queens Creek and 5 miles above bridge)

MARYLAND: Drouet (1939), in marine and brackish waters. Wulff et al (1968), jetty, Ocean City.

Microcoleus chthonoplastes (Mertens) Zanardini ex Gomont

Fide:

VIRGINIA: VIMS in Herbarium, Leg. K. M. S. Aziz, Mobjack Bay.

MARYLAND: Zaneveld (1966), Rattlesnake Landing in Chincoteague Bay, Leg. J. Zaneveld, W. D. Barnes, and H. W. West.

Microcoleus lyngbyaceus (Kützing) Crouan

Fide:

VIRGINIA: Wulff (1967), YR (GP). Drouet (1968), Mulberry Is. in James River, Leg. R. Patrick.

MARYLAND: Drouet (1968), Crisfield, Leg. F. Drouet and P. W. Wolle; Cabin John, Leg. F. Drouet and E. P. Killip; CB, Leg. H. C. Bold; Chincoteague Bay, Leg. J. Zaneveld, W. D. Barnes and H. W. West.

Microcoleus tenerrimus Gomont

Fide:

VIRGINIA: VIMS in Herbarium: Leg. K. M. S. Aziz. YR (between YR Bridge and Naval Weapons Station).

MARYLAND: Drouet (1939), in brackish and marine waters; on pilings

- at Wenona.
- Microcoleus vaginatus (Vaucher) Gomont  
Fide:  
 VIRGINIA: Drouet (1968), James R. downstream from Jamestown, Leg. R. Patrick.  
 MARYLAND: Drouet (1968), Patuxent R. at Benedict, Leg. F. Drouet and C. W. Reimer, Plummers Is. in Potomac R. west of Cabin John, Leg. Drouet et al.
- Oscillatoria amphibia C. Agardh ex Gomont  
Fide:  
 VIRGINIA: Zaneveld (1966), west of Queen Sound, Leg. L. C. Goldstein, E. S. Luttrell, and J. C. Strickland.  
 MARYLAND: Drouet (1939), in brackish and almost fresh water; marsh pool between Chance and Dames Quarter.
- Oscillatoria brevis Kützing ex Gomont var. neapolitana (Kützing) Gomont  
Fide:  
 MARYLAND: Drouet (1939), in brackish and semi-marine waters; on pilings at Wenona, puddle at old wharf at Shelldown, Leg. P. W. Wolle.
- Oscillatoria laetevirens Crouan ex Gomont  
Fide:  
 VIRGINIA: Zaneveld (1966), YR (Seaford), Leg. J. C. Strickland.
- Oscillatoria lutea C. Agardh  
Fide:  
 VIRGINIA: Drouet (1968), on shells in James R. 4.5 miles downstream from Jamestown Is., Leg. R. Patrick, Leg. J. C. Strickland et al.
- Oscillatoria margaritifera Kützing ex Gomont  
Fide:  
 VIRGINIA: Zaneveld (1966), west of Queens Sound, YR (Seaford), Leg. L. C. Goldstein, E. S. Luttrell and J. C. Strickland.  
 MARYLAND: Drouet (1939), in brackish and semi-marine waters; marsh ditch at Wenona, marsh pool at Chance, marsh ditch at Tylerton on Smiths Is., Leg. P. W. Wolle.
- Oscillatoria nigro-viridis Thwaites in Harvey ex Gomont  
Fide:  
 VIRGINIA: VIMS in Herbarium: Leg. B. L. Wulff, YR (GP). Strickland (1940), on pilings of the West Norfolk Bridge at Portsmouth. Zaneveld (1966), west of Queen Sound, Leg. L. C. Goldstein, E. S. Luttrell and J. C. Strickland.  
 MARYLAND: Drouet (1939), in marine and semi-marine waters; on pilings at Wenona.
- Oscillatoria princeps Vaucher ex Gomont  
Fide:  
 VIRGINIA: Zaneveld (1966), northwest of Wachapreague, Leg. L. C. Goldstein, E. S. Luttrell and J. C. Strickland, Portsmouth west of Hickory, Leg. C. M. Wilson.  
 MARYLAND: Zaneveld (1966), sine locus.
- Oscillatoria retzii C. Agardh  
Fide:  
 VIRGINIA: Drouet (1968), on logs in James R. north of the Fort Eustis Dock, Leg. R. Patrick. (This alga is reported by Drouet to be a freshwater alga, but the above site given is definitely brackish and, thus, is here included)
- Oscillatoria salinarum Collins in Collins, Holden and Setchell  
Fide:  
 VIRGINIA: Zaneveld (1966), west of Queen Sound, Leg. L. C. Goldstein, E. S. Luttrell and J. C. Strickland.  
 MARYLAND: Drouet (1939), brackish ditch at Ewell on Smiths Is., marsh ditch near Wenona, Leg. P. W. Wolle, Tylerton, Leg. P. W. Wolle.
- Oscillatoria splendida Greville ex Gomont  
Fide:  
 VIRGINIA: Zaneveld (1966), Portsmouth west of Great Bridge, Leg. C. M. Wilson.  
 MARYLAND: Zaneveld (1966), sine locus.

Oscillatoria submembranaceae Ardissone & Strafforello

Fide:

VIRGINIA: Drouet (1968), on barnacles on a pier at Seaford, Leg. J. C. Strickland.MARYLAND: Drouet (1968), on mud at Ewell on Smith Is., Leg. P. W. Wolle and F. Drouet, on an alluvial flat on Plummers Is., in the Potomac R. west of Cabin John.Oscillatoria subuliformis Thwaites in Kützing ex Gomont

Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Wass, on barnacles on a bouy in Sarah's Creek. Strickland (1940), from experimental jars in which oysters were active at West Point, Leg. J. W. Bailey, in Richmond from a marine aquarium at the Univ. of Va., Leg. J. W. Bailey and J. C. Strickland. Zaneveld (1966), Yorktown, Leg. R. M. Moore and J. C. Strickland, south border of YR.Phormidium persicinum (Reinke) Gomont

Fide:

VIRGINIA: Strickland (1940), from marine aquaria at West Point, Leg. J. W. Bailey and J. Strickland.Phormidium retzii (C. Agardh) Gomont

Fide:

VIRGINIA: Strickland (1940), James R. at Cobham's Wharf.

Phormidium submembranaceum Gomont

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).Phormidium uncinatum Gomont

Fide:

VIRGINIA: VIMS in Herbarium: Leg. M. Wass, YR (GP).Phormidium weissii Drouet

Fide:

MARYLAND: Drouet (1939), in a brackish pool at Wenona, on Ruppia in a marsh pool between Ewell and Rhodes Point on Smiths Is., road puddle at old wharf at Shelltown, Leg. P. W. Wolle.Porphyrosiphon notarissi (Meneghini) Kützing.

Fide:

VIRGINIA: Wulff, (1967), YR (GP). Drouet (1968), Mulberry Is. in the James R.

MARYLAND: Drouet (1968), in a saltmarsh near Jenkins Creek at Crisfield, Leg. F. Drouet and P. W. Wolle.Porphyrosiphon splendidus (Greville) Drouet

Fide:

VIRGINIA: Drouet (1968), Portsmouth west of Great Bridge, Leg. C. M. Wilson.MARYLAND: Drouet (1968), Potomac R. 3 miles below mouth of Monocacy R., Leg. M. H. Hohn, Waterloo Marsh at Monie Creek, Leg. P. W. Woole. (Drouet reports this alga as a freshwater alga, but the above given sites are probably slightly brackish)Schizothrix arenaria (Berkeley) Gomont

Fide:

VIRGINIA: Drouet (1968), James R. north of Fort Eustis Dock, Leg. R. Patrick.MARYLAND: Drouet (1968), Plummers Is. in Potomac R. west of Cabin John, Leg. F. Drouet and E. P. Killip, marsh on shore of Patuxent R., Leg. F. Drouet and C. W. Reimer, salt marsh near Rattlesnake Landing at Chincoteague Bay, Leg. Moul.Schizothrix calcicola (C. Agardh) Gomont

Fide:

VIRGINIA: Wulff (1967), YR (GP). Drouet (1968), James R. at Mulberry Is., Leg. R. Patrick, YR (West Point), Leg. J. W. Bailey, in James R. downstream from Jamestown Is. Mangum, Santos and Rhodes (1968), YR (Sandy Point).MARYLAND: Drouet (1968), in Potomac R. west of Cabin John, Leg. F. Drouet and E. P. Killip, salt marsh at Crisfield, Leg. F. Drouet and P. W. Wolle, in Patuxent R. at Solomons Is., Leg. E. P. Killip, F. Drouet and F. R. Forsberg. Wulff et al (1968), Jetty, Ocean City.



Schizothrix tenerrima (Gomont) Drouet

Fide:

VIRGINIA: Drouet (1968), James F. at Mulberry Is., Leg. R. Patrick, James R. at Cobham's Wharf, Leg. J. C. Strickland.

MARYLAND: Drouet (1968), Patuxent R. at Solomons Is., Leg. F. Drouet, E. P. Killip and F. R. Forsberg, at Wenona, Leg. P. W. Wolle and F. Drouet.

Spirulina major Kützing ex Gomont

Fide:

MARYLAND: Drouet (1939), brackish pool at Wenona, Cove Point, Leg. H. C. Bold.

Spirulina subsalsa Oersted ex Gomont

Fide:

VIRGINIA: Wulff (1967), YR (GP)

MARYLAND: Drouet (1968), Cove Point, Leg. H. C. Bold. Ewell and Rhodes Point on Smiths Is., Leg. P. W. Wolle and F. Drouet, marsh south of Jenkins Creek near Crisfield, Leg. F. Drouet and P. W. Wolle.

Spirulina subsalsa Oersted forma oceanica (Drouan) Gomont

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, on barnacles from a bouy in Sarah's Creek.

Spirulina tenerrima Kützing ex Gomont

Fide:

MARYLAND: Drouet (1939), in brackish and marine waters; marsh pool between Ewell and Rhodes Point on Smith Is.

Symploca atlantica Gomont

Fide:

VIRGINIA: Strickland (1940), James R. at Cobham's Wharf. Zaneveld (1966), YR (GP), Leg. C. F. Rhyne, James R. at Cobham's Wharf, Leg. J. C. Strickland.

MARYLAND: Zaneveld (1966), on wooden harbor pilings at Snow Hall Public Landing, Leg. J. Zaneveld, W. D. Barnes, and H. W. West.

Trichodesmium thiebautii Gomont

Fide:

VIRGINIA: VIMS in Herbarium: Leg. F. D. Ott, very abundant in the phytoplankton during August and September in the lower CB, 1970.

## Family Nostocaceae Dumortier ex Engler

Anabaena inaequalis (Kützing) Bornet et Flahault

Fide:

VIRGINIA: VIMS in Herbarium, Leg. H. J. Humm, YR (Yorktown).

Anabaena sphaerica Bornet et Flahault

Fide:

MARYLAND: Drouet (1939), in a brackish ditch between Wenona and Deal Is.

Anabaena torulosa (Carmichael) Lagerheim ex Bornet et Flahault

Fide:

VIRGINIA: Zaneveld (1966), south border of YR near York River Bridge.

## Family Microchaetaceae Lemmermann

Nodularia harveyana (Thwaites) Thuret

Fide:

VIRGINIA: VIMS in Herbarium, Leg. K. M. S. Aziz, YR (Yorktown)

MARYLAND: Drouet (1939), floating in a brackish pond at Rhodes Point on Smiths Is.

## Family Rivulariaceae Kützing ex Bornet et Flahault

Dichothrix penicillata Zanardini ex Bornet et Flahault

Fide:

VIRGINIA: Zaneveld (1966), YR 15 miles downstream from the YR Bridge.

Calothrix confervicola (Roth) C. Agardh

Fide:

VIRGINIA: VIMS in Herbarium: Leg. K. M. S. Aziz, YR between the YR Bridge and the Naval Weapons Station

MARYLAND: Wulff et al (1968), jetty, Ocean City.

Calothrix crustaceae Schousboe et Thuret ex Bornet et Thuret

Fide:

VIRGINIA: Zaneveld (1966), on oyster shells on the west side of Lynnhaven Inlet, Leg. W. D. Barnes and H. W. West. Wulff (1967), YR (GP).

MARYLAND: Zaneveld (1966), Snow Hill in Chincoteague Bay, Leg. J. Zaneveld, W. D. Barnes and H. W. West. Wulff et al (1968), jetty, Ocean City.

Calothrix pulvinata (Mertnes) C. Agardh

Fide:

MARYLAND: Drouet (1939), in marine and brackish waters; on pilings in Nanticoke R. at Sandy Hill Beach in Tyaskin, on pilings of old wharf at Shelltown, Leg. P. W. Wolle.

Rivularia nitida C. Agardh

Fide:

MARYLAND: Drouet (1939), in wet brackish places; on cedar stumps at head of Pocomoke Sound below Shelltown, Leg. P. W. Wolle.

## Family Scytonemataceae Kutzing ex Bornet et Flahault

Fremyella grisea (Bornet et Flahault) J. De Toni

Fide:

MARYLAND: Drouet (1939), in marine and brackish waters; on pilings of old wharf at Shelltown, Leg. P. W. Wolle.

Plectonema calothrichoides Gomont

Fide:

VIRGINIA: VIMS in Herbarium: Leg. K. M. S. Aziz, YR (above the YR Bridge)

Plectonema golenkinianum Gomont

Fide:

MARYLAND: Drouet (1939), in marine and brackish waters; on pilings of old wharf at Shelltown, Leg. P. W. Wolle.

Plectonema terebrans Bornet et Flahault

Fide:

VIRGINIA: VIMS in Herbarium: Leg. K. M. S. Aziz, YR (near Yorktown)

## Family Stigeonemataceae Kirchner

Mastigocoleus testarum Bornet et Flahault

Fide:

VIRGINIA: VIMS in Herbarium: Leg. H. J. Humm, YR (GP).

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TENTATIVE CHECKLIST OF MARINE FUNGI FROM  
THE VICINITY OF GLOUCESTER POINT, VIRGINIA<sup>1</sup>  
Fred Kazama

An adequate study of the fungi present in the Chesapeake Bay and its associated bodies of water has not been conducted. Scott (1962), using techniques for collecting and isolating terrestrial fungi, has made a brief survey of the phycomycetous fungi in the vicinity of Gloucester Point, Virginia. In his study, Scott (1962) apparently utilized gross cultures rather than pure cultures for the identification of the chytrids and other fungi. Several studies (Emerson, 1950; Miller, 1968; Barr, 1969; 1970) show that pure cultures of fungi, especially the chytrids, are necessary to show the range of variability before positive identifications can be made. Frequently, cultural conditions modify the morphology of fungi to the point where positive identification from prior descriptions of the organisms becomes difficult (Miller, 1968; Kazama, 1971, in press). Since the morphology of fungi may vary with cultural conditions, determinative keys designed for terrestrial fungi must be used with care. Adequate laboratory studies should be conducted before positive identifications are made, especially at the specific level.

<sup>1</sup>This section does not constitute a publication and the information is subject to correction and/or revision.

DIVISION MYCOTA

Subdivision Eumycotina

Class Phycomycetes

Order Chytridiales

Family Phlyctidiaceae

Subfamily Phlyctidioideae

Rhizophyidium carpophilum (Zopf) Fischer  
Rhizophyidium globosum (Braun) Rabenhorst  
Rhizophyidium pollinis-pini (Braun) Zopf  
Rhizophyidium sp.  
Podochytrium sp.  
Phlyctochytrium sp.

Subfamily Entophlyctoideae

Diplophlyctis intestina (Schenk) Schroeter

Family Rhizidiaceae

Subfamily Rhizidioideae

Rhizophlyctis hyalina (Karling) Sparrow

Family Cladochytriaceae

Cladochytrium tenue (Nowakowski) Cohn  
Cladochytrium crassum Hillegas

Order Saprolegniales

Family Thraustochytriaceae

Thraustochytrium globosum Kobayashi and Ookubo  
Thraustochytrium motivum Goldstein

Family Saprolegniaceae

Achlya racemosa Hildebrand  
Achlya sp. #1  
Achlya sp. #2  
Aphanomyces laevis de Bary  
Aphanomyces sp.  
Leptolegnia caudata de Bary

Order Lagenidiales

Family Lagenidiaceae

Lagenidium pygmaeum Zopf  
Lagenidium callinectes Couch  
Lagenidium sp.

Order Peronosporales

Family Pythiaceae

Pythium afertile Kanouse and Humphrey  
Pythium gracile Schenk  
Pythium aquatile Hohnk  
Pythium sp.

- Order Mucorales  
 Family Mucoraceae  
Mucor sp.
- Class Deuteromycetes  
 Order Moniliales  
 Family Dematiaceae  
Alternaria maritima Suth.  
Helminthosporium halodes Drechsler  
Hormiscium sp.  
Cladosporium sp.  
Hormodendrum sp.
- Family Moniliaceae  
Monosporium maritimum Suth.  
Cephalosporium sp.  
Aspergillus sp.  
Penicillium restrictum Gilman and Abbott
- Subdivision Myxomycotina  
 Order Labyrinthulales  
Labyrinthula vitellina Cienkowski  
Labyrinthula sp.

## LIST OF SUBSTRATA AND THE FUNGI FOUND ON EACH

- Achlya sp.  
Rhizophydium carpophilum
- Nitella sp.  
Rhizophydium globosum  
Pythium gracile  
Diplophlyctis intestina
- Pine pollen  
Rhizophydium pollinis-pini  
Rhizophydium sp.  
Thraustochytrium motivum  
Pythium afertile  
Lagenidium pygmaeum
- Coscinodiscus asteromphalus and C. concinnus  
Podochytrium sp.
- Cellophane bait  
Rhizophlyctis hyalina  
Pythium aquatile  
Pythium sp.  
Cladochytrium tenue  
Cladochytrium crassum
- Elodea sp.  
Cladochytrium tenue
- Hemp seed bait  
Achlya sp.
- Snake skin bait  
Aphanomyces laevis  
Aphanomyces sp.  
Leptolegnia candata
- Surirella splendida  
Thraustochytrium globosum
- Callinectes sapidus  
Lagenidium callinectes
- Spartina alterniflora  
Phlyctochytrium sp.  
Lagenidium sp.  
Pythium gracile  
Alternaria maritima  
Helminthosporium halodes  
Hormiscium sp.  
Cladosporium sp.  
Hormodendrum sp

Monosporium maritimum  
Cephalosporium sp.  
Aspergillus sp.  
Penicillium restrictum  
Mucor sp.  
Zostera marina  
Labyrinthula vitellina  
Labyrinthula sp.

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 Plaglogramma 7  
 Planktoniella 3  
 Plectonema 35  
 Pleurosium 9  
 Podochytrium 38  
 Polykrikos 13  
 Polysiphonia 28, 29  
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|                        |                    |                     |
|------------------------|--------------------|---------------------|
| Pronoctiluca 12        | Sargassum 24       | Tabellaria 7        |
| Prorocentrum 12        | Scenedesmus 21     | Terpsinoe 4         |
| Protoceratium 15       | Schizothrix 33, 34 | Thalassiosira 3     |
| Protoderma 19          | Schroderella 6     | Thalassiothrix 7    |
| Prymnesium 1           | Scytosiphon 23     | Thalassionema 7     |
| Pseudodendroclonium 19 | Skeletonema 3      | Thraustochytrium 38 |
| Punctaria 23           | Sphacelaria 22     | Trailliella 27      |
| Pylaiella 22           | Spirogyra 18       | Trichodesmium 34    |
| Pyramimonas 1          | Spirulina 34       | Tropidoneis 9       |
| Pyrophacus 13          | Spyridia 27        |                     |
| Pythium 38             | Staurasturum 18    | Ulothrix 18, 19     |
|                        | Stephanodiscus 3   | Ulva 20             |
| Rhabdonema 7           | Stephanopyxis 3    |                     |
| Rhaphoneis 7           | Stilophora 23      | Vaucheria 1         |
| Rhizoclonium 21,22     | Streptotheca 4     |                     |
| Rhizophlyctis 38       | Striaria 23        | Warnowia 13         |
| Rhizophyidium 38       | Striatella 7       |                     |
| Rhizosolenia 6         | Surirella 10, 11   |                     |
| Rhodomonas 1           | Symploca 34        |                     |
| Rhopalodia 9           | Synedra 7          |                     |
| Rivularia 35           |                    |                     |

Marvin L. Wass

This list is intended to cover only tidal waters, ponds built on tidal creeks, floodplains of tidal tributaries, the barrier islands and shores subjected to frequent storm wave flowage. Except for the Patuxent River records of Anderson (1968), it is restricted to Virginia.

This has not permitted a more comprehensive coverage and many Virginia records are not included. Of the 30 coastal counties included, 1-26 and 35-38 in Virginia Flora (Massey, 1961), most are poorly known floristically, especially in regard to wetland plants, e.g. *Zostera* is listed only as "Virginia in range". Massey's county records are given as the number of counties in which a species is found, e.g., 5c, unless only a few counties are included.

The flora of Virginia is now being intensively studied by the state's botanists interested in the systematics of higher plants, with the goal of producing a monograph. A great deal more field work will be needed, particularly in the middle and upper peninsulas, if the coastal area is to be covered as well as it was in the Carolinas by Radford, Ahles and Bell (1968).

The nomenclature used follows that of Radford *et al* (1968), which places many names listed by Massey in synonymy. For each species, the records of Massey (1961) are given first, followed by those selected from VIMS records and the works of Erlanson (1922), Harvill (1965, 1967), Anderson *et al* (1968), Clovis (1968), Gillespie (1970), Loetterle (1970), and Davis (1971). Arrangement is alphabetical within families. Common names have been partially coined for some species.

Numerous other papers and theses would need to be checked to compile a complete record. More important is the acquisition of precise environmental data, such as that supplied by Anderson *et al* (1968) for the Patuxent River marshes.

The meager, but growing involvement of VIMS in this area has been assisted by three people, most particularly by Dr. Ashton M. Harvill, Jr., of Longwood College and also by two former students of William and Mary College, Allene Barans and G. Alex Marsh. Initials preceding a reference refer to location and those following refer to the collector. The letters "pac" mean probably all counties. The numbers following a location refer to county number of Massey (1961).

| Locations                 | Collectors and Authorities |
|---------------------------|----------------------------|
| AI - Assateague Island    | AB - Allene Barans         |
| CB - Chesapeake Bay       | AH - A. M. Harvill, Jr.    |
| CI - Cedar Island         | AM - A. B. Massey          |
| CR - Chickahominy River   | EE - Eileen Erlanson       |
| JI - Jamestown Island     | GM - G. Alex Marsh         |
| MR - Mattaponi River      | JC - Jesse F. Clovis       |
| PI - Parramore Island     | JK - James Kerwin          |
| PR - Pamunkey River       | KM - Kenneth Marcellus     |
| RR - Rappahannock River   | LL - Lynn Loetterle        |
| SI - Smith Island, Va.    | MG - Mary Gillespie        |
| YR - York River           | OD - Ole Davis             |
| Wmbg. - Williamsburg, Va. | RA - Richard Anderson      |

## DIVISION ARTHROPHYTA

## Order Equisetales

## Family Equisetaceae (horsetails)

Equisetum arvense L., Common horsetail. Wet soil of marshes, stream banks and ditches, 8c, AM. Streambank, Toe Ink Wayside, common 20, MG.

Equisetum hyemale L. Scouring rush. Stream banks, limy soil. 8c (as E. prealtum), AM, PR, edge, Chestnut Grove Farm, 20, MG.

## DIVISION PTEROPHYTA

## Order Ophioglossales

## Family Ophioglossaceae

Botrichium dissectum var. obliquum. (Muhl.) Clute. Grape fern.

Moist soil of flood plains, 10c, AM. Chisel's Run, AM.

Botrichium virginianum (L) SW. Rattlesnake Fern. Swamps, frequent 10c, AM. Floodplain of Queens Creek drainage, 6, EE.

## Order Filicales (true ferns)

## Family Osmundaceae

Osmunda cinnamomea L. Cinnamon fern. Frequent in damp glens and swamps. In marshes "over the state". JI, rare, L.L. PR, 20, Causiac M., scarce; CR, edge, MG. RR, 25, Drake M., scarce; pac, MW.

Osmunda regalis (Willd.) A Gray. Royal Fern. Common, freshwater marsh, damp shores and swamps, 7c, AM. JI, 19, brackish margins, common, LL. PR, common to abundant, Causiac M, 20, Sweet Hall M., 22; Hoskins C., 23, scarce; Drake M., 25, abundant; pac, MW.

## Family Pteridaceae

Pteridium aquilinum (L.) Kuhn. Bracken. Smith Is., 2, swale, rare, JC; pac, MW.

## Family Aspidiaceae

Athyrium filix-femina (L) Roth. Lady Fern. Swamps, wet meadows, 1, 2, AM. JI, 19, low areas near brackwater, common, LL. Moist soil, Toe Ink Wayside, 20, MG.

Thelypteris palustris Schott. Marsh Fern. Freshwater marshes and swamps, 8c, AM. JI, 19, common near brackwater, forming beds in wet woods, LL; Longhill, 19, open swamps, EE. PR, Causiac M., 20, common; Sweet Hall M., 22, abundant; MR, 22, below Indian reservation; Hoskins C., 23, Drake M., 25; Aquia C., 35; pac except 1-3, MW.

Onoclea sensibilis L. Sensitive Fern. Marshes and swamps, 7c, AM. JI, 19, moist woods, common, LL. PR, 20, Causiac M.; GM, Sweet Hall M., 22, common, KM. Drake Marsh, 25, frequent, MW, GM.

## Family Blechnaceae

Woodwardia areolata (L.) Moore. Netted Chain-Fern. Moist to wet woods and swamps, 18c, AM. JI, common, LL. Wet woods near Rumley M., 20, MG.

Woodwardia virginica (L.) Smith. Virginia Chain-Fern. Bogs and swamps, 7c, AM. JI, 19, moist woods, occasional, LL.

## Family Polypodiaceae

Polyipodium polypodioides (L.) Walt. Resurrection Fern. Occasional in tree crotches and on mossy banks, 5c, AM. On trunk of Platanus, floodplain of Queen's Lake, EE. PR, 20, trunk of Acer over creek, West Island Swamp, pac, rare, MW.

## DIVISION CONIFEROPHYTA

## Order Coniferae

## Family Taxodiaceae

Taxodium distichum (L.) Richard. Bald Cypress. Swamps and shores, 10c, AM. Abundant in Dismal Swamp, James R., Chickahominy R. Dragon Run, Seashore State Park. Scarce on E. Shore, York R. PR, one tree ca 45 ft. tall in West Island Swamp, 20, few below Sweet Hall M., 22. Decreasing in most places, old trees in water indicate sea level rise or erosion.

## Family Cupressaceae

Juniperus virginiana L. Red Cedar. Abundant pioneer tree. Quite salt tolerant; on all larger coastal islands and wooded "marsh islands"; fruit important to birds in winter.

## DIVISION ANTHOPHYTA

## Order Pandanales

## Family Typhaceae

Typha angustifolia L. Narrow-leaved Cat-tail. Freshwater and oligo-haline. Shallow water, often with marl, YR, 1-4, 19, AM. Parramore I.; Starvation Pt., Cow C., 7; Croaker Landing, 19; Hoskins C., 23, Causiac M., 20, MW. JI, 19, abundant, brackish marshes, LL. Commonly found where marsh adjoins high land and freshwater seeps occur, pac MW. Md.: (Upper Patuxent R), Holland Cliffs, Magruder Landing, Lower Marlboro, RA.

Typha latifolia L. Common Cat-tail. Freshwater. JI, 19, LL. Croaker Landing, 20, Aquia Creek, 35, MW.

## Family Sparganiaceae

Sparganium americanum L. Broad-fruited Bur-reed. 1, 2, (as S. eurycarpum), AM. Mouth of Chisel's Run at Longhill Swamp, 19, EE. Upper Patuxent: Lyon's Creek, Mt. Calvert and Hill's Bridge, RA.

## Order Najadales

## Family Zosteraceae

Zostera marina L. Eelgrass. Upper meso- to euhaline. Massey gave no records, but Zostera occupies perhaps 50,000 acres in subtidal shallows of Chesapeake Bay. This area is much less than formerly, since it disappeared completely ca 40 years ago from seaside of the Eastern Shore of Va., except at Chincoteague, and is recolonizing southward only very slowly.

## Family Potamogetonaceae

Potamogeton berchtoldi Fieber. Slender Pondweed. Shallow water 1,3,28, AM. Back Bay, 3, rare, 1962, JK.

Potamogeton crispus L. Curly Pondweed. Limy or brackish water 15, 1937, AM. Jones' Mill Pond, 19, EE; Cheatham Annex pond, 19, MW, GAM.

Potamogeton foliosus Raf. Leafy Pondweed. Fresh, limy or brackish water, 37, AM.

Potamogeton nodosus Poiret. Longleaf Pondweed. Piscataway Creek, 23, MW, GAM.

Potamogeton perfoliatus var. bupleuroides (Fernald) Farwell. Redhead Grass. Limy or brackish water, 1,3,37, AM. Back Bay, 3, 1962, rare, JK.

Potamogeton pectinatus L. Sago. Pondweed. Limy or brackish water. 1-3, 38, AM. Back Bay, 3, abundant, 1962, JK.

Potamogeton pulcher Tuckerman. In muddy shores, 3,4, AM. Causiac Marsh, 20, MW, GAM.

## Family Ruppiaceae

Ruppia maritima L. Widgeon grass. Fresh to euhaline. 1-3, AM. Parramore Is. lake, abundant, MW. Back Bay, 3, abundant, 1962, YR, 6, 7, 19, 20, 21, common upriver, MW.

## Family Zannichelliaceae

Zannichellia palustris L. Horned Pondweed. Fresh or brackish water, 38, AM. Running water, Queen's Creek, 6, EE. Fox Mill Run, often most abundant aquatic plant in brackish water, MW.

## Family Najadaceae

Najas flexilis (Willd.) Roskt. and Schmidt. Slender Water Nymph. Fresh or brackish water, 38, AM.

Najas quadalupensis (Speng.) Morong. Common Water Nymph. Coastal waters, 2, 19, AM. In Jones' Mill Pond, EE.

Najas sp. Back Bay, abundant, 1960-69, JK.

## Order Alismales

## Family Juncaginaceae

Triglochin striata R. and P. Arrow Grass. Brackish to saline, 3, AM.

## Family Alismataceae

- Alisma subcordatum Raf. Water Plantain. Muddy shores, shallow water, AM. CR, Lanexa, wooded swamp, 19, EE. Shallow ditch, 20, MG.
- Sagittaria falcata Pursh. Falcate Arrowhead, Duck-potato. Wet shores and swamps, 3, 12, 19, AM. Beaverdam Swamp, 7, rare, MW. JI, 19, shallow brackish marshes, occasional, LL. Queen's C. tidal marshes, EE. PR, Chandlers I., 20, rare, Sweet Hall M., 22, shallows, below marsh, common; Hoskins C., 23, rare, MW.
- Sagittaria graminea Michaux. Grassy Arrowhead. Shallow water and mud, 3, 14, 38, AM. CR, Windsor Shales, 20, marsh edge, MG.
- Sagittaria latifolia Willd. Broad-leaved Arrowhead. Shallow water and peaty mud, 1, 2, 31, 38, AM. Blackstump Creek, 19, MW. Md., Upper Patuxent R., Lyon's Creek, Mt. Calvert, Hills Bridge, RA.
- Sagittaria latifolia var. pubescens (Muhl.) J. G. Smith. Sphagnum swamp, 19, EE.
- Sagittaria subulata (Michx.) Small. Awl-leaved Arrowhead. Fresh to brackish marshes, 8c, AM. CR, tidal swamp near Lanexa, 19, EE.

## Order Hydrocharitales

## Family Hydrocharitaceae

- Elodea canadensis Michaux. Water-weed. Ponds and sluggish streams, 12, 19, 38, AM. Jones' Mill Pond, 19, EE. CR, Dillon's Lndg., 20, MG.
- Vallisneria americana Michaux. Tapegrass. Quiet and slow moving waters, 1-3, 38, AM.

## Order Graminales

## Family Poaceae

- Agrostis alba L. Redtop. Widely naturalized, AM. PI, 1, along trail, MW, AH.
- Ammophila breviligulata Fernald. American Beach Grass. Coastal dunes and sandy beaches, 1, 2, 3, AM. New Point I, 8, MW. Extensively planted on Assateague I.
- Andropogon scoparius Michaux. Little Blue Stem. AI, AH.
- Cenchrus tribuloides L. Thorny sandspur. Coastal sand and dunes, 8c, AM. CI, 1; New Point Is., 7, MW. JI, 19, low dunes, occasional, LL.
- Cinna arundinacea L. Stout Woodreed. Swampy areas, 9c, AM. JI, 19, open pine woods, LL; JR, and Queen's Creek, 6, tidal marshes and wooded flood plain, EE. PR, Chandler's I. 20; MR, 21, 3rd marsh on right, MW.
- Arundinaria gigantea (Walter) Muhl. Giant Cane. Stream banks, swamps, seepage areas, 7c, AM. JI, 19, fairly common, thickets along edges of brackish marshes, LL. Cypress swamps south of Five Ponds, 19, EE.
- Calamagrostis cinnoides (Muhl.) Barton. Sphagnum-magnolia swamps, 19, EE. Moist to wet areas, 10c, AM.
- Digitaria sanguinalis (L.) Scopoli. Hairy Crab Grass. Common weed, 1-3, AM. AI, 1, AH. JR, 19, tidal marshes, wooded flood-plain, EE.
- Distichlis spicata (L.) Greene. Saltgrass. Saline sands of the seashore, 2, 3, 4, 7, 10, AM. Tidal salt marshes, 19, EE. Meso- (10 ppt) to euhaline marshes near high tide level, CI
- Echinochloa crusgalli (L.) Beauvois. Barnyard Grass. Weed from Europe, waste places, 11, 19, 38, AM. AI, 1, AH. JI, 19, margins of brackish marshes, LL.
- Echinochloa walteri (Pursh) Heller. Walter's Millet. Marshes and wet soil, 1-4, 13-15, 19-21, 24, AM. JI, 19, brackish marsh, sandy shores of JR, LL. Valuable duck food, occasional to frequent, Starvation Pt., 7; Black Stump Creek, 19; Aquia Creek, 35, MW. Md. (Patuxent R.) 5 sites, RA.
- Elymus virginicus L. Virginia Wild Rye. Moist soil, stream banks, 11c, AM. Tidal marshes, moist roadsides, 6, 19, EE. JI, 19, LL. PI, 1; VIMS beach, 7; MR, 3rd marsh on right, 21, MW, AH. Md., Patuxent R., 4 sites, RA.
- Eragrostis spectabilis (Pursh) Steud. Purple Lovegrass. Weed in light soil, 1-3, 17, 36, 38, AM. New Point I., 8, MW, AH.
- Erianthus contortus Baldwin ex. Ell. Twisted-awn Plume Grass, Moist waste places, 7c, AM. St. Peter's Swamp, 20, MG.

- Erianthus giganteus (Walter) Muhl. Giant Plume Grass. Moist soil, 2-4, 19, 37, AM. JI, 19, low marshy ground, LL. SE of Ewell, 19, sphagnum-magnolia swamp, EE.
- Festuca myuros L. Mouse-tail Fescue. Introd. from Europe. Dry fields, 7c, AM. SI, 2, JC.
- Festuca rubra L. Red Fescue. Moist to wet places, 3, 5, 12, 38, AM. Cedar Is., 1, New Point, 8, MW, AH.
- Glyceria obtusa (Muhl) Trinius. Blunt Manna Grass. Wet situations, marshes, open swamps, 4, 38, AM. Hoskin's Creek, 23, MW, AH.
- Glyceria striata (Lam.) Hitchcock. Striate Manna Grass. Moist to wet soil, 1, 2, 4, 19, 37, AM. Beaverdam Swamp, 7, rare, MW, AH.
- Hystrix patula Moench. Bottlebrush Grass. Moist woods, 5c, AM. Beaverdam Swamp, 7, MW, AH.
- Leersia oryzoides (L) Swartz. Rice Cutgrass. Wet waste places, 1-4, 18, 19, 36, AM. Chandlers Is., 20, Aquia Creek, 35, abundant in oligohaline marshes, frequent in swamps, MW.
- Panicum amarulum Hitchcock and Chase. Tall Dune Grass. Sandy shores, 1-3, 16, AM. Goodwin I., 6, outer beach, rare; New Point I., 8, frequent, MW, AH.
- Panicum amarum Ell. Short Dune Grass. Sand dunes and shores, 10c, AM. JI, 19, sandy field, LL. Cedar Is., 1, common; Goodwin I, 6; VIMS beach, 7, common; New Point I., abundant, MW, AH.
- Panicum anceps Michaux. Moist places, 10c, AM.
- Panicum agrostoides Spreng. Wet open areas and along streams, 7c, AM. PR, 20, Chandler's I., Aquia Creek, 35, MW, AH.
- Panicum dichotimiflorum Michaux. Moist soil, 1-3, 19, 38, AM. Jenkins Neck, 7; New Point I., 8, MW, AH.
- Panicum lanuginosum Ell. Open woods, 7c, AM. PI, MW, AH.
- Panicum virgatum L. Moist ground, brackish marshes, 8c, AM. ES, 2, foot of Cape Charles breakwater; Hoskins C. and Piscataway Creek, 28, MW, AH. Md.: (Patuxent R.), 5 sites, at Holland Cliffs, 10 ppt. salinity.
- Phragmites communis Trinus. Common Reed. This sturdy grass, rather worthless for wildlife, is slowly increasing in Va., although it is not nearly as common as in Md. Marshes, shores and seeps, 3, 4, 38, AM. ES, (CI) healthy plant on sand dune; Harper's Creek, 8, small stand along ditch; Tappahannock, 23, south edge, dominates spoiled marsh, VIII-71, MW. Md.: (Patuxent R.), 6 sites, RA.
- Polypogon monspeliensis (L) Desf. Rabbit-foot Grass. Waste places 1-3, 14, AM. PI, along trail, MW, AH.
- Sacciolepis striata (L) Nash. Wet soil, 5c, AM. JI, 19, sandy shores bordering brackish marshes, LL.
- Setaria magna Greisbach. Giant Bristle Grass. Swamps and wet areas, 2-4, 6, AM. Hoskins Creek, 23, MW, AH.
- Spartina alterniflora Loisel. Saltmarsh Cordgrass. Coastal plain, salt marshes, 12c, AM. May dominate 100,000 acres of polyhaline marsh in Va., producing up to 6 tons/acre/yr. ES, probably comprises 95% of seaside marsh vegetation. On outer side of Myrtle I. (2), in wet accreted sand; VIMS, 7, colonized much of shore sand beach; Poropotank R., dominant at mouth, frequent on banks up to freshwater; New Point I, 8, luxuriant on exposed shore behind sand drift, MW. Md: (Patuxent R.) four sites, 3 - 17 ppt, RA.
- Spartina cynosuroides (L.) Roth. Big Cordgrass. Forming dense stands in shallow marshes. Usually below 10 ppt and at MHW level. Decreased greatly in recent decades in nursery grounds sectors of rivers. Goodwin I., 6, rare, YR above bridge, some lush stands. Fox Mill Run, Beaverdam Swamp, 7, dense growth in oligohaline sectors. JI, 19, abundant, LL. Hoskins C., Piscataway C., 23, luxuriant growth in lower ends, much destroyed by recent fill in Hoskins C., MW. Md.: (Patuxent R.) same sites as for S. alterniflora, 3-17 ppt, RA.

Spartina patens (M. A. Curtis) Fern. Saltmeadow Hay. Salt marshes, 11c, AM. Dominant plant of high salt marsh, also on sandy shores, low dunes and swales of islands. ES, 1, 2, abundant on leeward side of barrier islands, creek shores and in the Saxis marshes. Slows shore erosion of many counties bordering lower CB. Md.: (Patuxent R.), Benedict and Holland Cliffs, 10-17 ppt, RA.

Trisetum pennsylvanicum (L) Beauvois ex. R. & S. Three-bristle. Swamps, 4, 6, 36, AM. Open swamps, 6, common, EE. Beaverdam Swamp, 7, common; Causiac M., 20, MW, AH. Lanexa, 20, moist meadow, LL.

Zizania aquatica L. Wild Rice. Shallow water along streams and marshes, 7c, AM. Wild rice is now largely harvested by blackbirds in midsummer. Poropotank R., 7, 21, common; Whitestone, lake 2½ m. N., 10; Blackstump C., 19; PR, 22, Sweet Hall M.; MR, 22, below reservation; Hoskins Creek, 23, common, MW. JI, 19, shallow brackish marsh, LL. Md: (Upper Patuxent R.), 3 sites, freshwater, much decreased, RA.

Zizaniopsis miliacea (Michaux) Doell and Ascherson. Southern Wild Rice. Wet situations 37, AM. PR, Chandlers I., 20, Sweet Hall M. and White Landing 22. CR, 20, edge, MG. Md.: (Patuxent R.), Hills Bridge, RA.

#### Family Cyperaceae

Carex alata Torrey. Winged Sedge. Marshes and lowgrounds, 1-3 19, AM. JI, 19, brackish marshes, LL; flood plains, EE.

Carex albolutescens Schweinitz. Light-yellow Sedge. Wet soil, 1-3, AM (as C. longii). Poropotank R., 7, Starvation Pt., Tanyard Landing, Croaker Landing, 19; RR, 24, Drake Marsh, MW, AH. Lanexa, 20, moist meadow, MG. Wmbg., 19, common, EE. Md.: (Upper Patuxent R.), Lyons C., Mt. Calvert, RA.

Carex baileyi Britton. Bailey's Sedge. Swamps, 4, 13, 19, 38, AM. Beaverdam Swamp, 7, rare, MW, AH.

Carex blanda Dewey. Smooth Sedge. Lowgrounds, 13, 36-38, AM. Lanexa, 20, moist meadow, MG.

Carex bromoides Schkuhr. Oat Sedge. Swamps, moist woods, 15, 19 38, AM. Five Forks, 19, south in wooded floodplain, EE. CR, 20, moist edge, MG.

Carex comosa Boott. Long-haired Sedge. Swamps, 4, 19, 38, AM. Md.: (Upper Patuxent R.), Lyons C., Mt. Calvert, RA.

Carex crinita Lam. Bearded Sedge. Lowground, swamps, 19, AM. Wmbg., 19, sphagnum swamps, EE. Lanexa 20, moist meadow, MG. Causiac M., 20; Hoskins Creek, 23, MW, AH.

Carex decomposita Muhl. Swamp along College Creek, EE. Swamps, 13, 14, 19, AM.

Carex festucacea Schkuhr. Stalked Sedge. Wet woods, 4, 5, 19, AM. Beaverdam Swamp, 7, MW, AH.

Carex glaucescens Ell. Sedge. Wet soil and shallow water, 3, 4, 13, 18, AM.

Carex granularis Muhl ex Schkuhr. Lowgrounds, 38, AM. Beaverdam Swamp, 7, MW, AH.

Carex howei Mackenzie. Howe's Sedge. Swamps and wet thickets (no record), AM. Chisel's Run, 19, wooded swamp, EE: Ware Creek, southside, MG.

Carex hyalinolepis Steudel. Clear-scale Sedge. Shores and swamps, 15, AM. Beaverdam Swamp, 7; Drake Marsh, 25, MW, AH.

Carex incompta Bicknell. Bog Sedge. Swamps, peaty places, 19, AM. PR, 20, south of Cook landing, edge of lake, MG.

Carex intumescens Rudge. Wet soil, 19, 38, AM. SE of Ewell, 19, sphagnum swamp, EE.

Carex kobomugi Ohwi. Japanese Sedge. Coastal sand dunes, 3, AM. CI, colony about 30 ft. in diam. about 1/4 mile behind beach. Not seen since 1969, but obviously valuable in building secondary dunes, MW, AH.

- Carex lacustris Willd. Lake Sedge. Shallow water, swamps, 3, 38, AM. JI, 19, brackish margins, LL.
- Carex laevivaginata (Kukenth) Mackenzie. Smooth-sheathed Sedge. Wet woods, 3, 19, 38, AM. Beaverdam Swamp, 7, MW, AH. North of Wmbg., 19, wooded ravine, EE. Lanexa, 20, moist meadow, MG.
- Carex longii Mackenzie, Long's Sedge. Wet soil, 1-3, AM. JI, 19, roadside gully, MG.
- Carex lupulina Muhl. ex. Schkuhr. Hop Sedge. Wet woods, 3, 4, 19, 37, 38, AM. SE of Ewell, 19, sphagnum swamp, EE. Md: (Patuxent R.), Lyon's C., Mt. Calvert.
- Carex lurida Wahlenberg. Pale Sedge. Swamps, 2, 4, 13, 19, 36, AM. Beaverdam Swamp, 7, MW, AH. Wmbg. 19, along streams, common, EE; JI, wet pond bank, LL. Lanexa, 20, moist meadow, MG. Hoskins C., 23, MW, AH. Md.: (upper Patuxent), 3 sites, RA.
- Carex mitchelliana (M. A. Curtis) Gleason. Wet soil, low-grounds and swamps, 6, 14, 19, AM.
- Carex oxylepis Torr. & Hook. Sharp-scaled Sedge. Moist swamps, 19, AM. Beaverdam Swamp, MW, AH. Wmbg., 19, hardwood slope, EE.
- Carex projecta Mackenzie. Wet places, 38, AM. Beaverdam Swamp, 7, MW, AH.
- Carex reniformis (Bailey) Small. Swamps, 13, AM. Beaverdam Swamp, MW, AH.
- Carex rosea Schkuhr. Rosy Sedge. Woodlands, 3, 19, 36-38, AM. Beaverdam Swamp, 7, MW, AH. Lanexa, 20, moist meadow, MG.
- Carex scoparia Schkuhr. Dry soil (all other authors say swamps, etc.), 12, 19, 36, 38, AM. Wmbg., open swamps, common, EE.
- Carex seorsa Howe. Wet woods, 3, 13, 38, AM. Beaverdam Swamp, 7, MW, AH.
- Carex stipata Muhl. Crowded Sedge. Bottomlands 3, 4, 38, AM. Beaverdam Swamp, 7, MW, AH. CR, edge, 20, MG. Md.: (Patuxent R.), 3 sites, RA.
- Carex stricta Lam. Bunch Sedge. Wet soil and swamps, 1, 2, 36, 38, AM. Lanexa 20, moist meadow, MG.
- Carex typhina Michaux. Cattail Sedge. Lowgrounds 13, 17, 38, AM. JI, 19, shallow water in woods, MG.
- Carex venusta Dew. Charming Sedge. Boggy places, 13, 17, AM. CR, 20, edge, MG.
- Carex vulpinoidea Michaux. Fox Sedge. Moist lowgrounds, 12, 13, 38, AM. C1, 1; PI, 2; Beaverdam Swamp, 7; MW, AH. Wmbg., open swamps, EE.
- Cladium jamaicense Crantz. Saw Grass. Shallow water, low wet soil, 1-4, AM.
- Cyperus dentatus Torrey. Nutgrass. Wet shores and depressions, 3, AM.
- Cyperus engelmanni Steudel. Moist lowgrounds, 2, AM. Aquia C., 35, marsh by creek mouth, MW, AH.
- Cyperus erythrorhizos Muhl. Red-root Sedge. Moist soil, 3, 4, 38, AM. PR, Chandlers Is., 20, MW, AH.
- Cyperus esculentus L. Edible Nutgrass. Noxious weed, AM. Hoskins C., 23, on dike, MW, AH.
- Cyperus filicinus Vahl. Coastal marshes, wet sand, 1-3, 5, 7, 19, AM.
- Cyperus filiculmis Vahl. Dry soil, 3, 9, 13, 20, 38, AM. New Point I., 8, MW, AH.
- Cyperus flavescens L. Pale-yellow Sedge. 1-3, 9, 19, 38, AM. Wmbg., 19, railway ditch, EE.
- Cyperus grayii Torrey. Dry sandy places, 1-3, 12-14, AM. New Point I., 8, MW, AH. JI, 19, on sandy bank with Opuntia humifusa, LL.



- Cyperus lancastricensis Porter. Moist woods, 2, 4, 37, 38, AM. CR, 20, edge, Rte. 609 crossing, MG.
- Cyperus odoratus L. Scented Sedge. Moist wet soil, 3, AM. YR (Carter's Creek), 6, swamp; Jones' Mill Pond, EE (as C. perax). Rte. 627 railway crossing, 20, MG.
- Cyperus ovularis (Michaux) Torrey. Oval Sedge. Moist woods, 6c, AM. JI, 19, wet clay, LL.
- Cyperus pseudovegetus Steudel. Green Sedge. Wet soil, 1, 2, 19, 38, AM (as C. virens). Wmbg., 19, moist roadside, EE.
- Cyperus retrorsus Chapman. Reflexed Sedge. In clearings, 1-4, 13, 19, 38, AM. New Point I., 8, Hoskins C., 23, dredge spoil, common, MW, AH.
- Cyperus rivularis Kunth. Brook Sedge. Wet Places, 1-3, AM. Wmbg., 19, railway ditch, EE.
- Cyperus rotundus L. Round Sedge. Fields and waysides, 4, 5, 38, AM. CI, 1; New Point I., 8, MW, AH.
- Cyperus strigosus L. Skinny Sedge. Common weed in wet areas. Hoskins C., 23, peat dike, MW, AH.
- Dichromena colorata (L.) Hitchcock. White-topped Rush. Shores and marshes, 3, 7, 19, AM. College Creek, 19, swamp, EE.
- Dulichium arundinaceum (L.) Britton. Leafy Joint Sedge. Swamps and shores, 1-4, 10, 20, 35, 38, AM. CR (Lanexa) 20, flood-plain, EE. Hoskins Creek, 23, freshwater, MW, AH. Md.: (upper Patuxent R.), 3 sites.
- Eleocharis albida Torrey. White Spike-rush. Moist soil, 2, 3, 15, 23, AM. AI, 1, AH.
- Eleocharis compressa Sullivan. Shores and marshes. NE Virginia, AM. Chandler's I., 20, MW, AH.
- Eleocharis engelmanni Steudel. Marshes, 6, 15, 19, 38, AM. JI, standing water along road, LL.
- Eleocharis fallax Weatherby. Wet shores and marshes, 3, 4, AM. (E. ambigens). JR, 19, brackish marshes and shores, LL.
- Eleocharis obtusa (Willd.) Schultes. Blunt Spike-rush. Wet soil, 1, 10, 13, 19, 36-38, AM. Lake shore, 20, MG.
- Eleocharis palustris (L.) R. & S. Common Spike-rush. Wet shores, (no Va. coastal record), AM (as E. smallii). Md.: (Patuxent R.), 5 sites, RA.
- Eleocharis parvula (R. & S.) Link. Dwarf Spike-rush. Saline shores, 1-3, 12, AM. Starvation Pt., Beaverdam Swamp (lower end), 7, common; Megges Bay, mud flat, 9, MW, AB. YR, 6, Carters Creek, mud of salt marsh, EE.
- Eleocharis quadrangulata (Michaux) R. & S. Squarestem Spike Rush. Shallow water, 3, 4, 20, AM. Poropotank R., 7, MW. CR (Wilcox Neck), 19, river bank, EE.
- Eleocharis rostellata Torrey. Saline marshes, 3, AM. PR, Eltham Marsh, MG. Rare (Radford et al, 1968).
- Eleocharis tuberculosa (Michaux) R. & S. Swamps, wet places, 2-4, 19, 38, AM.
- Fimbristylis spadicea (L.) Vahl. Brown Fringe-sedge. Brackish shores, 1-3, 6, 23, AM. High marsh, esp. poor sandy areas, common; CI, 1; Goodwin I., 6; Poropotank R., Jenkins Neck, 7; Bethel Beach, New Pt. I., 8, MW.
- Fuirena pumila Torrey. Annual Umbrella-grass. Wet shores, bogs, 12, AM. Assateague Is., 1, AH.
- Fuirena squarrosa Michaux. Perennial Umbrella-grass. Wet places, 3, 12, 19, 38, AM. Wmbg., 5 m. west at sphagnum swamp, 19, EE (as F. hispida).
- Rhynchospora capitellata (Michaux) Vahl. Beak Rush. Moist lowgrounds, shores, 1, 2, 19, AM. Assateague Is., 1, AH. Low places in woods, 19, EE. Moist soil, 20, MG.
- Rhynchospora corniculata (Lam) Gray. Horned Rush. JI, 19, occasional, low marshy areas, LL. Swamps, wet waysides, 3, 4, 6, 17, AM.

Rhynchospora macrostachya Torrey. Wet, peaty places, 4, 17, 20, AM. CR (Lanexa), 20, swamp, EE.

Scirpus americanus Persoon. Common threesquare. Fresh to saline marshes, 1-3, 9, 12, 19, AM. CI, 1; Beaverdam Swamp (lower end), 7; New Pt. campground, 8; Chandler's I., 20, Occupacia Creek, 25; Aquia Creek, 34, MW, AB, AH. Queen's Creek, 6, tidal marshes, EE. JI, 19, brackish marshes and tidal shores, common, LL. Eltham Marsh, 20, MG. Md.: (Patuxent R.), Benedict, Holland Cliffs, lower mesohaline, RA.

Scirpus atrovirens Willd. Black Bulrush. Bogs, wet places, 13, 19, 36, 38, AM. Beaverdam Swamp, 7, MW, AH.

Scirpus cyperinus (L.) Kunth. Woolgrass. Wet places 1-3, 19, 35, AM. Chandlers Is., 20, MW, AH. Md.: (Upper Patuxent R.), 5 sites, RA.

Scirpus etuberculatus (Steud) Kuntze. Swamp Bulrush. Shores, marshes, 3, AM.

Scirpus fluviatilis (Torrey) Gray. River Bulrush. Along shores, 9, AM. Hoskins Creek, 23. Md.: (Upper Patuxent). Lyon's Creek, Mt. Calvert, RA.

Scirpus fontinalis Harper. Wet lowgrounds and seepage, 15, 19, AM. Beaverdam Swamp, 7, frequent at edge over disturbed marl, MW, AH.

Scirpus lineatus Michaux. Bulrush. Wet low areas, 6, 19, AM. Beaverdam Swamp, 7, MW, AH.

Scirpus olneyi Gray. Olney threesquare. Coastal, saline marshes, 1-3, 6, 19, AM. Starvation Pt., 7; Sweet Hall M., 22; Aquia Creek, 35; MW, AB. Tidal marsh, 19, Carter's Creek, EE. PR, 30, Chestnut Grove Farm, wet soil river's edge, MG. Md.: (Upper Patuxent R.) 6 sites, RA.

Scirpus robustus Pursh. Saltmarsh Bulrush. Coastal marshes, 3, 6, 14, 15, 38, AM. Md.: (Patuxent R.), Benedict, Holland Cliffs, RA. JI, 19, standing water of brackish marshes, LL. Hoskins Creek, 23; Beaverdam Swamp, 7, Carter's Creek, Tanyard Landing, Miller's Landing; YR, 6, Queen's Creek; Carter's Creek, EE.

Scirpus rubricosus Fern. Woolgrass. JI, 19, wet low-ground of brackish marshes, LL. Wet lowgrounds, swamps 3, 9, 19, 38, AM.

Scirpus validus Vahl. Great Bulrush. Shallow water, 1-3, 12, 19, 38, AM. Beaverdam Swamp, Miller's Landing, 7; Chandler's I., 20; Sweet Hall M., 22; frequent to abundant, MW, AB. College Creek, 19, swamp, EE. PR (Eltham M.), 20, MG. Md.: (Upper Patuxent) 4 sites, RA.

#### Family Araceae

Acorus calamus L. Sweet Flag. Marshes, 5, 8, 17, 36, AM. Md.: (Upper Patuxent), Hills Bridge, RA. Drake M., 25, MW, GM. Moist meadow, 20, MG.

Arisaema triphyllum (L) Schott. Jack-in-the-Pulpit. Moist, peaty soil in low woods, 3, 13, 17, 19, 38, AM. Beaverdam Swamp, 7, largest plants in low areas, MW. Moist soil in rich deciduous woods, 20, MG. JI, 19, one colony in damp depression of deciduous woods, LL.

Orontium aquaticum L. Golden Club. Wet soil along flood plains, bogs, 1, 2, 17, 19, 20, AM. PR, (White Landing), 22, common, MW. Moist floodplain, north side of Ware Creek, 20, MG. Md., (Upper Patuxent), Hills Bridge, RA.

Peltandra virginica (L) Kunth. Arrow-arum. Poropotank M., 7, common, MW. JI, 19, shallow brackish marsh, LL. CR, 20, marsh, MG. PR, 22, Lee and Sweet Hall M's., common to abundant, probably increasing, Hoskins Creek, 23, MW. Seeds of arrow-arum, know as "wampee duck-corn" float about in great quantities in fall and winter, but are apparently eaten frequently only by wood ducks.

Symplocarpus foetidus (L) Nutt. Skunk Cabbage. Marshes, moist meadows, 15, 18, 19, 31, AM. Beaverdam Swamp, 7, rare, MW.

Family Lemnaceae

Lemna perpusilla Torrey. Lesser Duckweed. Surface of still water, 1-3, 19, 38, AM (includes L. minor). Beaverdam Swamp 7, abundant on ponds and backwater, MW. JI, 19, brackish marsh, abundant, LL. CR, 20, MG.

Spirodela oligorrhiza (Kurtz) Hegelm. CR, 20, still water surface, MG. (Not listed by AM).

Spirodela polyrrhiza (L) Schleid. Greater Duckweed. Surface of still water and wet peat, 1-3, 10, 15, AM. JI, still water, brackish marsh, common, LL. CR, edge of Diascund Dam, MG.

Wolffia columbiana Karst. Water-Meal. Edge of Jone's Mill Pond, 6, AM. Small pond at Cheatham Annex, abundant, MW.

Wolffia papulifera C. H. Thompson. Surface of still water, 22, AM. JI, 19, swampy areas, occasional, LL.

Wolffia punctata Griseb. Still water, 2, 14, 15, 19, 22, AM. CR, 20, MG.

Wolffiella floridana (J. D. Smith) Thompson. Surface of still water, 2, 3, 15, AM. CR, still water at edge, MG.

Family Eriocaulaceae

Eriocaulon parkeri Robinson. Pipewort. Marsh mud, tidal flood plains, 1, 2, 12, 18-23, 36, AM. Chickahominy, EE.

Lachnocaulon anceps (Walt) Morong. Bogs, wet woods, 12, 14, 17, 19, AM. Chisel's Run, 19, sphagnum swamp, EE.

Family Commelinaceae

Aneilema keisak Hasskarl. On saline marshes, 15, 17, 18, 22-24, 26, AM. In low soggy ground bordering brackish marshes, rare, JI, 19, LL. Marsh on Diascund Creek, 20, MG. PR (West Island Swamp), 20, abundant, MW, GM. (Massey's habitat designation is likely in error.

Family Pontederiaceae

Heteranthera reniformis R. and P. Mud Plantain. Mud, Chickahominy; Jones' Mill Pond, EE. Shallow water, mud, 17, 19, 38, AM.

Pontederia cordata L. Pickerel-weed. Shallow water, muddy shores, 7c, AM. Abundant, especially in oligohaline and fresh marshes; Poropotank Creek, 7; Sweet Hall M., 22; Hoskins Creek, 23; Aquia Creek, 35, MW. Wmbg., College Creek, common, EE. Md: (Upper Patuxent) 5 sites, RA.

Family Juncaceae

Juncus acuminatus Michaux. Wet soil near streams, 1-3, 17, 19, 38, AM. Wmbg., 19, moist ground, EE. JI, 19, wet, often flooded area, LL. Hoskins Creek, 23, MW, AH.

Juncus balticus Willd. Baltic Rush. Smith I., 2, JC. Only Va. record.

Juncus biflorus Ell. Wet meadows, swamp edges, 1-3, 13, 17, AM. Assateague I., 1, AH. Cedar I., 1, MW, AH. JI, 19, moist lowground in pines; brackish margin, LL.

Juncus bufonius L. Toad Rush. Wet situations, 3, 19, 38, AM. Assateague I., 1, AH. Parramore I., 1, near old Coast Guard station, MW, AB. Wmbg. 19, wet roadsides, EE.

Juncus canadensis J. Gay ex. La Harpe. Canada Rush. Swampy places, 3, 4, 19. Assateague I., 1, AH. West of Wmbg, 19, swamps, EE.

Juncus coriaceus Mackenzie. Juncus debilis Gray. Wet peaty open woods, 1, 2, 4, 19, AM. West of Wmbg., 19, wet soil, EE.

Juncus effusus L. Soft-rush. Meadows, wet places, 3, 4, 12, 19, AM. Locustville, 1, Beaverdam Swamp, 7; Poropotank M., 7, AB; JI, 19, brackish marsh, LL. Moist meadow, 20, MG. Hoskins Creek, 23, MW, AH. Nomini Creek, 3rd bridge, 25, MW, AH.

Juncus elliotii Chapman. Wet shores, low places, 3, 17, AM. Near Wmbg., 19, swamp, EE. Moist ravine, 20, MG.

- Juncus gerardi Loisel. Black Grass. Saline marshes, 1-3, 38, AM. Parramore I., 1; Croaker Landing, 19; Poropotank C., 7; MW, AH. PR(Eltham Marsh), 20, MG. Md: (Patuxent R.) Benedict, RA.
- Juncus griscomi Fernald. Wet woods, 3, 19, AM. Beaverdam Swamp, 7, MW, AH.
- Juncus roemerianus Scheele. Black Needle-rush. Saline marshes, 2, 3, 15, AM. Parramore I., 1, large enclaves in marshes, AH. Hampton, Grandview Park, abundant; Poropotank R., Tanyard Land., 7, abundant; Bethel M., 8, New Point I; Piscataway Creek, 25, MW, AB.

## Family Lilaceae

- Asparagus officinalis L. Frequent in mesohaline marshes; burning of which is said to facilitate gathering of asparagus.
- Lilium superbum L. Turks-cap Lily. Woods and wayside, 7c, AM. Long Hill, 19, wooded swamp; CR, Lanexa, 20, swamp, flood plain, EE. Rare, seen in only one creek marsh, MW.
- Smilax bona-nox L. 1-4, 17, 19, AM. Parramore I., common in thickets, MW, AB. Smith I., 2, JC, GM.
- Smilax glauca Walter. Waste places, common, AM. MR, shore below reservation, MW, GM.
- Smilax hispida Muhl. Hairy Greenbriar. Wet woods and swamps, 37, 38, AM (as S. tamnoides). JI, 19, margin of brackish marsh, scarce, LL (as S. tamnoides).
- Smilax laurifolia L. Big-leaf Greenbriar. 3, 4, 17, 19, AM. Queen's and Carter's Creeks, 6, marsh edges, EE. PR (Cohoke Swamp), 22, frequent, MW.
- Smilax rotundifolia L. Common Greenbriar. Moist thickets, common, AM. Parramore I., 1, MW, AB. JI, 19, moist areas, common, LL. Edge of Diascund Dam, 20, MG.
- Smilax tamnifolia Michaux. Carrion-flower. Boggy places, 3, 18, 19, AM. Longhill, 19, sphagnum swamp, EE.
- Smilax tamnoides L. China Root, Hellfetter. Wet woods, swamps, 37, 38, AM. JI, 19, occasional, lowground margins of brackish marshes, LL.

## Family Dioscoreaceae

- Dioscorea villosa L. Wild Yam. Moist woods, wet places, 6c, AM, (incl. D. hirticaulis and quaternata). Longhill, 19, sphagnum swamp, EE. Hoskins Creek, 23, tussock in freshwater marsh, MW.

## Family Iridaceae

- Iris prismatica Pursh. Slender Blue Flag. JI, 19, lowground, rare, LL. Swamps, boggy areas, 37, 38, AM.
- Iris pseudacorus L. Yellow Flag. Wet peaty soil; shallow water, 6, 37, 38. Beaverdam Swamps, 7, few large clumps, tidal fresh sector, MW. CR (Dillon's Lndg.), 20, MG.
- Iris versicolor L. Blue Flag. Ditches, marshes, shallow pools, 1, 2, 19, 37, 38, AM. Open swamps, 19, common, EE.
- Iris virginica L. Southern Blue Flag. Wet soil, shallow pools, 3-5, 12-14, 19, AM. Beaverdam Swamp, 7, lower end, frequent clumps; PR(Chandler's I.), scarce; RR(Drake M.), 25, MW. JI, 19, wet brackish marsh, low swamps, LL.
- Sisyrinchium angustifolium Miller. Blue-eyed Grass. 8c, AM. Parramore I., MW, AB. JI, 19, common, LL. Lanexa, 20, moist meadow, MG.
- Sisyrinchium mucronatum Michaux. Meadows, 6c, AM (including S. atlanticum). SI, 2, JC (as S. atlanticum).

## Family Orchidaceae

- Habenaria ciliaris (L.)R. Brown. Yellow Fringed-orchid. Moist places, 12, 16, 17, 19, AM. West of Wmbg., 19 sphagnum swamps, EE.
- Habenaria cristata (Michaux) R. Brown. Crested Fringed-orchid. Chisel's Run, Sphagnum, magnolia swamp, EE.
- Habenaria lacera (Michaux) R. Brown. Green Fringed-orchid. Open swamps, marshes, 3, 19, 31, 37, AM. Longhill, 19, swamp, EE. PR (Causiac M.) 20, rare, MW.
- Habenaria repens Nuttall. Water-spider Orchid. CR, 19, wooded swamp, EE. (Not listed by Massey or Gleason).

- Pogonia ophioglossoides (L) Ker. Rose Pogonia. Meadows, swamps, 3, 4, 17, 19, 20, AM. Chisel's Run, 19, sphagnum swamp.
- Spiranthes cernua var. odorata (Nuttall) Correll. Marsh Ladies' Tresses. Wet soil at margin of brackish marshes, 19, rare, LL.
- Spiranthes praecox (Walter) Watson. Grass-leaved Ladies' Tresses. Wet soil, 7, 16, 20, 24, AM. 20, moist meadow, MG.
- Family Saururaceae
- Saururus cernuus L. Lizard's Tail. Swamps, seepage areas, 9 c, AM. Poropotank M., 7, JK. Beaverdam Swamp, 7, abundant, MW. PR (West I. Swamp), 20, abundant, MW. 19, shaded swampy areas, abundant, EE.
- Family Salicaceae
- Populus deltoides Marsh. Cottonwood. Along streams and swamp borders, 3, 15, 19, 36, AM. CR, 20, edge of river, MG.
- Salix nigra Marshall. Black Willow. Shores and wet lowgrounds, frequent, AM. Beaverdam Swamp, 7, abundant, MW. New Point, 8, MW. JI, 19, marsh borders, LL. CR(Dillon's Landing), 20, MG. Likely in all counties, MW.
- Salix sericea Marshall. Silky Willow. Shores, lowgrounds, 4, 37, AM. Toe Ink Wayside, 20, moist soil, MG.
- Family Myricaceae
- Gale palustris (Lam.) Chev. Sweet Gale. Wet situations, Va. in range, AM. Md.(Upper Patuxent), 3 sites, RA, (as *Myrica gale*).
- Myrica cerifera L. Wax Myrtle. Moist to wet soil, 1-3, 18, 21, AM. ES, probably all barrier islands: Assateague I., 1, stable dunes, AH. Cedar I., 1, MW. Parramore I., 1, Pinus juniperus community, AH. Hog I., 2, GM. Smith I., 2, JC. Grandview, 5, abundant, OD. Ware Pt., 7, abundant, New Point I., 8, Hoskins Creek 23, MW. JI, 19, along brackish marshes, abundant, LL. Now widely used as an ornamental.
- Myrica pennsylvanica Loisel. Bayberry. Infertile coastal sands, 1-3, AM. Cedar I., 1; Assateague I., 1, stable dunes, AH.
- Family Betulaceae
- Alnus serrulata (Aiton) Willd. Tag Alder. Stream banks, brushy swamps, probably all counties, MW. Beaverdam Swamp, 7, common, MW. JI, 19, sandy shore, rare, LL. CR, 20, wet bank, MG. PR (West I. Swamp), common, MW.
- Betula nigra L. River Birch. Along streams, 37, AM. Beaverdam Swamp, 7, common, decreasing, MW. Queen's Creek, Jones' Mill Pond, 19, rare (two trees), EE.
- Carpinus caroliniana Walter. Ironwood, Musclewood. Streams, low woods, 3, 19, AM. Beaverdam Swamp, 7, abundant, MW.
- Family Fagaceae
- Quercus michauxii Nuttall. Swamp Chestnut Oak. Swamps, AM. PR (West I. Swamp), 20, frequent near edge, MW. CR (edge), 20, MG.
- Quercus nigra L. Water Oak. Lowgrounds, 1-3, 13, 17, 20, AM. Beaverdam Swamp, 7, common, MW. Diascund Creek, 20, marsh edge, MG.
- Quercus palustris Muenchh. Pin Oak. Moist to wet woods, 1, 2, 18, AM. Swampy flood plain, 18, EE. JI, 19, occasional near marshes, LL. Mesic woods, 20, MG.
- Quercus phellos L. Willow Oak. Lowgrounds, 1-3, 12, 17, 19, AM. Beaverdam Swamp, 7, common, largest tree in swamp. JI, 19, moist areas bordering marsh, common, LL. JI, 19, moist areas bordering marsh, common, LL. PR, edge of Eltham M., 20, lowground, MG.
- Quercus virginiana Miller. Live Oak. Light soil along the coast 2, 3, 5, 19, AM. New Point, 8, campground and island, MW. The disjunct population in Mathews Co. is the northern limit. Record for Northampton was probably a waif (fide AH). Record for James City Co. was a large tree on Wm. & Mary campus. Species now widely planted in coastal Va.
- Family Ulmaceae
- Ulmus americana L. White or American Elm. Along streams, 1-3, 14, 19, 20, AM. Beaverdam Swamp, 7, common, MW. JI, 19, fairly common, lowground bordering marshes, LL. CR, edge of river, 20, MG.

Ulmus rubra Muhl. Slippery Elm. Mesic soil, 3, 14, 15, 17, 19, AM. Beaverdam Swamp, rare, MW. JI, 19, low woods bordering marsh, scarce, LL.

Family Urticaceae

Boehmeria cylindrica (L) Swartz. False Nettle. Moist soil, 1, 2, 13, 19, 37, AM. Cedar I., 1, swale, MW. Yorktown Creek M., 6, MW, GM. JI, 19, marsh border common, LL. MR, below reservation, 22; Hoskins Creek, 23, MW, GM. Md:(Upper Patuxent), 6 sites, RA.

Pilea pumila (L) Gray. Clearweed. Moist woods, thickets, 1, 2, 19, AM. Wmbg., 19, shaded lowground, EE. Md.(Upper Patuxent), 3 sites, RA.

Family Loranthaceae

Phoradendron serotinum (Raf.) M. C. Johnston. Mistletoe. Parasite of deciduous trees, 1-3, 12, 19, AM (as P. flavescens). Causiac M., 23, rare, MW.

Family Polygonaceae

Polygonum arifolium L. Halberd-leaved Tearthumb. Marshes, 1, 2, 17, 20, 36, AM. JI, 19, marsh margins, occasional, LL. Blackstump Creek, 19; Chandler's I., 20, frequent, Causiac M., 20, common; Sweet Hall M., 22, abundant; below Mattaponi Reservation, 22; Hoskins Creek, 23, common; Aquia Creek, 35, MW. Md:(Upper Patuxent), 5 sites, RA.

Polygonum densiflorum Meissner. Dense-flowered Smartweed. Wet woods, shores, 3, 15, 19, AM. Mill Creek Pond (edge), 19, EE.

Polygonum glaucum Nuttall. Glaucus Smartweed. Moist saline soil, 1-3, AM. Assateague I., 1, AH.

Polygonum hydropiperoides Michaux. Water Smartweed. Shallow water and wet soil, 1-3, 19, 35, AM. CR, 20, edge of marsh, MG.

Polygonum hydropiperoides var. opalosanum (Riddell ex Small) Stone. Shallow water, swales, 7, AM. JI, 19, low brackish marshes, occasional, LL (as full species).

Polygonum lapathifolium L. Wet thickets, shores, 19, 36, AM. Causiac Marsh, 20, GAM.

Polygonum pennsylvanicum L. Moist disturbed soil, throughout, AM. Poropotank R. (Tanyard Lndg.), 7, common, GAM. Hoskins C., 23, spoil dike, MW, AB.

Polygonum punctatum Ell. Punctate Smartweed. Swamps, wet areas, 1-3, 16, 19, AM. Carters' C., 7; Blackstump Creek, 19; Causiac M., 20; below Mattaponi Res., 22; Hoskins C., 23, Mt. Landing C., 23; MW, AB. JI, 19, brackish marsh, occasional, LL. Md: (Holland Cliffs), 6-9 ppt., IX-64; (Upper Patuxent), 5 sites, RA.

Polygonum sagittatum L. Arrow-leaved Tearthumb. Moist soil, 1-3, 13, 17, 20, 36, AM. Chamberlayne Pt., 20; Lester Manor, 22; Hoskins Creek, 23, MW, GAM. JI, 19, occasional, LL. Sphagnum-magnolia swamp, 19, EE. Md: (Upper Patuxent), 5 sites, RA.

Rumex acetosella L. Sheep Sorrel. Common weed, AM. Parramore I., 1, MW, AB.

Rumex conglomeratus Murray. Waste places, 3, 19. ES (Locustville M.), 1, MW, AB. Beaverdam S., Poropotank M., 7, Croaker Lndg., 19, MW, GAM.

Rumex crispus L. Waste places, 1-3, 19, 38, AM. Locustville, 1; Starvation Pt., 7; Hoskins C., 23, MW, AB.

Rumex verticillatus L. Swamp Dock. In swamps, 1, 3, 19, 24, 28, AM. Poropotank R., Beaverdam Swamp, Carter's C., 7; Causiac M., 20, Hoskin's C., 23, MW, AB. JI, 19, brackish marsh ooze, LL. Md: (Upper Patuxent), Magruder Lndg., Lower Marlboro, RA.

Family Chenopodiaceae

Atriplex patula L. Sparscale. Coastal marshes, rich soil, 7c, AM. CI, swale, GAM. Grandview 5, rare, OD; Goodwin I., Yorktown C., 6, abundant, MW. Wate's Pt., 7, marsh, AH. New Point, 8, Hoskins C., 23, MW. Md: (Upper Patuxent), 2 sites, RA.

Chenopodium ambrosioides L. Mexican Tea. Waste lands, 13, 17, AM. AI, 1, AH. SI, 2, JC. New Point I, 8, MW, GAM.

- Salicornia europaea L. Glasswort. Salt marshes and flats, 1-3, 8, 9, 19, 20, AM. PI, 1, AH. SI, 2, JC. Hog I., 2; Goodwin I., 6; Catlett I., 7; New Point, 8; Croaker Lndg., 19, MW, GAM.
- Salicornia virginica L. Saltwort. Salt marshes, 1, 2, AM. AI, 1; PI, 1, AH. Hog I., 2; Goodwin I., 6; Robin's Neck, 7; MW, GAM.
- Salsola kali L. Russian Thistle. Sandy shores, 7c, AM. AI, 1; PI, 1, one of sand dune dominants, AH. CI, 1; Hog I., 2, GAM. SI, 2, JC. New Point, 8, MW.
- Suaeda linearis (Ell.) Mog. Sea Blite. Coastal sand, Va. in range, AM. AI, 1; Bailey's Beach, 7, marsh behind beach, AH.
- Suaeda maritima (L.) Dum. Sea Blite. Coastal salt marshes, AM. Grandview Preserve, 5, rare, OD.
- Family Amaranthaceae
- Amaranthus cannabinus (L.) J. D. Sauer. Water Hemp. Salt marshes, 9 c, AM (as Acnida canabina). Poropotank M., 7; Blackstump C., 19, Hoskins C., 23, MW, GAM.
- Family Phytolaccaceae
- Phytolacca americana L. Pokeberry. Common weed, AM. SI, 2, JC. Common on dikes and spoil banks, MW.
- Family Aizoaceae
- Mollugo verticillata L. Carpet-weed. Common weed, AM. AI, 1, AH. Grandview Preserve, 5, rare, OD.
- Sesuvium maritimum (Walter) BSP. Sea Purslane. Moist sand near coast, 3, AM. AI, 1, AH. New Point, 8, MW, GAM.
- Family Caryophyllaceae
- Spergularia marina (L.) Grisebach. Sand Spurrey. Saline soil, 3, 19, AM. AI, 1, AH. PI, 1, GAM.
- Family Ceratophyllaceae
- Ceratophyllum demersum L. Coontail. Ponds, quiet water, 3, 28, 37, 38, AM. Beaverdam Swamp, abundant in sunlit creek, MW. CR, 19, shallow water at Dillon's Lndg, MG. Piscataway Creek, 23, MW.
- Family Nymphaeaceae
- Nuphar luteum (L) Sibthorp & Smith. Spatterdock, Yellow Pond Lily. Swamps, ponds and along shores, 6c, AM (as N. advena). CR, 20 Diacund C., MG. PR, 20, Chandler's I.; MR, 22, below reservation; Hoskins C., Piscataway C., 23; Aquia C., 35; perhaps most abundant emergent plant in tidal fresh water, MW.
- Family Nelumbonaceae
- Nelumbo lutea (Willd.) Persoon. Lotus Lily. Quiet water, 3, AM. Occoquan C., 36, Conrad I., one colony X-71, MW.
- Family Cabombaceae
- Brasenia schreberi Gmelin. Water Shield. Quiet water; sluggish streams, 17, 37, AM. Roadside pond below Kilmarnock, 10, MW. CR, 20, shallow water Dillon's Landing, MG.
- Family Ranunculaceae
- Ranunculus abortivus L. Kidney Leaf Buttercup. Weed, 6c, AM. Beaverdam Swamp, 7, scarce, MW, AH. JI, 19, moist soil in woods, rare, LL. Wmbg., 19, wooded flood plain, EE.
- Ranunculus pusillus Poir. Low Spearwort. Swamps, wet waysides, 3-5, 37, AM. Beaverdam Swamp, 7, common, MW, AB. Lanexa, 20, moist meadow, MG. JI, 19, wet ground of often flooded meadow, occasional, LL.
- Ranunculus scleratus L. Cursed Crowfoot. Wet soil or shallow water, 1, 2, 4, 19, 37, AM. PI, 1, roadside, MW, AB. JI, 19, in wet soil or standing water, occasional, LL. PR, Eltham M., 19, wet edge, MG.
- Ranunculus septentrionalis Poir. Northern Buttercup. Moist soil near streams, 6, 14, 19, 37, AM. Cohoke Swamp, 22, in flower, IV-69, scarce, MW.
- Thalictrum polygamum Muhl. Meadow Rue. Moist meadows, swamps, 15, 19, 20, 37, AM. Beaverdam Swamp, 7; below Mattaponi Reservation, 22, MW, GAM.
- Thalictrum revolutum DC. Woods and thickets, 3, 15, 19, 38, AM. Wmbg., 19, shell marl banks, EE. Hoskins C., 23, marsh, MW, GAM.

- Magnolia virginiana L. Sweet Bay. Moist to wet places, general in Coastal Plain, AM. Swampy ground west of Wmbg., 19, and near YR, EE. Diascund Creek, woodland border, MG.
- Family Lauraceae
- Lindera benzoin (L.) Blume. Spicebush. Lowgrounds and along streams, 1, 2, 19, 38, AM. Beaverdam Swamp, 7, common, MW. Poropotank R., 7, 21, JK. JI, 19, moist shady woods, rare, LL.
- Persea borbonia (L.) Sprengel. Red Bay. Moist woods along shores, 2-4, 12, 19, AM. Edge of brackish marshes, common, LL. PI, 1, common in low woods, MW, AH. SI, 2, JC.
- Family Brassicaceae
- Cakile edentula (Bigelow) Hooker. Sea Rocket. Coastal sand, 1, 2, 3, 7, AM. ES, outermost plant of barrier island beaches in summer; only plant numerous on new island at Dawson Shoals. VIMS beach, 7, occasional; New Point I., 8, common, MW.
- Cardamine bulbosa (Schreb.) BSP. Swamp Bittercress. Wet meadows and woods, 6, 13, 19, 36, 37, AM. Swampy floodplains, Drake M., 25, MW, AB.
- Cardamine pennsylvanica Muhl. Bittercress. Dry situations, 16, 19, 37, AM. Wet soil of stream bottom in mesic woods, 20, MG.
- Lepidium virginicum L. Poor-man's pepper. Common weed, AM. Smith I., 2, JC.
- Family Sarraceniaceae
- Sarracenia purpurea L. Bogs, wet peaty places, 3, 17, 19, AM. Chisel's Run, 19, swampy woods, rare, EE.
- Family Saxifragaceae
- Itea virginica L. Virginia Willow. Swamps, along brooks, 11c, AM. Sphagnum swamps, 19, EE. CR, 20, wet soil of bank, MG.
- Parnassia asarifolia Vent. Wmbg., marsh at Elko, 19, EE. (Coastal record not accepted by Massey).
- Saxifraga pennsylvanica L. Wmbg., swampy flood-plains, 19, EE. (Only coastal record).
- Family Hamamelidaceae
- Liquidambar styraciflua L. Sweet Gum. Lowground woods. Common swamp and upland trees. Most sought, and often girdled, by beavers; hence decreasing along tidal fresh creeks. Abundant in all coastal counties.
- Family Platanaceae
- Platanus occidentalis L. Sycamore. Lowgrounds, near streams. Scarce to common in flood plain swamps. Decreasing, large trees sought by lumbermen; many killed by flooding from beaver dams. Probably swamp tree most used by great blue herons, wood ducks, and pileated woodpeckers for nest sites and by raccoons for den sites. Wmbg., 19, occasional, EE.
- Family Rosaceae
- Crataegus viridis L. Hawthorne. Low wet woods, 1-3, AM. PR, 20, low wet edges of woods, MG.
- Geum canadense Jacquin. Avens. Open woods, borders, 6c, AM. Beaverdam Swamp, 7, MW, wooded floodplains, 19, EE. Md.:(Patuxent), Lyon's Creek, Mt. Calvert, RA.
- Prunus americana Marshall. Wild Plum. Woodland borders, 12, 19, 36, 37, AM. Dragon Run Swamp, (lower end), 7, 9, frequent on banks; West I. Swamp, 20, occasional, MW.
- Rosa palustris Marshall. Swamp Rose. Wet thickets, meadows, widespread, 12c, AM. Poropotank M., 7; JI, 19, common in brackish marshes along shores of Back River, Cohoke Swamp, 22, LL. Hoskins Creek, 23, MW. Md.:(Upper Patuxent), RA.
- Family Fabaceae
- Aeschynomene virginica (L.) BSP. Coastal flood-plain marshes, shores of fresh to brackish water, 15, 17, 20, 22, 23, AM. 21, 3rd marsh on right, MR.
- Amphicarpa bracteata (L.) Fernald. Hog Peanut. Damp thickets, 7c, AM. CI, 1, south end, swale, MW, GAM.



Cassia fasciculata Michaux. Partridge Pea. Lighter soils, 15c, AM. AI, 1, AH. Grandview Preserve, 5, rare, OD. Moist soil near Rumley Marsh, 20, MG. Chandlers I., 20, MW.

Centrosema virginianum (L.) Benth. Butterfly Pea. Dry sandy thickets, 9c, AM. AI, 1, AH; JI, 19, sandy banks of JR, LL.

Mellilotus officinalis (L) Lam. Yellow Sweet Clover. Roadsides, 5c, AM. CI, 1, abundant at old Coast Guard Station.

Strophostyles helvola (L.) Ell. Dune Bean. Sand of high or inner beaches, 6c, AM. CI, 1, GAM. Grandview Preserve, 5, rare, OD.

Strophostyles umbellata var paludigena Fern. Marsh Bean. Hog I, 2, GAM. SI, 2, JC. Fresh to brackish tidal marsh 18-20, AM. PR(Chandlers I.), 20, MW, GAM.

Trifolium dubium Sibth. Dry places, 3, AM. SI, 2, JC.

Trifolium repens L. Wide spread, 3, 6, 18, 19, AM. PI, 1, GAM.

Vicia angustifolia Reichard. Roadsides, 3, 19, 36, 38, AM. SI, 2, JC.

#### Family Linaceae

Linum virginianum var. medium Planchon. Low places, 6c, AM. CI, 1, swale at south end, GAM.

#### Family Geraniaceae

Geranium carolinianum L. Waste places, 3, 4, 19, 25, 38, AM. SI, 2, JC.

#### Family Rutaceae

Xanthoxylum clava-herculis L. Hercules'-club. Woods and thickets, 7c, AM. SI, 1, JC.

#### Family Polygalaceae

Polygala mariana Mill. Moist situations, 1-4, 19, AM. JI, 19, rare, LL. Edge of Diascund Dam, 20, MG.

#### Family Euphorbiaceae

Euphorbia maculata L. Wartweed. Weed in waste places, 5c, AM. Grandview Preserve, 5, rare, OD.

Euphorbia polygonifolia L. Spurge. Moist coastal beaches, dunes, 7c, AM. CI, 1; New Point, 8, GAM.

#### Family Callitrichaceae

Callitriche heterophylla Pursh. Water Starwort. Shallow, quiet water, margin of sluggish streams, 1-4, 19, 31, AM.

#### Family Anacardiaceae

Rhus copallina L. Dwarf Sumac. Throughout, AM. SI, 2, JC. Grandview Preserve, 5, rare, OD.

Rhus radicans L. Poison Ivy. Throughout, AM. Beaverdam Swamp, 7, abundant, forming vines to near 3 in. diam. and 50 ft. long. Common in all freshwater marshes transitional to swamps. Greatest development in ash, birch and gum swamps, where its berries are preferred by birds. Adventitious mass of rootlets appressing vines to trees is perhaps as toxic as the leaves are.

Rhus vernix L. Poison Sumac. Wet swampy places, along streams, 17, 19, AM. Longhill, 19, sphagnum swamp, locally abundant, EE.

#### Family Aquifoliaceae

Ilex opaca Aiton. Holly. Moist woods and open lowground, 10c, AM. SI, 2, JC.

Ilex verticellata (L) Gray. Winterberry. Along margin of streams; swamp places, 3, 19, 20, AM. Poropotank M, Beaverdam Swamp, frequent, MW.

Ilex vomitoria Aiton. Yaupon. Sandy soil near coast, 2, 3, AM. SI, JC.

#### Family Staphyleaceae

Staphylea trifolia L. Moist woodland borders and thickets, 15, 19, 36, 37, AM. Wmbg., Jones' Mill Pond, 19, EE.

#### Family Aceraceae

Acer rubrum L. Red or Swamp Maple. Moist woods, swamps; common over entire state, AM. Md:(Upper Patuxent), Lyon's Creek, Mt. Calvert, RA. JI, 19, low moist ground along marshes, common, LL. Hoskins Creek, 23, MW. The red maple is the most water tolerant and often most abundant of the deciduous swamp trees.

## Family Balsaminaceae

Impatiens capensis Meerb. Spotted Touch-Me-Not, Jewelweed.  
Swamps, wet soil, 8c, AM. Beaverdam Swamp, 7, abundant, MW.  
JI, 19, common, LL. Edge of Diascund Dam, 20, MG. Hoskins  
Creek, 23. Md:(Upper Patuxent), 3 sites, RA. Likely in all  
counties, wherever freshwater surfaces.

## Family Rhamnaceae

Berchemia scandens (Hill) K. Koch. Supple-jack, Rattan Vine. Wet  
to swampy situations, climbing into trees, 1-4, 15, AM. AI, 1,  
"maple-water oak-black gum" swamp, AH. CI, PI, MW, AH. JI, 19,  
occasional near marsh edges, LL.

## Family Vitaceae

Parthenocissus quinquefolia (L.) Virginia Creeper. CI, 1, MW.  
Less common in swamps than is poison ivy.

Vitis aestivalis Michaux. Summer Grape. Low woods & stream banks.  
MR, 22, below Mattaponi Res., GAM.

Vitis rotundifolia Michaux. Muscadine. SI, 2, JC, CR, 20, MG.

Vitis vulpina L. Frost Grape. Lowground thickets and stream banks,  
llc (none bordering CB or seacoast ), AM. SI, 2, JC.

## Family Malvaceae

Hibiscus moscheutos L. (Incl. ssp. palustris) Marsh Hibiscus.  
Marshes, 1-3, 17, 19, AM. Carter's Creek, 7; Croaker Landing,  
19, EE. JI, 19, brackish marshes, common, LL. Chandlers I., 20;  
CR (Diascund Dam), 20, MG; MR, 3rd marsh on right, 9 miles up  
river, 21, Hoskins Creek, 23, Aquia C., 35, EE. Md.:(Patuxent R.)  
4 sites, to 13 ppt, RA.

Kosteletskyia virginica (L) Presl. Seashore Mallow. Saline to  
brackish marshes and shores, 1-4, 6, 10, 18, 19, AM. CI, 1, rare;  
Tanyard Landing, 7; Piankatank R, 9; Croaker Lndg. 19, MW. JI, 19,  
fairly common, brackish marshes, LL. PR (Sweet Hall M), 22,  
common, MW.

## Family Hypericaceae

Hypericum dissimulatum Bickn. Moist sand ,14, 17, AM. Md:(Patuxent  
R.), fresh marsh, RA.

Hypericum gentianoides (L.) BSP. Waste places, 3, 16, 17, 19, AM.  
AI, 1, AH.

Hypericum mutilum L. St. John's Wort. Moist situations, 8c, AM.  
AI, 1, AH. JI, 19, occasional, Chandler's I., 20. Edge of  
Diascund Dam, 20, MG.

Hypericum virginicum L. Marsh St. John's Wort. Bogs, swamps, 3,  
19, 35, AM. AI, 1, AH. Yorktown Creek M., 6, GAM.

## Family Tamaricaceae

Tamarix gallica L. Tamarisk. Not in Massey. Gloucester Pt.,  
one tree by bridge, GAM. Jenkins' Neck, large stand along YR  
shore on sand beach, 7, MW. This salt tolerant shrub seems to  
have an obvious potential for controlling beach erosion.

## Family Cistaceae

Helianthemum canadense (L) Michaux. Frostweed. Sand dunes, 1, 3,  
4, AM. AI, 1, AH.

Hudsonia tomentosa Nuttall. Beach Heather. Coastal sand and dunes,  
1-4, AM. AI, 1, AH. JI, 19, low dunes, shores of James, occasional,  
LL.

## Family Cactaceae

Opuntia compressa (Salisbury) Macbride. Prickly Pear. CI, 1, north  
end, small patches among back dunes, MW. PI, 1, frequent but  
isolated plants, apparently heavily cropped by deer, MW. Myrtle  
I, 2, north end, one large clump in swale, MW. Smith I., 2, JC.

## Family Lythraceae

Decodon verticillatus (L) Ell. Water Willow. Swamps, along streams,  
1-3, 6, 9, 38, AM. JI, 19, shallow water of marshy area, rare, LL.  
Wmbg., Jones' Mill Pond, EE. Md: (Upper Patuxent), fresh marsh, RA.

Lythrum lineare L. Loosestrife. Coastal marshes, 3, 6, 15, 19, 24, AM.  
JI, 19, 24, AM. JI, 19, edge of brackish marsh, rare, LL. YR, salt  
marshes, 19, EE. Piscataway Creek, 23, 2 miles from mouth, MW, GAM.  
Md:(Patuxent R.), Benedict, to 14 ppt, RA.

Lythrum salicaria L. Purple Loosestrife. Wet meadows, floodplains, 38, AM. Edge of Diascund Dam, 20, MG. Md: (Patuxent R.) fresh marsh, 1 site, RA.

Family Melastomataceae

Rhexia mariana L. Meadow Beauty. Moist coastal sand, 1, 3, 4, 19, AM. Moist soil on roadside, 20, MG.

Rhexia virginica L. Meadow Beauty. Wet to moist places, 9c, AM. AI, 1, AH. Sandy swamps throughout Peninsula, EE.

Family Onagraceae

Ludwigia alternifolia L. Seedbox. Moist situations, 10c, AM.

JI, 19, occasional, Wmbg., 19, wet woods, EE. Diascund Creek M., 20, MG. Md: (Patuxent), fresh marsh, RA.

Ludwigia palustris (L) Ell. Water Purslane. JI, 19, wet soil of low meadow, rare, LL. Wmbg. mud flat around pond, 19, EE.

Diascund Creek M., 20, MG. Md: (Patuxent R.), fresh marsh, RA.

Oenothera humifusa Nuttall. Evening Primrose. Coastal sands, 3, 13, AM. CI, 1, low dunes, common, in bloom 6-VI-69, MW, AB.

Oenothera laciniata Hill. Sandy soil, common 4c, AM. SI, 2, JC.

Oenothera perennis L. Sundrops. Open ground, 19, AM. CI, 1, wet swale, partly shaded, rare (1 clump), in full bloom, 6-VI-69, MW, AH.

Family Haloragaceae

Myriophyllum brasiliense Camb. Parrot-feather. Aquarium plant which escapes to ponds, 19, AM. CR, 20, shallow water, MG.

Myriophyllum spicatum L. Eurasian Water Milfoil. Not in Massey.

This aquatic weed became a major pest in tidal tributaries of the Potomac R. in the early 60's (Haven, 1964). Within the last five years it has become the dominant plant in Back Bay. It's waterfowl value is debateable, but it seems to have some value in controlling turbidity in Back Bay (Fairfax Settle, pers. comm.).

Family Apiaceae

Cicuta maculata L. Spotted Cowbane, Beaver Poison. Wet meadows, floodplains, 6c, AM. JI, 19, edge of brackish marsh, common, LL. Along streams, 19, common, EE. Below Mattaponi Res., 22. Hoskins Creek, 23.

Cryptotaenia canadensis (L) DC. Honewort. Thickets, 15, 19, 36, AM. Beaverdam Swamp, 7, frequent, MW, AB.

Daucus carota L. Queen Anne's Lace. Widespread weed, AM. Hog I., 2, GAM.

Eryngium aquaticum L. Marshes and along shores, 1-3, 15, 35, AM.

JI, 19, low wet ground adjacent to Spartina marsh, rare, LL.

Hydrocotyle ranunculoides L. 3, 15, 19, 37, AM. Small stream, EE.

Hydrocotyle umbellata L. Water Pennywort. Wet soil along shores, 3, 4, 19, AM. Edges of ponds and streams, 19, EE. CR, 20, wet shoreline, MG.

Hydrocotyle verticillata Thunberg. Water Pennywort. Wet soil in marshes; open swamps, 3, 9, 20, AM. CI, 1, swale one mile from south end, MW, GAM. JI, 19, wet edge of marshes, common, LL. CR, 19, swampy floodplain, EE.

Lilaeopsis chinensis (L) Klze. Coastal marshes, 3, 15, 18, 20, AM.

JI, 19, occasional dense colonies below high water line of JR, LL.

Tanyard Landing, 7; Hull Creek, 11, mud-tidal marshes of Queen's Creek, EE.

Oxypolis rigidior (L) Coult. and Rose. Swamps, wet places, 1, 17, 19, 36, AM. Queen's Creek marsh, 19, Wmbg., EE.

Ptilimnium capillaceum (Michaux) Raf. Mock Bishop's-weed. Coastal marshes, 8c, AM. JI, 19, low wet ground adjacent to Spartina marsh, occasional, LL. Chandlers I., 20. Edge of Eltham M., 20, MG. Md: (Patuxent R.), freshwater, 3 sites, RA.

Sium suave Walt. Water Parsnip. Wet areas, 1, 15, 19, AM. JI, 19, shallow water, common, LL. CR, 19, swampy floodplain, EE, (as S. cicutaeifolium). Chandlers I., 20, in bloom, 7-VIII-69. Md: (Patuxent R.), Hills Bridge, RA.

## Family Cornaceae

- Cornus amomum Mill. Dogwood. Moist to wet soil near streams and ponds, 15, 17, 31, AM. Beaverdam Swamp, 7, common, in bloom 17-VI-69, MW, AB. Md: (Patuxent R.), freshwater, 3 sites, RA.
- Cornus foemina Mill. Dogwood. Wet woods and swamps, 3, 13, 19, AM. Poropotank M., 7, freshwater, MW, AB.

## Family Nyssaceae

- Nyssa sylvatica Marshall. Black Gum. Woods and wet situations, 9c, AM. CR, 20, edge of river, MG. West I. Swamp, 20, largest and perhaps most abundant tree, MW.

## Family Clethraceae

- Clethra alnifolia L. Sweet Pepperbush. Swamps and borders of marshes, 1-3, 16, 17, 19, 24, AM. Hoskins Creek, 23, lower end, MW, AH. Edge of Diascund Dam, 20, MG. Wooded floodplains throughout Peninsula, EE.

## Family Ericaceae

- Leucothoe racemosa (L) Gray. Fetter-bush. Moist soil, 8c, AM. Edge of Diascund Dam, 20, MG.
- Vaccinium atrococcum (Gray) Heller. Black High-bush Blueberry. Wet woods, swamps, 19, 36, AM. JI, 19, in moist soil bordering marshes, occasional, LL. North side of Ware Creek, wet woods, 20, MG.
- Vaccinium corymbosum L. Highbush Blueberry. Moist woods, swamps, 2, 4, 19, 36, AM. Poropotank M., 7, MW, AB. Edge of Diascund Dam, 20, MG.

## Family Primulaceae

- Lysimachia ciliata L. Woods and clearings, 15, 17, 19, 37, 38, AM. CI, 1, swale 1 mile from south end, in bloom 10-VI-69, rare, MW, GAM.
- Lysimachia terrestris (L) BSP. Swamp Loosestrife. Moist soil on roadside, 20, MG.
- Samolus parviflorus Raf. Water Pimpernel. Wet soil or shallow water, 9c, AM. Beaverdam Swamp, 7, MW, AB. JI, 19, brackish mudflats, occasional, LL. PR (Eltham Farm), 20, rivers edge, MG. Md: (Patuxent R.), Magruder Lndg., to 6ppt, RA.

## Family Plumbaginaceae

- Limonium carolinianum (Walt) Britt. Sea Lavender. Salt marshes, 1-3, 6, 8, 9, AM. YR, 6, tidal marshes, EE. Starvation Pt., 7, GAM. Bethel Beach 8, marsh, AH.
- Limonium nashii Small. Sea Lavender. PI, 1, AH. Smith I., 2, JC. Goodwin I., 6. Mobjack Bay, end of Rte. 600, 8, MW, GAM.

## Family Oleaceae

- Fraxinus pennsylvanica Marsh. Red Ash. Lowgrounds, 4, 15, 18, 19, 36. Beaverdam Swamp, 7, dominant tree, except where destroyed by beaver dams, MW. Floodplains, throughout, EE.
- Fraxinus tomentosa Michaux. Pumpkin Ash. Swamps, 6c, AM. CR, 20 rivers edge, MG.

## Family Gentianaceae

- Sabatia brachiata Ell. Dry fields, 3, 17, AM. CI, south end, in bloom 9-VI-69, frequent, MW, GAM.
- Sabatia dodecandra (L) BSP. Large Marsh Pink. Coastal marshes, 6c, AM. JI, 19, low soggy ground, rare, LL. JR, YR, edge of tidal marsh edges, 19, EE.
- Sabatia stellaris Pursh. Sea Pink. Coastal marshes; sandy shores, 6c, AM. CI, 1; Achilles, 7. Tidal marsh, Capitol landing, Queens Creek, 6, EE. Starvation Pt., 7, in bloom, 6-IX-65, AH. New Point, 8, Hog Is. 2. JI, 19, low soggy ground adjacent to Spartina marsh, rare, LL. Piscataway C., 23, in bloom 23-VI-69, scarce, MW, GAM.

## Family Asclepiadaceae

- Asclepias incarnata L. Swamp Milkweed. Wet soils, 6c, AM. JI, 19, low soggy ground adjacent to Spartina, rare, LL. Eltham M., 20, MG. MR, below Reservation, 22, Hoskins Creek, 23. Md: (Patuxent R.), 4 sites to 12 ppt, RA.
- Asclepias lanceolata Walter. Milkweed. Coastal marshes, 3, 4, AM. JI, 19, low soggy ground adjacent to Spartina, rare, LL.

## Family Convolvulaceae

Calystegia sepium (L.) R. Brown. Hedge Bindweed. Aggressive weed, 1-3, AM. SI, 2, JC. Grandview Preserve, 5, rare, OD. Goodwin I., 6, sand beach, rare; New Point, 7, MW, GAM. CI, 1, MW, AB. Hoskins C., 23, MW, GAM.

Cuscuta corylii Engel, M. Hazel Dodder. On shrubs and herbs in lowgrounds, 3, AM. Piscataway C., 23, MW, GAM.

Cuscuta gronovii Willd ex R & S. On a variety of plants in lowgrounds, 1, 2, 4, 19, 38, AM. Aquia C., 35, MW, GAM.

Cuscuta rostrata Shuttlew ex. Engel M. Beaked Dodder. Not in Massey. Mt. Landing Creek, 23, MW, GAM. (Needs confirmation)

## Family Polemoniaceae

Phlox drummondii Hooker. Not in Massey. Smith I., 2, GAM.

Polemonium reptans L. Lowgrounds, 19, AM. Beaverdam Swamp, 7, very rare, MW. St. Peter's Swamp, 20, stream edge, MG.

## Family Boraginaceae

Heliotropium curassavicum L. Coastal sands, 1-3, AM. AI, 1, AH.

Myosotis laxa Lehmann. Forget-me-not; Scorpion grass. In water, 20, 37, AM. Lanexa, 20, meadow, MG. In shallow water of ponds and streams throughout, EE. Md: (Patuxent R), Mt. Calvert, freshwater, RA.

## Family Verbenaceae

Lippia lanceolata Michaux. Fog-fruit. Sandy or light soil, 1-4, 15, 37, AM. AI, 1, AH. JI, 19, mud of brackish marshes, occasional, LL.

## Family Lamiaceae

Lycopus americanus Muhl. ex. Barton. Moist to wet lowgrounds, 12, 17, 19, 31, AM. CI, 1, swale at south end, MW, GAM. Md:(Patuxent R), Magruder Landing, Hills Bridge, to 6 ppt, RA.

Lycopus virginicus L. Moist to wet soils of floodplains and seepage, 1-3, 19, AM. Eltham M., 20, MG. Md:(Patuxent R), Hills Bridge, freshwater, RA.

Monarda punctata L. Dry coastal sands, 6c, AM. AI, 1, AH. SI, 2, JC.

Teucrium canadense L. Moist soil, thickets, waysides, 3, 4, 19, 37, AM. CI, 1, MW, GAM. Goodwin I, 6, Croaker Landing, 19. JI, 19, along roadcuts, occasional, LL. Causiac M. 20, Hoskins C., common, 23. Md: (Patuxent R) 3 sites to 14 ppt., RA.

## Family Scrophulariaceae

Agalinis purpurea L. Purple Gerardia. Moist, acid, soil, 10c, AM, (as Gerardia purpurea). PR, Sweet Hall M., 22, scarce, MW. Abundant in tidal marshes of Va., EE.

Bacopa monnieri (L) Pennell. Water Hyssop. Coastal sands, 2, 3, AM. AI, 1, AH. JI, 19, low wet ground, rare, LL.

Chelone glabra L. Wet soil near streams, 11c, AM. Beaverdam Swamp, 7, abundant, MW.

Gratiola virginiana L. Hedge Hyssop. In shallow water in pools; stream margins, 12c, AM. Hampstead sluggish stream, 20, MG. Md:(Patuxent R), 2 sites, freshwater, RA.

Linaria canadensis (L.) Dumont. Toad-flax. Dry fields, 13c, AM. PI, 1, MW, AB. SI, 2, JC.

Mimulus alatus Aiton. Wet woods, low grounds, 10c, AM. Swampy floodplains, 19, EE. Pamunkey, 20, MW, GAM.

Mimulus ringens L. 1, 6, 19, 36, 37, AM. Swampy floodplains; throughout, EE.

Veronica anagallis-aquatica L. Sluggish streams, stream borders, pools, 12, 15, 19, 20, AM. St. Peter's Swamp, shallow water, MG. In small stream, Wmbg., EE.

## Family Bignoniaceae

Campsis radicans (L.) Seem. Trumpet Creeper. In thickets, 8c, AM. SI, 2, JC. Grandview Preserve, 5, rare, OD. West Island Swamp, 20, common, MW.

## Family Acanthaceae

Justicia americana (L) Vahl. Water-willow. Shallow water in streams and ponds, 1, 4, 18, AM. JI, 19, in shallow water of small sandy cove off Back R., rare, LL.

## Family Rubiaceae

- Cephalanthus occidentalis L. Button Bush. In wet marshes; along streams, 10c, AM. Beaverdam Swamp, 7; JI, 19, wet ground of low marshy area, occasional; sandy shores of James, LL. Chandlers I., 20, Sweet Hall M., 22, Hoskins Creek, 23, MW. Md: (Patuxent R) 3 sites, to 12 ppt, RA.
- Diodia teres Walter. Buttonweed. Sandy field and waste places common weed, AM. New Point I., low dune, scarce, MW, GAM. Grandview Preserve, 5, accumulates sand on dunes, scarce, OD.
- Diodia virginiana L. Buttonweed. Moist lowgrounds, 10c, AM. AI, 1, AH. Grandview Preserve, 5, rare, OD. JI, 19, fairly common, especially in gullies, LL. Moist soil on roadside, 20, MG.
- Galium asprellum Michaux. Moist lowgrounds, 36, 37, AM. PI, 1, MW, AB.
- Galium circaezans Michaux. Moist woods, 7, 12, 19, 37, 38, AM. Beaverdam Swamp, 7, common, MW, AH.
- Galium hispidulum Michaux. Dry woods, 1-4, AM. AI, 1, AH.
- Galium obtusum Bigelow. Bedstraw. Moist to wet woods, 1, AM. AI, 1, AH. CI, 1, MW. Moist woods, 20, Hoskins Creek, 23, MW. Md: (Patuxent R) Lyon's C., freshwater, RA.
- Galium tinctorium L. Bedstraw. Moist to wet soil of woods and swamps, 3, 4, 16, 19, 37, AM. JI, 19, mud flats of brackish marshes, fairly common, LL. Md:(Patuxent R), 2 sites, freshwater, RA.

## Family Caprifoliaceae

- Viburnum cassinoides L. Moist to wet soil, 4, 6, AM. Wooded swamps along Carter's Creek, 6, EE.
- Viburnum dentatum L. In thickets and woods, 3, 4, 20, 38, AM. CR, swampy island, 19, EE. St. Peter's Swamp, 20, MG.
- Viburnum nudum L. Swamps, wet woods, 19, 37, AM. Wmbg., wooded. swamps, 19, EE. Bottom of ravine, 20, MG. Hoskin's Creek, Piscataway Creek, 23, MW, GAM.
- Viburnum prunifolium L. Common, 7c, AM. Beaverdam Swamp, 7, frequent, MW. JI, 19, common, LL. CR, 20, river's edge, MG.

## Family Campanulaceae

- Lobelia amoena Michaux. Not in Massey. Sphagnum-magnolia swamp, 19, EE.
- Lobelia cardinalis L. Cardinal Flower. Moist to wet meadows, 6c, AM. Swampy floodplains, 6, EE. JI, 19, pond bank, rare, LL. Chandlers I., 20; CR, 20, moist soil, MG. Mount Landing C., 23, MW. Md: (Patuxent R), 2 sites, freshwater, RA.

## Family Asteraceae

- Achillea millefolium L. Yarrow. Common weed, 1-3, AM. SI, 2, JC.
- Aster dumosus L. Aster. Moist to wet areas, 3, 16, 19, 27, AM. JI, 19, moist soil, occasional, LL.
- Aster puniceus L. Aster. Michaelmas Daisy. Moist situations, 19, 38, AM. Wmbg., 19, swampy floodplains of College Creek, EE. Md:(Patuxent R), Hills Bridge, freshwater, RA.
- Aster subulatus Michaux. Wild Aster. Coastal marshes, 1-3, 19, AM. AI, 1, AH. Starvation Pt., 7, AH; beneath Coleman Bridge, 7, common, MW, GAM. JR, YR, 6, 19, EE.
- Aster tenuifolius L. Wild Aster. Coastal marshes, along shores, 1-3, 15, 19, AM. AI, 1, AH. Fleets Bay, Placid Harbor, 10, 26-VIII-65, AH. JI, 19, high tide line along shores of James, occasional, LL. YR, (Skimino Creek), 19, EE.
- Baccharis halimifolia L. Sea Myrtle. Marsh borders, 1-4, 7, 15, 19, AM. AI, PI, 1, AH. CI, 1, abundant on inner side of island at high tide line, MW, GAM. Goodwin I., 6, MW. SI, 2, JC. Plankatank R., Megges Bay, 9, AH.
- Bidens coronata (L) Britton. Tickseed Sunflower. Moist lowgrounds, 4, 19, AM. JI, 19, low soggy ground by brackish marshes, occasional LL. Tidal marshes, Wmbg., Queens Creek, 19, EE. Aquia Creek, 35, MW, GAM.
- Bidens frondosa L. 1-3, 19, 36, AM. Swampy ground, 19, EE. Md: (Patuxent R), Hills Bridge, freshwater, RA.

- Bidens laevis (L) BSP. Beggar-ticks. Marshes, pools, ditches, 2, 19, AM. JI, 19, brackish marshes, sandy shores, LL. Black-stump Creek, in water, 19, MW, GAM. Jones' Mill Pond, 19, swampy ground, EE. Mt. Landing Creek, 23, Aquia Creek, 35, MW, GAM. Md: (Patuxent R.), Hills Bridge, freshwater, RA.
- Bidens tripartita L. Beggar-ticks. In swamps, 36, AM (As B. comosa and B. connata). AI, 1, AH.
- Borrichia frutescens (L.) DC. Sea Ox-eye. Edge of salt marshes, 1-5, 7, 10, 19, AM. AI, PI, 1, Salicornia-Distichlis flats, AH. Hog I., 2, GAM. SI, 2, JC. YR (Penniman), 6, sandy shore, EE.
- Carduus spinosissimus Walter. Yellow Thistle. 1-3, 19, AM (as Cirsium horridulum). CI, 1, rare, MW, GAM. SI, 1, JC (as C. horridulum).
- Eclipta alba (L) Hassk. Moist places, 1, 2, 19, 38, AM. Marshes along Queen's Creek, 6, EE. JI, 19, moist soil of weedy area bordering brackish marshes, rare, LL.
- Erigeron bonariensis L. Waste places, 3, 4, AM. CI, 1, MW, GAM. HI, 2, in bloom 13-VIII-69, GAM.
- Erigeron pulchellus Michaux. Robin's Plantain. Moist woods and meadows, 3, 12, 15, 19, 38, AM. CI, 1, MW, AB.
- Eupatorium capillifolium (Lam.) Small. Dog Fennel. Moist to wet meadows, 1-6, 16-20, AM. CI, 1, frequent, MW. AH.
- Eupatorium hyssopifolium L. Thoroughwort. Dry openings, 13c, AM. Grandview Preserve, rare, OD.
- Eupatorium serotinum Michaux. Moist waysides, 1-3, 19, 24, AM. Grandview Preserve, 5, rare, OD. JI, 19, margins of brackish marshes, rare, LL. Upper Patuxent, RA.
- Helenium autumnale L. L. Lowground weed, 11c, AM. Chandler's I., common, MW, GAM.
- Iva frutescens L. Marsh Elder. Coastal salt marshes, 8c, AM. AI, 1, AH. CI, 1, abundant, MW, GAM. SI, 2, JC. Goodwin I., 6, Achilles, 7, New Point, 8. JI, 19, marsh margins, occasional, LL. Md: (Patuxent R), 2 sites, 10-14 ppt, RA.
- Mikania scandens (L) Willd. Climbing Hempweed. PI, 1, climbs in trees, AH. Grandview Preserve, 5, rare, OD. JI, 19, brackish marshes, often twining in marsh grass, common, LL. Mt. Landing Creek, 23, MW, GAM. Md: (Patuxent R), 3 sites, freshwater to 6 ppt, RA.
- Pluchea camphorata (L) DC. Camphorweed. Coastal marshes, wet places, 2-4, 7, 19, AM. YR, and tributaries, 6, tidal marshes, EE. JI, 19, moist places of mixed woods, occasional, LL. Md: (Patuxent R), 3 sites, 6-14 ppt, RA.
- Pluchea foetida (L) DC. Marsh Flea-bane. Wet coastal areas, 1-3, AM. AI, 1, AH. JI, 19, fairly common, brackish marsh margins, LL.
- Pluchea purpurascens (Swartz) DC. Camphor-weed. Coastal salt marshes, 3, AM. AI, 1, AH. PI, 1, Salicornia-Distichlis tidal flats, AH. Hog I., 2, GAM. Grandview Preserve, 5, scarce, OD.
- Senecio aureus L. Golden Ragwort. Moist lowgrounds, 1-3, 15-20, 37, AM. Beaverdam Swamp, 7, abundant, MW.
- Solidago sempervirens L. Golden Rod. Brackish to fresh coastal areas, 1-3, 16, 19, AM. Grandview Preserve, 5, rare, OD. New Point I., 7, common, MW, GAM. Queen's Creek, 6, salt marshes, EE.
- Vernonia glauca (L.) Willd. Moist open woods, 1-3, 15, 38, AM. Chandlers I., 20, MW, GAM.
- Vernonia noveboracensis (L.) Michaux. Wet meadows, and floodplains, 1-3, 19, AM. Chandler's I., 20, MW, GAM.

## ADDENDUM

(The following plants were inadvertently omitted.)

- Pinus taeda L. Loblolly Pine. Most salt tolerant pine. In all coastal counties. Parramore I., AH.
- Lolium multiflorum Lam. Rye Grass. PI, 1; Locustville, 1, mainland marsh, MW, AB.
- Poa pratensis L. Kentucky Blue Grass. Open areas, 1, 2, 3, 36, 38, AM. PI, on trail, scarce, GM.
- Sphenopholis obtusata (Michaux) Scribner. Wedge Grass. Moist soil, 9c, AM. CI, PI, 1, swales, MW, AH.
- Triplasis purpurea (Walt.) Chapm. Sand Grass. Dry sand, 3, 5, 13, AM. New Point I, 8, MW, AH.
- Uniola latifolia Michaux. Swamp Oats. Moist borders, 7c, AM. PR, West I, 22, creek bank, MW.
- Uniola paniculata L. Sea Oats. Coastal dunes, 2, 3, 4, 5. This outer bastion of the dunes has lost ground in Va. I found a single large clump at Kiptopeke and Harvill (personal comment) found some on Hog I., 2, which is still grazed.
- Bassia hirsuta (L) E. B. Bartram. Salt marsh borders, 1, AM. PI, 1, AH.
- Claytonia virginica L. Moist open woods, 5c, AM. Cohoke Swamp, 22; Beaverdam Swamp, 7, common, MW.
- Camelina microcarpa Andrz. False Flax. Wayside weed, 19, 36, AM.
- Amorpha fruticosa L. False Indigo. Rich streamside thickets (no coastal counties), AM. Aqua Creek, 35, marsh at mouth, MW.
- Solanum carolinense L. Horse Nettle. Waste places, 3, 19, AM. Hog I, 2, GAM. 7, MW, AH.
- Utricularia biflora Lam. Shallow pools, 3, 18, 22, AM. White Stone, 10, pond, MW, GAM.
- Viburnum recognitum Fernald. Damp alluvial thickets, 1, 2, AM. Drake Marsh, MW, AB.
- Ambrosia artemesiifolia L. Ragweed. CI, 1, southend swale, MW, GAM.
- Melothria pendula L. Creeping Cucumber. Moist thickets, 3, 4, 5, 19, AM. Gloucester Point (under bridge), MW.
- Erechtites heiracifolia (L) Raf. Fireweed. Moist lowgrounds and shores, 3, 19, 37, AM. PR, Chamberlayne Pt., 20, MW, GM.
- Gnaphalium obtusifolium L. Rabbit Tobacco. Dry waysides, 6c, AM. CI, 1, south tip, MW, AB.
- Gnaphalium purpureum L. Dry soil, 7c, AM. CI, swale; PI, 1, near house, MW, AB.



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Certain sections of protistans are claimed by both botanists and zoologists. The classification presented is that of the Committee on Taxonomy and Taxonomic Problems of the Society of Protozoologists (Honigberg, et al, 1964). Groups listed elsewhere in the checklist under algae, disease organisms, or parasites, are noted.

Many protozoan groups remain little known in Chesapeake Bay. Records date from those of Wolfe, et al (1926). Ecological data is sparse or lacking for most records.

- Subphylum Sarcomastigophora
  - Superclass Mastigophora
    - Class Phytamastigophorea
      - Order Chrysomonadida (see Chrysophyceae, p. 2)
      - Order Cryptomonadida (also see Cryptophyceae, p.2)
        - Halosphaera sp. CB, JJW.
      - Order Dinoflagellida (see Parasites, p. 78 and Pyrrophyta, p. 12)
      - Order Ebrida
        - Ebria sp. Patuxent R., rare, DCM.
      - Order Euglenida (see Euglenophycophyta)
    - Superclass Sarcodina
      - Class Rhizopodea
        - Order Arcellinida
          - Family Diffugiidae
            - Diffugia sp., CB, JJW.
        - Order Foraminiferida (see Order Foraminiferida, p. 71)
      - Class Actinopodea
        - Subclass Acantharia
          - Order Acanthometrida
            - Acanthometra sp. CB, JJW.
          - Suborder Spurellaria
            - Acanthosphaera sp. CB, JJW.
          - Suborder Cyrtellaria
            - Family Cyrtoidae
              - Dictyophimus tripus. CB, JJW.
          - Suborder Triplea
            - Aulacantha sp. CB, JJW.
          - Suborder Cyrtoida
            - Cornutella sp. CB, JJW.

Subphylum Sporozoa (see Disease Organisms and Parasites)

#### CLASS CILIATA

##### Subclass Holotrichia

Jesse C. Thompson, Jr., Roanoke College

- Order Gymnostomatida
  - Family Didiniidae
    - Mesodinium cinctum Callins. CB, JJW.
  - Family Colepidae
    - Tiarina sp. CB, JJW: (possibly T. fusus Claparede and Lachmann).
  - Family Amphileptidae
    - Lionotus CB, JJW. (Possibly L. fasciola Ehrenberg).
- Order Hymenostomatida
  - Family Tetrahymenidae
    - Paratetrahymena wassi Thompson, 1963. Polyhaline. GP, 30 ft, mud.
  - Family Uronematidae
    - Gauconema trihymene Thompson, 1966. Euhaline. ES(Cedar Is.), ocean beach.
    - Parauronema virginianum Thompson, 1963. Poly- and euhaline. ES (Cedar Is.), ocean beach; YR(near GP) (Thompson, 1967).
    - Uronema elegans (Maupas, 1883). Euhaline. ES(Cedar Is.), ocean beach, (Thompson and Kaneshiro, 1968).

Uronema marinum Dumardin, 1841. Euhaline. ES(Cedar Is.), ocean beach, (Thompson, 1966).

Uronema nigricans (Muller, 1786). Oligohaline. Potomac R., (Fairview Beach, Va.), (Thompson and Evans, 1968).

Potomacus pottsii Thompson, 1966. Oligohaline. Potomac R., (Fairview Beach, Va.).

Family Pleuronematidae

Pleuronema sp. YR(near GP).

Cyclidium sp. YR(near GP).

Family Cohnilembidae

Cohnilembus verminus YR(near GP).

Family Pseudocohnilembidae

Pseudocohnilembus hargisi Evans and Thompson, 1968. Polyhaline. GP(near shore).

Pseudocohnilembus marinus Thompson, 1966. Euhaline. ES(Cedar Is.), ocean beach.

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Subclass Peritrichia

Order Peritrichida

Family Vorticellidae

Vorticella sp. CB, JJW.

## Order Foraminiferida

The following information has been taken from the references listed below.

## Order Foraminiferida

## Family Astrorhizidae

Astrammmina rara Rhumbler, 1931. (3 variants). Upper meso- and polyhaline. RR, estuary, rare.

## Family Hormosinidae

Reophax nana Rhumbler, 1911. Mesohaline. RR, estuary, scarce; marsh, rare.

## Family Rzehakinidae

Miliammmina earlandi Loeblich et Tappan, 1955. Oligo- and mesohaline. RR, estuary, rare; marsh, common.

Miliammmina fusca (Brady, 1870). Oligo- and mesohaline. RR, estuary, frequent; low outer marsh, abundant.

## Family Lituolidae

Ammoastuta salsa Cushman et Bronnimann, 1948. Oligo- and lower mesohaline. RR, estuary; inner marsh, abundant.

Ammobaculites crassus Warren, 1957. Oligo- and mesohaline. RR, JR, estuary and marsh, abundant.

Ammobaculites dilatatus Cushman and Bronnimann, 1948. Oligo- and mesohaline. RR, estuary and marsh, scarce.

Ammobaculites exiguus Cushman et Bronnimann, 1948. Oligo- and mesohaline. RR, estuary and marsh, rare.

Haplophragmoides hancocki Cushman et McCulloch, 1939. Oligo- and lower mesohaline. RR, estuary, rare; marsh, frequent.

Haplophragmoides manilaensis Andersen, 1952. Oligohaline. RR, estuary, rare; marsh, scarce.

Haplophragmoides wilberti Andersen, 1952. Oligohaline. RR, estuary, rare; marsh, scarce.

## Family Trochamminidae

Arenoparrella mexicana (Kornfeld, 1931). Oligo- and lower mesohaline. RR, estuary, rare, polyhaline.

Tiphotrocha comprimata (Cushman and Bronnimann, 1948). Oligo- and mesohaline. RR, estuary, rare; marsh, abundant.

Trochammina inflata (Montagu, 1808). Oligo- and mesohaline. RR, estuary, rare; marsh, frequent.

Trochammina macrescens (Brady, 1870). Oligo- and lower mesohaline. RR, estuary, rare; marshes, scarce.

Trochammina squamata Parker and Jones, 1860. Oligo- and lower mesohaline. RR, estuary, rare.

## Family Spirillinidae

Ammonia beccarii (Linnaeus, 1758) var. A. Mesohaline. RR, abundant on Zostera; estuary, frequent.

Ammonia beccarii tepida (Cushman, 1926). Upper mesohaline. JR, 6-23 ppt. RR, estuary, frequent; marsh, rare.

## Family Elphidiidae

Elphidium clavatum Cushman, 1930. RR, estuary, abundant; marsh, rare.

Elphidium galvestonense Kornfeld, 1931. Upper mesohaline. RR, estuary, rare.

Protelphidium tisburyense (Butcher). Mesohaline. RR, estuary and marsh, rare.

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## ORDER TINTINNIDA

Wolfe et al (1926) listed 18 species of tintinnids in six genera and Morse (1947) listed seven genera and a family, "Undellidae gen. sp.". Her "ssp." is taken to mean that more than one species occurred in a genus. Her promised "publication on the tintinnids of Chesapeake Bay" never materialized.

## Family Tintinnidae

- Amphorides fistula Duc d' Orleans. CB, JJW. Genus was formally Amphorella.  
Amphorides sublata Daday. CB, JJW.  
 "Codonella ssp." Patuxent R., rare, DCM.  
Conocylis helix Duc d' Orleans. CB, JJW. (This species is presumed to be a tintinnid, but could not be traced.)  
Cytarrocylis gigantea (Brant ?). CB, JJW.  
Cytarrocylis hemifusus Duc d' Orleans, CB, JJW.  
Eutintinnus sp. Patuxent River, rare, DCM.  
Favella sp. Patuxent R., rare, DCM.  
Helicostomella sp. Patuxent R., rare, DCM.  
Leprotintinnus sp. Patuxent R., rare, DCM.  
 "Metacylis ssp." Patuxent R., rare, DCM.  
Ptychocylis. CB, JJW.  
Tintinnopsis acuta Duc d' Orleans.  
Tintinnopsis beroidea (Stein ?). CB, JJW. JR (mouth), 13-II-64, very abundant, HGM.  
Tintinnopsis davidoffi Daday. CB, JJW, as in T. beroidea  
Tintinnopsis fusus Duc d' Orleans. CB, JJW.  
Tintinnopsis incurvata Duc d' Orleans. CB, JJW.  
Tintinnopsis lata Duc d' Orleans. CB, JJW.  
Tintinnopsis macropus Duc d' Orleans. CB, JJW.  
Tintinnopsis major Duc d' Orleans. CB, JJW.  
Tintinnopsis urnula Duc d' Orleans. CB, JJW.  
 "Tintinnopsis ssp." Patuxent R., autumn, DCM.  
Tintinnus acuminatus Schroeder. CB, JJW.  
Tintinnus rapa Duc d' Orleans. CB, JJW.  
Tintinnus serratus Kofoid. CB, JJW.

## ORDER HYPOTRICHIDA

## Family Euplotidae

- Euplotes sp. CB, JJW, DCM.

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- Wolfe, J. J., B. Cunningham, N. Wilkerson & J. Barnes. 1926. An investigation of the microplankton of Chesapeake Bay. J. Elisha Mitchell Sci. Soc. 42:25-54. The list of protozoans in this report has several misspellings and possible misidentifications. I have been unable to trace the genera Chitonosperma, Cornutella, Panduroform, Spheropsis and Spongioxiphis.

## INDEX TO FREE-LIVING PROTOZOA

- Acanthometra 69  
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 Ammobaculites 71  
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## CHAPTER IV: DISEASES AND PARASITES

KNOWN AND POSSIBLE  
DISEASE ORGANISMS  
PRESENT IN THE CHESAPEAKE BAY  
(Numbers indicate literature cited)  
Frank O. Perkins

## Phylum Protozoa

## Subphylum Sporozoa

## Class Haplosporea

Minchinia nelsoni Haskin, Stauber, and Mackin, 1966. (1, 2).Minchinia costalis Wood and Andrews, 1962. (3, 4).Urosporidium crescens Deturk, 1940. (5, 6).Minchinia sp. (7).

## Class Telosporea

Nematopsis ostrearum Prytherch, 1940. (13).

## Subphylum Sarcostigophora

## Class Rhizopodea

Labyrinthula sp. (8).Paramoeba pernicioso Sprague, Beckett, and Sawyer, 1969. (9).

## Subphylum Cnidospora

## Class Microsporidea

Nosema michaelis Sprague, 1970. (6).Nosema dollfusi Sprague, 1964. (10).Pleistophora cargo Sprague, 1966. (11).Pleistophora sp. (19).Glugea weissenbergi Sprague and Vernick, 1968. (15).

## Phylum Eumycophyta

## Class Phycmycetes

## Order Saprolegniales

Dermocystidium marinum Mackin, Owen, and Collier, 1950. (12).Dermocystidium sp. (13).

## Order Lagenidiales

Lagenidium callinectes Couch, 1942. (14).

## Phylum Schizomycophyta

## Class Schizomycetes

Vibrio parahemolyticus Sakazaki, Iwanami, and Fukumi, 1963. (16).Pasteurella sp. (17).

## Viruses

Lymphocystis virus (18).

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  10. Sprague, V. 1970. Some protozoan parasites and hyperparasites in marine bivalve molluscs. In: A symposium on disease of fishes and shellfishes. S. F. Snieszko (ed.). Spec. Publ. 5, Amer. Fish. Soc., Washington, D.C.
  11. Sprague, V. 1966. Two new species of Pleistophora (Microsporida, Nosematidae) in decapods, with particular reference to one in the blue crab. J. Protozool. 13:196-199.
  12. Andrews, J. D. 1957. Oyster mortality studies in Virginia. II. The fungus disease caused by Dermocystidium marinum in oysters of Chesapeake Bay. Ecol. Monogr. 27:1-26.
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  14. Sindermann, C. J. and A. Rosenfield. 1967. Principal diseases of commercially important marine bivalve Mollusca and Crustacea. U.S. Fish & Wildlife Ser. Fishery Bull. 66:335-385.
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LIST OF KNOWN HOSTS OF DISEASE  
AND POSSIBLE DISEASE ORGANISMS

| <u>Disease Organism</u>      | <u>Host</u>  |
|------------------------------|--|
| <u>Minchinia nelsoni</u>     | <u>Crassostrea virginica</u>   |
| <u>Minchinia costalis</u>    | <u>Crassostrea virginica</u>   |
| <u>Urosporidium crescens</u> | <u>Megalophallus</u> sp. in <u>Callinectes sapidus</u>   |
| <u>Minchinia</u> sp.         | <u>Eurypanopeus depressus</u>  |
| <u>Nematopsis ostrearum</u>  | <u>Crassostrea virginica</u> , <u>Panopeus herbstii</u> , <u>Eurypanopeus depressus</u> , <u>Neopanope texana sayi</u> |

| <u>Disease Organism</u>       | <u>Host</u>  |
|-------------------------------|--|
| <u>Labyrinthula</u> sp.       | <u>Spartina alterniflora</u><br><u>Zostera marina</u>        |
| <u>Paramoeba pernicioso</u>   | <u>Callinectes sapidus</u>                                   |
| <u>Nosema michaelis</u>       | <u>Callinectes sapidus</u>                                   |
| <u>Nosema dollfusi</u>        | <u>Bucephalus cuculus</u> in<br><u>Crassostrea virginica</u> |
| <u>Pleistophora cargoi</u>    | <u>Callinectes sapidus</u>                                   |
| <u>Pleistophora</u> sp.       | <u>Fundulus heteroclitus</u>                                 |
| <u>Glugea weissenbergi</u>    | <u>Apeltes quadracus</u>                                     |
| <u>Dermocystidium marinum</u> | <u>Crassostrea virginica</u>                                 |
| <u>Dermocystidium</u> sp.     | <u>Macoma balthica</u>                                       |
| <u>Lagenidium callinectes</u> | <u>Callinectes sapidus</u> ,<br><u>Neopanope texana</u>      |
| <u>Vibrio parahemolyticus</u> | <u>Callinectes sapidus</u>                                   |
| <u>Pasteurella</u> sp.        | <u>Roccus americanus</u>                                     |
| <u>Lymphocystis</u> virus     | <u>Roccus saxatilis</u>                                      |

## SOME BACTERIA OF CHESAPEAKE BAY

R. R. Colwell

Vibrio spp. (including V. parahaemolyticus) See also p. 75.  
Pseudomonas spp. (including P. fluorescens)  
Achromobacter spp.  
Corynebacterium spp.  
Cytophaga spp.  
Flavobacterium spp.  
Micrococcus spp.  
Bacillus spp.  
Enterobacter spp.  
Proteus spp.  
Achromobacter spp.  
Caulobacter spp.  
Saprospira spp.  
Spirillum spp.  
Azotobacter spp.  
Nitrosomonas spp.  
Thiobacillus spp. (including T. denitrificans)  
Desulfovibrion spp.

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Several publications have appeared on bacteria normally found in Chesapeake Bay. The information given above is mainly from the following references.

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## SOME PARASITES OF CHESAPEAKE BAY FAUNA

by D. E. Zwerner and A. R. Lawler

## Parasitology Section

## PHYLUM PROTOZOA

## Subphylum Sarcomastigophora

## Superclass Mastigophora

## Class Phytomastigophorea

## Order Dinoflagellida

## Family Blastodiniidae

Oodinium cyprinodontum Lawler, 1967. YR, on gills of Fundulus majalis (Walbaum), F. heteroclitus (Linnaeus), Cyprinodon variegatus Lacepede, Lucania parva (Baird) (Lawler, 1967); ES (Wachapreague), on gills of Fundulus luciae (Baird). (Lawler, 1968).

## Subphylum Sporozoa

## Class Haplosporea

## Order Haplosporida

Urosporidium crescens De Turk, 1940. ES (Wachapreague) in metacercariae of Megalophallus sp. (Digenea) in Callinectes sapidus. (Perkins, 1971).

## Subphylum Cnidospora

## Class Myxosporidea

## Order Myxosporida

## Family Sphaerosporidae

Sphaerospora renalis Bond, 1937. CB (Baltimore, Md.) In F. heteroclitus (Linnaeus). (Bond, 1937).

## Family Myxidiidae

Myxidium folium Bond, 1937. CB (Baltimore, Md.) in hepatic ducts and gall bladder of F. heteroclitus (Linnaeus), (Bond, 1937).

## Family Myxosomatidae

Myxosoma funduli Kudo, 1920. CB (Baltimore, Md.) in F. heteroclitus (Linnaeus). (Bond, 1937).

Myxosoma subtecalis Bond, 1937. CB (Baltimore, Md.) in viscera, fat of cranial cavity, and kidney of F. heteroclitus (Linnaeus). (Bond, 1937).

## Family Myxobolidae

Myxobolus bilineatus Bond, 1938. CB (Baltimore, Md.) in brain and viscera of F. heteroclitus (Linnaeus). (Bond, 1938).

Myxobolus sp. YR, from F. heteroclitus (Linnaeus). (Owens in Dillon, 1966).

## Class Microsporidea

## Order Microsporida

## Family Nosematidae

Glugea hertwigi Weissenberg, 1911. CB, F. heteroclitus (Linnaeus). (Bond, 1938).

Glugea weissenbergi Sprague and Vernick, 1968. Patuxent R. (Solomons Is., Md.) in Apeltes quadracus (Mitchill). (Vernick et al., 1969).

## PHYLUM PLATYHELMINTHES

## Class Trematoda

## Order Monogenea

## Suborder Monopisthocotylea

## Superfamily Gyrodactyloidea

## Family Gyrodactylidae

## Subfamily Gyrodactylinae

Gyrodactylus prolongis Hargis, 1955. YR, 10-IV-64 on skin of C. variegatus Lacepede, new host record, ARL. YR, on skin of F. heteroclitus (Linnaeus) and F. majalis (Walbaum). (Dillon and Lawler in Dillon, 1966).

- Gyrodactylus stephanus Mueller, 1937. YR, 10-IV-64, on skin of C. variegatus Lacepede, new host record, ARL. YR, on skin of F. heteroclitus (Linnaeus) and F. majalis (Walbaum). (Dillon and Lawler in Dillon, 1966).
- Superfamily Dactylogyroidea  
 Family Dactylogyridae  
 Subfamily Ancyrocephalinae  
Ancyrocephalus parvus Linton, 1940. YR, on gills of Strongylura marina (Walbaum). (Kingston et al., 1969).  
Haliotrema mugilinus (Hargis, 1955) Yamaguti, 1963. Mobjack Bay, Ware River, 16-VIII-58, new locality record. On gills of Mugil cephalus Linnaeus.  
Tetrancistrum longiphallus (MacCallum, 1915) Price, 1937. CB (York Spit), 4-IX-1957, new locality record. On gills of Chaetodipterus faber (Broussonet).
- Family Diplectanidae  
Diplectanum bilobatus Hargis, 1955. YR, 16-VI-59, on gills of Cynoscion nebulosus (Cuvier), new locality record.  
Rhamnocercus bairdiella Hargis, 1955. YR, on gills of Bairdiella chrysura (Lacepede), (Kingston et al., 1969).  
Rhamnocercus stichospinus Seamster and Monaco, 1956. YR, 29-VII-60, on gills of Menticirrhus americanus (Linnaeus), new host and locality record.
- Superfamily Capsaloidea  
 Family Capsalidae  
 Subfamily Capsalinae  
Caballerocotyla manteri (Price, 1951) Price, 1960. ES, 22-VIII-57, on gills of Euthynnus alletteratus (Rafinesque), new locality record.
- Subfamily Benedeniinae  
Benedeniella posterocolpa (Hargis, 1955) Yamaguti, 1963. CB, on skin, ventral side of Rhinoptera bonasus (Mitchill). (McMahon, 1963).
- Family Dioncidae  
Dioncus agassizi Goto, 1900. Lower CB (Buckroe Beach Pier), 25-VI-68, on gills of Echeneis naucrates Linnaeus, new locality record, ARL.  
Dioncus remorae (MacCallum, 1916) Price, 1938. Lower CB (Buckroe Beach Pier) 25-VI-68, on gills of E. naucrates Linnaeus, new locality record, ARL.
- Family Loimoidae  
Loimopapillosum dasyatis Hargis, 1955. CB, on gills of Dasyatis sayi (Lesueur). (McMahon, 1963).
- Family Microbothriidae  
 Subfamily Microbothriinae  
Microbothrium apiculatum Olsson, 1869. CB, on skin near cloacal region of Squalus acanthias Linnaeus. (Dillon and Hargis, 1965a).
- Family Monocotylidae  
 Subfamily Monocotylinae  
Monocotyle diademalis Hargis, 1955. CB, on gills of Dasyatis americana Hildebrand and Schroeder, and on gills of Dasyatis sayi (Lesueur). (McMahon, 1963).  
Monocotyle pricei Pearse, 1949. CB, on gills of Dasyatis sayi (Lesueur). (McMahon, 1963).
- Subfamily Merizocotylinae  
Empruthotrema raiiae MacCallum, 1916. CB area, on gills of Raja eglanteria Bosc. (McMahon 1963).
- Superfamily Udonelloidea  
 Family Udonellidae  
Udonella caligorum Johnston, 1835. Offshore, 22-VIII-57, on Caligus sp. (parasitic copepod), on gills of Euthynnus alletteratus (Rafinesque), new host and locality record; YR, 20-III-67, on Caligus sp. (parasitic copepod), on skin of Cyclopterus lumpus Linnaeus.

## Suborder Polyopisthocotylea

## Superfamily Diclidophoroidea

## Family Diclidophoridae

## Subfamily Diclidophorinae

Diclidophora maccallumi (Price, 1943) Sproston, 1946. CB,  
on gills of Urophycis regius (Walbaum). (Kingston et al., 1969).

## Subfamily Choricotylinae

Choricotyle aspinachorda Hargis, 1955. CB, on gills of  
Orthopristis chrysoptera (Linnaeus). (Kingston et al., 1969).

Choricotyle prionoti (MacCallum, 1917) Llewellyn, 1941.  
Offshore, 21-III-58, on gills of Prionotus evolans (Linnaeus),  
new host and locality record.

Choricotyle louisianensis Hargis, 1955. Offshore between Cape  
Hatteras and Washington Canyon, 5-9-V-66, on gills of Menticirrhus  
saxatilis Bloch & Schneider, new host and locality record,  
ARL.

Neoheterobothrium cynoscioni (MacCallum, 1917) Price, 1943.  
CB, YR, on gills of Cynoscion regalis (Bloch & Schneider).  
(Kingston et al., 1969).

## Subfamily Pedocotylinae

Pedocotyle minima Hargis, 1955. YR, on gill arches of  
Bairdiella chrysura (Lacepede). (Kingston et al., 1969).

## Subfamily Bicotylophorinae

Bicotylophora trachinoti (MacCallum, 1921) Price, 1936. CB,  
on gills of Trachinotus carolinus (Linnaeus). (McMahon, 1963).

## Family Discocotyliidae

## Subfamily Octomacrinae

Octomacrum microconfibula Hargis, 1952. Chickahominy River,  
11-IV-60, on gills of Notemigonus crysoleucas (Mitchill).

## Family Hexostomatidae

Neohexostoma euthynni (Meserve, 1938) Price, 1961. CB, on  
gills of Euthynnus alletteratus (Rafinesque), as Hexostoma sp.  
(Hargis, 1957), New Point, October 1955.

## Family Macrovalvitrematidae

Hargisia bairdiella (Hargis, 1956) Yamaguti, 1963. CB, on  
gills of Bairdiella chrysura (Lacepede). (McMahon, 1963).

Macrovalvitrematoides micropogoni (Pearse, 1949) Yamaguti  
1963. YR, on gills of Micropogon undulatus (Linnaeus).  
(Kingston et al., 1969).

Pseudotagia cupida (Hargis, 1955) Yamaguti, 1963. CB area,  
on gills of Orthopristis chrysoptera (Linnaeus). (Kingston  
et al., 1969).

## Family Mazocraeidae

## Subfamily Clupeocotylinae

Clupeocotyle brevoortia Hargis, 1955. CB, on gills of Brevoortia  
tyrannus (Latrobe), (McMahon, 1963).

## Subfamily Mazocraeoidinae

Mazocraeoides georgei Price, 1936. YR?, Pamunkey R., 6-IV-57,  
on gills of Alosa aestivalis (Mitchill) new host record; CB,  
on gills of B. tyrannus (Latrobe). (McMahon, 1963). (Probably  
reported as M. hargisi Price, 1961 by Kingston et al.,  
1969). JR, 4-IV-58, on gills of Alosa pseudoharengus (Wilson).

Mazocraeoides olentangiensis Sroufe, 1959. YR, 22-IV-58, on  
gills of Dorosoma cepedianum (Lesueur), new locality record.

## Superfamily Microcotyloidea

## Family Microcotylidae

## Subfamily Microcotylinae

Microcotyle macroura MacCallum and MacCallum, 1913. CB Bridge  
Tunnel, 23-XI-68, on gills of Morone saxatilis (Walbaum), new  
locality record, ARL.

Microcotyle peprili Pearse, 1949. CB, on gills of Peprilus  
alepidotus (Linnaeus). (McMahon, 1964).

Microcotyle pomatomi Goto, 1900. CB, on gills of Pomatopus  
saltatrix (Linnaeus). (McMahon, 1964).

Microcotyle poronoti MacCallum, 1915. CB, on gills of Peprilus  
triacanthus (Peck). (McMahon, 1964).

- Microcotyle stenotomi Goto, 1900. CB, on gills of Stenotomus chrysops (Linnaeus), (McMahon, 1964).
- Cynoscionicola heteracantha (Manter, 1938) Price, 1962. YR, CB, on gills of Cynoscion regalis (Bloch & Schneider). (Kingston et al. 1969). CB (Oceanview) 29-VIII-57, on gills of C. nebulosus (Cuvier), new host record.
- Cynoscionicola pseudoheteracantha (Hargis, 1956) Price, 1962. YR, Perrin, on gills of Cynoscion nothus (Holbrook) landed VII-56, new locality record.
- Subfamily Metamicrocotylinae
- Metamicrocotyla macracantha (Alexander, 1954) Koratha, 1955. CB (Oceanview), 2-X-57, on gills of M. cephalus Linnaeus, new locality record.
- Family Axinidae
- Subfamily Heteraxininae
- Heteraxinoides xanthophilis (Hargis, 1956) Yamaguti, 1963. CB, YR, on gills of Leiostomus xanthurus Lacepede. (Kingston et al., 1969).
- Axinoides hyporhampi Price, 1962. CB, on gills of Hyporhampus unifasciatus (Ranzani). (Kingston et al., 1969).
- Subfamily Axinoidinae
- Nudaciraxine gracilis (Linton, 1940) Price, 1962. CB, on gills of Strongylura marina (Walbaum) (McMahon, 1964).
- Superfamily Gastrocotyloidea
- Family Gastrocotylidae
- Subfamily Gastrocotylinae
- Neothoracocotyle acanthocybii (Meserve, 1938) Hargis, 1956. Offshore, southern edge of Norfolk Canyon, 20-VIII-67, on gills of Acanthocybium solanderi (Cuvier), new locality record, ARL.
- Pseudaxine mexicana Meserve, 1938. CB, on gills of Scomberomorus maculatus (Mitchill). (McMahon, 1964).
- Scomberocotyle scomberomori (Koratha, 1955) Hargis, 1956. YR, 13-VI-68, on gills of Scomberomorus cavalla (Cuvier), new host for CB, ARL. CB, on gills of Scomberomorus maculatus (Mitchill). (McMahon, 1964).
- Subfamily Gotocotylinae
- Gotocotyla acanthophallus (MacCallum & MacCallum, 1913) Yamaguti, 1963. CB, on gills of Pomatomus saltatrix (Linnaeus), on gills of Scomberomorus maculatus (Mitchill). (McMahon, 1964). YR, 13-VI-68, on gills of Scomberomorus cavalla (Cuvier), new host for CB, ARL.
- Subfamily Thoracocotylinae
- Thoracocotyle crocea MacCallum, 1913. CB, on gills of S. maculatus (Mitchill). (McMahon, 1964).
- Family Protomicrocotylidae
- Subfamily Protomicrocotylinae
- Protomicrocotyle mirabilis (MacCallum, 1918) Johnston and Tiegs, 1922. CB, Lynnhaven Inlet, 19-IX-58, on gills of Caranx hippos (Linnaeus), new locality record.
- Order Digenea
- Family Bucephalidae
- Bucephalus cuculus McCrady, 1874. CB (Wicomico R.), sporocysts and cercariae in Crassostrea virginica.
- Rhipidocotyle lintoni Hopkins, 1954. CB, adults in Strongylura marina (Walbaum); metacercariae in Menidia.
- Rhipidocotyle transversale Chandler, 1934. CB, adults in S. marina (Walbaum); metacercariae in Menidia.
- Family Fellodistomatidae
- Cercaria laevicardi Martin, 1945. ES (Nandua Creek), 1-XI-67, from digestive gland of Laevicardium mortoni Conrad; Goodwin Islands, 26-III-68, new locality records.
- Family Heterophyidae
- Ascocotyle diminuta Stunkard and Haviland, 1924. Annapolis, Md., metacercariae encysted in gills of Fundulus heteroclitus (Linnaeus). Natural final hosts probably piscivorous birds although adult worms have been recovered from wild rats (Stunkard and Uzmann, 1955).

## Family Microphallidae

Megalophallus sp.

ES (Wachapreague), metacercariae in musculature, hepatopancreas, and gills of Callinectes sapidus. (Perkins, 1971).

## Class Cestoda

## Order Tetraphyllidea

## Family Phyllobothriidae

Anthobothrium lacinatum Linton, 1890. CB (New Point Comfort), 30-IX-64, from spiral valve of Carcharhinus milberti (Valenciennes), new locality record, ARL.

Rhinebothrium lintoni Campbell, 1970. CB, in spiral valve of Dasyatis americana Hildebrand and Schroeder. (Campbell, 1970).

Rhinebothrium maccallumi Linton, 1924. CB, in spiral valve of Dasyatis americana, Hildebrand and Schroeder. (Campbell, 1970).

Rhinebothrium spinicephalum Campbell, 1970. CB, in spiral valve of Dasyatis americana, Hildebrand and Schroeder. (Campbell, 1970).

## Family Dioecotaeniidae

Dioecotaenia cancellata (Linton, 1890) Schmidt, 1969.

CB (Solomons, Md.), in spiral valve of Rhinoptera bonasus (Mitchill). (Schmidt, 1969; Campbell, 1970).

## Family Oncobothriidae

Acanthobothrium americanum Campbell, 1969. CB, in spiral valve of Dasyatis americana Hildebrand and Schroeder. (Campbell, 1970).

Acanthobothrium brevissime Linton, 1908. CB, in spiral valve of Dasyatis americana Hildebrand and Schroeder; in spiral valve of Raja eglanteria Bosc. (Campbell, 1969).

Acanthobothrium floridensis Goldstein, 1964. CB, in spiral valve of Raja eglanteria Bosc. (Campbell, 1969).

Acanthobothrium lineatum Campbell, 1969. CB, in spiral valve of Dasyatis americana Hildebrand and Schroeder. (Campbell, 1969).

Acanthobothrium paulum Linton, 1890. CB, in spiral valve of Dasyatis americana Hildebrand and Schroeder; in spiral valve of Raja eglanteria Bosc. (Campbell, 1969).

## PHYLUM ASCHELMINTHES

## Class Nematoda

## Order Dioctophymidea

## Family Dioctophymidae

Eustrongylides sp. YR, from Fundulus heteroclitus (Linnaeus). (Owens in Dillon, 1966).

## Order Ascarididea

## Family Heterocheilidae

## Subfamily Filocapsulariinae

Contraecaecum habena (Linton, 1900) Linton, 1934. Solomons, Md., in 99% of stomachs of Opsanus tau (Schwartz & Dutcher, 1963).

Contraecaecum sp. Solomons, Md., encysted in mesenteries of Leiostomus xanthurus Lacepede. (Huizinga and Haley, 1962).

## Order Spiruridea

## Family Cucullanidae

## Subfamily Dacnitoidinae

Dichelyste sp. Solomons, Md., mid-gut of Leiostomus xanthurus Lacepede. (Huizinga and Haley 1962). / D. lintoni (Barreto, 1922) has been reported from this host species. /

## Order Philometridea

## Family Dracunculidae

Philometra rubra (Leidy, 1856). YR (mouth), 13-XII-70, in body cavity of Morone saxatilis (Walbaum). (Identified by M. Chitwood.)

## PHYLUM ACANTHOCEPHALA

## Order Echinorhynchidea

## Family Pomphorhynchidae

Pomphorhynchus sp. Solomons, Md., immature specimens from Cynoscion regalis (Bloch and Schneider). (O'Rourke, 1949) P. tereticolle (Rud., 1809) was reported from this host at Woods Hole, Mass. by Linton (1889).

## Family Rhadinorhynchidae

## Subfamily Illiosentinae

Telosentis tenuicornis (Linton, 1891) Van Cleave, 1947. Solomons, Md., from intestine of following fishes: Anguilla rostrata (Le Sueur), Bairdiella chrysur (Lacepede), Leiostomus xanthurus (Linnaeus), Morone americana (Gmelin), Orthopristis chrysoptera (Linnaeus). (Huizinga and Haley, 1962). O'Rourke (1949) reports immature forms of this species from Cynoscion regalis (Bloch and Schneider) as well as from previously mentioned L. xanthurus and M. undulatus.

## Subfamily Serrasentinae

Serrasentis socialis (Leidy, 1851) Van Cleave, 1924. Solomons, Md., immature specimens in intestine of Cynoscion regalis (Bloch and Schneider), Leiostomus xanthurus (Lacepede), and Micropogon undulatus (Linnaeus). O'Rourke (1949), all, and Huizinga and Haley (1962) for L. xanthurus.

## PHYLUM ANNELIDA (see Hirudinea, p. 120)

## PHYLUM ARTHROPODA

## Class Crustacea

## Subclass Copepoda

## Order Cyclopidea

## Family Notodelphyidae

Doropygus laticornis Wilson, 1932. GP, abundant in atrium of Molgula, July, MW.

## Family Bomolochidae

Bomolochus eminens Wilson, 1911. Point No Point, Md., fish parasite, local host unknown, CBW.

## Family Ergasilidae

Ergasilus cerastes Roberts, 1969. PR, 24-IX-58, on gills of Ictalurus catus (Linnaeus). See record for this species in free living Copepoda section.

Ergasilus labracis Krøyer, 1863. CB, on gills of Morone saxatilis (Walbaum). (Roberts, 1970).

Ergasilus lizae Krøyer, 1863. Ware R., Mobjack Bay, 16-VIII-58, on gills of Mugil cephalus Linnaeus.

Ergasilus manicatus Wilson, 1911. YR, Sarah's Creek and GP, on gills of Fundulus heteroclitus (Linnaeus) and F. majalis (Walbaum) on 16-VI-70 and 19-X-67 respectively.

## Order Caligidea

## Superfamily Caligoidea

## Family Caligidae

## Subfamily Caliginae

Caligus chelifer Wilson, 1905. Oceanic, rare, TEB, ECT.

Caligus schistonyx Wilson, 1905. Lower CB, scarce TEB, ECT; on Brevoortia tyrannus (Latrobe), CBW.



- Parapetalus gunteri Pearse, 1952. CB (YR, Seaford, Windmill Point) 18-VII-63, on Rachycentron canadum (Linnaeus), new locality record.
- Family Cecropidae  
Cecrops latreillii Leach, 1816. Offshore, Virginia Capes, 13-I-67, on Mola mola (Linnaeus), new locality record.
- Family Eirgidae  
Eirgos anurus Bere, 1936. CB (YR, York Spit) on gills of Chaetodipterus faber (Broussonet) 4-IX-57, new locality record.
- Family Euryphoridae  
 Subfamily Euryphorinae  
Gloiopotes hygomanus Steenstrup and Lutken, 1861. Offshore, southern edge of Norfolk Canyon, 20-VIII-67, on Acanthocybium solanderi (Cuvier), new locality record.  
Gloiopotes ornatus Wilson, 1905. Off Virginia seacoast, on Makaira nigricans Lacepede.
- Family Pandaridae  
Pandarus smithii Rathbun, 1886. ES (Wachapreague), on skin of Odontaspis taurus (Rafinesque).
- Superfamily Dichelesthioidea  
 Family Anthosomatidae  
Lernanthropus brevoortiae Rathbun, 1887. CB (YR, York Spit), 30-VII-57, on gills of Brevoortia tyrannus (Latrobe).  
Lernanthropus gisleri v. Beneden, 1852. YR, V and VII on gills of Cynoscion nebulosus (Cuvier).  
Lernanthropus pomatomi Rathbun, 1887. CB, on gills of Pomatomus saltatrix (Linnaeus).  
Lernanthropus pupa Burmeister, 1823. YR, V and VI, on gills of Chaetodipterus faber (Broussonet).
- Family Dichelesthidae  
Hatschekia harkema Pearse, 1948. YR, 13-VIII-66, on Chilomycterus schoepfi (Walbaum) new locality record.
- Family Eudactylinidae  
Eudactylina turgipes Bere, 1936. YR, 22-IX-58, on Gymnura micrura (Bloch & Schneider), new locality record.  
Nemesis atlantica Wilson, 1922. ES (Wachapreague), 14-VII-66, on Rhizoprionodon terraenovae (Richardson), new locality record.
- Family Pseudocynidae  
Pseudocynus appendiculatus Heller, 1868. ES (Wachapreague and offshore) IX, on gills of Euthynnus alletteratus (Rafinesque).  
Pseudocynopsis buccata (Wilson, 1922). YR, IX-58, on gills of Scomberomorus cavalla (Cuvier) and S. maculatus (Mitchill), new locality record.
- Superfamily Lernaeoidea  
 Family Lernaeidae  
 Subfamily Lernaeenicinae  
Lernaeenicus longiventris Wilson, 1917. Off Virginia Capes, 27-VII-66, on skin of Coryphaena hippurus Linnaeus, new locality record.  
Lernaeenicus radiatus (Lesueur, 1824). CB, adult females imbedded in many fishes, among them are Brevoortia tyrannus (Latrobe), Leiostomus xanthurus Lacepede, Fundulus majalis (Walbaum), and others. Copepodid larvae of this parasite, formerly known as Lerneocera centropristi Pearse, 1947, found on gills of Centropristis striata (Linnaeus).

- Order Lerneopodidea  
 Family Chondracanthidae  
 Subfamily Chondracanthinae  
Pseudochondracanthus diceraus Wilson, 1908. CB (York Spit) 30-VII-57, on gills of Sphaeroides maculatus (Bloch and Schneider), new locality record.
- Family Lerneopodidae  
 Subfamily Clavellinae  
Brachiella coryphaenae Pearse, 1952. Off Virginia Capes, 15-VIII-61 and 27-VII-66, on gills of Coryphaena hippurus Linnaeus, new locality record.  
Brachiella thynni Cuvier, 1830. Offshore, southern edge of Norfolk Canyon, 20-VIII-67, on Acanthocybium solanderi (Cuvier), new locality record.  
Clavellisa spinosa Wilson, 1915. YR, XI-55, on gills of Brevoortia tyrannus (Latrobe), new locality record.
- Subfamily Lerneopodinae  
Lernaeopodina relata (Wilson, 1915) Yamaguti, 1963. Offshore, Virginia Capes, on Raja laevis Mitchill.
- Subclass Branchiura  
 Order Argulidea  
 Family Argulidae  
 Subfamily Argulinae  
Argulus alosae Gould, 1841. Lower YR, 24-X-70, discovered in a bucket containing the scyphozoan medusa Rhopilema verrilli (Fewkes, 1887). /Identified by R. F. Cressey./  
Argulus bicolor Bere, 1936. Pamunkey R., Lee Marsh and Romancoke, VIII and X-66, in plankton. New Point Comfort, Mobjack Bay, summer, 56, on Rhinoptera bonasus (Mitchill). YR, 26-V-59, on Scomberomorus cavalla (Cuvier). YR, 7-VII-59, on Peprilus triacanthus (Peck). /Identified by R. F. Cressey./  
Argulus laticauda Smith, 1873. Solomon's Md., on Opsanus tau (Linnaeus). (Dutcher and Schwartz, 1962) GP, see Hargis (1958).  
Argulus sp. GP, 12-VII-62, on skin of Fundulus majalis (Walbaum). R. F. Cressey is describing this as a new species.

## ADDENDUM

Some Parasites of Chesapeake Bay Fauna

/Identifications by Dr. Robin M. Overstreet, Gulf Coast Research Laboratory, Ocean Springs, Mississippi; collections by Dr. A. R. Lawler/

- Order Digenea  
 Family Lepocreadiidae  
Bianium plicatum (Linton, 1928) Stunkard, 1931. YR, 5-VII-63, adult in Sphaeroides maculatus (Bloch & Schneider), new locality record.
- Family Opecoelidae  
Opecoeloides vitellosus (Linton, 1900) von Wicklen, 1946. YR, 23-IX-64, adult in Chasmodes bosquianus (Lacepede), new host record. YR, 14-VII-63, adult in Prionotus carolinus (Linnaeus), new host record. This is a new locality record for this species.
- Family Fellodistomatidae  
Lintonium vibex (Linton, 1905) Stunkard and Nigrelli, 1930. YR, 5-VII-63, adult in Sphaeroides maculatus (Bloch & Schneider), new locality record.
- Family Hemiuridae  
Lecithaster confusus Odhner, 1905. YR, 23-IX-64, adult in Chasmodes bosquianus (Lacepede), new host and locality records.  
Lecithocladium excisum (Rudolphi, 1819) Lühe, 1901. Perrin, Va., 12-VII-63, in Peprilus alepidotus (Linnaeus), new locality record.

Parahemiurus merus (Linton, 1910) Woolcock, 1935. James River  
(36°59.'9 N, 76°29.'4 W), 4-IX-64, adult in Menticirrhus americanus  
(Linnaeus) or (?) M. saxatilis (Bloch & Schneider), new host record.  
YR, 22-VIII-65, adult in Pomatomus saltatrix (Linnaeus), new host  
record. This is a new locality record for this species.

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Chapter V: Free-living Invertebrates  
(except Protozoa)

Marvin L. Wass

This is the fourth revision of the list of invertebrates done by Dr. Willis G. Hewatt in 1959. The 7-year period since the last list was done has seen the publication of many papers and the accumulation of much data. The assistance of several authorities has also enhanced the list. The 819 species are composed mainly of 297 arthropods, 120 mollusks, 109 polychaetes and 72 cnidarians. Most of these organisms are readily observed but not always easily identified. Among smaller organisms we may still expect some additions to the 96 nematodes, 24 nemertean and 22 flatworms.

Information on life histories and physical tolerances are much needed, although communities and biological interactions likewise merit attention. The insects are omitted from the list and thus are the most needed addition to a future work.

The cnidarians have been done by Dale Calder, the copepods by Victor G. Burrell and David Zwerner, the decapod crustaceans by Willard A. Van Engel and Paul A. Sandifer, and several other arthropod groups also by W. A. Van Engel.

Species data (when known) are given in this order: salinity ("Venice" system), area, abundance, substrate, depth, collector and identifying authority. Authorities are listed alphabetically below by surname. Others are mentioned in the introductions to certain taxa.

|      |  |
|------|--|
| JDA  | Jay D. Andrews, VIMS                                       |
| DFB  | Donald F. Boesch, VIMS                                     |
| TEB  | Thomas E. Bowman, Smithsonian Institution                  |
| VGB  | Victor G. Burrell, South Carolina Marine Research Division |
| PC   | Paul Chanley   |
| HE   | Herbert Elliott  |
| JBF  | James B. Feeley  |
| DG   | Daniel Gibson  |
| GDG  | George D. Grice, Woods Hole Oceanographic Institute        |
| SH   | Sewell Hopkins, Texas A. and M. University                 |
| WGH  | Willis G. Hewatt, Texas Christian University               |
| HPJ  | Harry P. Jeffries, Narragansett Marine Laboratory          |
| FJSM | Frank J. S. Maturo, Jr., University of Florida             |
| GAM  | G. Alex Marsh, III, Florida Atlantic University            |
| JPEM | Joseph P. E. Morrison, Smithsonian Institute               |
| RCO  | Raymond C. Osburn  |
| RC   | Robert Orth, University of Maryland                        |
| MP   | Marian H. Pettibone, Smithsonian Institution               |
| MR   | Michael Richardson, Oregon State University                |
| FS   | Frank J. Schwartz  |
| PAS  | Paul A. Sandifer   |
| WT   | Willis L. Tressler   |
| WAVE | Willard A. Van Engel, VIMS                                 |
| CBW  | Charles Branch Wilson                                      |
| HW   | Harry W. Wells   |
| HCY  | Harry C. Yeatman   |

The following area abbreviations are used:

|     |                   |    |                    |
|-----|-------------------|----|--------------------|
| CB  | Chesapeake Bay    | PR | Pamunkey River     |
| SI  | Solomon's Island  | RR | Rappahannock River |
| TML | Tue Marshes Light | YR | York River         |
| GP  | Gloucester Point  | HR | Hampton Roads      |
| MR  | Mattaponi River   | ES | Eastern Shore      |
| JR  | James River       | YS | York Spit          |

## PHYLUM PORIFERA: CLASS DEMOSPONGIAE

## Order Haplosclerina

## Family Haliclونidae

Haliclona permollis (Bowerbank, 1866). Meso- and polyhaline. GP, abundant, MW.

Haliclona loosanoffi (Hartman, 1958). Meso- and polyhaline. Solomons, Md., WH. YR (Mumfort Is.), most common sponge on Zostera and only one present all year (Marsh, 1970).

## Order Poecilosclerina

## Family Microcionidae

Microciona prolifera (Ellis and Solander, 1786). Meso- to polyhaline. YR, abundant on piling in summer, deeper water in winter, MW.

## Family Myxillidae

Lissodendoryx carolinensis Wilson, 1911. Meso- and polyhaline. Stinking sponge, abundant in summer, WH.

## Family Ophlitaspongiidae

Mycale sp. GP, 18-VI-68, color differs from Mycale cecilia, DFB, HW. On Zostera blades and forming mass at base of clump, GAM.

## Order Halichondrina

## Family Halichondridae

Halichondria bowerbanki Burton, 1930. Upper meso- to euhaline. Most conspicuous fouling sponge in summer, MW.

## Order Hadromerina

## Family Suberitidae

Prosuberites microsclerus de Laubenfels, 1936. Upper meso- and polyhaline. YR7, Forms thin encrustations on shells of Urosalpinx in eel grass beds, GAM, HW.

## Family Clionidae (See Hopkins, 1962).

Cliona celata Grant, 1826. ES (Seaside), 14-36 ppt, (Hopkins, 1962).

Cliona lobata Hancock, 1849. Mostly ES (Bayside), 14-27 ppt, SH.

Cliona truitti Old, 1941. ES, 3-27 ppt, SH.

Cliona vastifica Hancock, 1849. ES (Bayside and Seaside), 14-36 ppt, scarce species, SH.

## Order Choristida

## Family Crainellidae

Craniella crania (Muller, 1776). Polyhaline. CB (Rappahannock Shoals), aggregated on coarse sand, depth 30 feet, rare, summer, MW.

Craniella laminaris (George and Wilson, 1919.) Polyhaline. Abundant at mouth of YR on sand to silty-sand, summer, MW.

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## PHYLUM CNIDARIA

by Dale Calder

## Class Hydrozoa

## Order Anthomedusae (Athezata)

## Suborder Capitata

## Family Moerisiidae

Moerisia lyonsi Boulenger, 1908. Oligo- and mesohaline.Hydroid: JR (Deep Water Shoal to Hog Is.), on plant detritus, Brachidontes recurvus shells.

Medusa: JR (Deep Water Shoal to Hog Is.), PR (West Point). Common July-August.

## Family Tubulariidae

Ectopleura dumortieri (van Beneden, 1844). Meso- and polyhaline.

Hydroid: JR (Hampton Roads), YR (TML to Aberdeen Creek), RR (Urbanna). April-January.

Medusa: YR (GP). April-December, common to abundant in autumn.

Hybocodon prolifer L. Agassiz, 1862. Polyhaline.

Medusa: CB (C 00). One specimen, 29-II-68, V. G. Burrell, Jr.

Tubularia crocea (L. Agassiz, 1862). Polyhaline.

Hydroid: CB (southeastern region). Abundant late summer on Bridge-Tunnel pilings.

## Family Halocordylidae

Halocordyle disticha (Goldfuss, 1820). Meso- and polyhaline.Hydroid: CB (Cape Charles), JR (Hampton Roads), YR (Perrin, GP), common on Zostera. June-October.

Medusa: YR (GP). June-September.

## Family Corynidae

Dipurena strangulata McCrady, 1857. Meso- and polyhaline.Hydroid: YR (GP, Pages Rock), only on Microciona prolifera. May-November.

Medusa: YR (GP). June-October, common to abundant in summer.

Sarsia tubulosa (M. Sars, 1835). Meso- and polyhaline.

Hydroid: YR (GP). Frequently present on VIMS wet-tables. November-May.

Medusa: YR (GP). December-April.

Linvillea agassizi (McCrady, 1857). Meso- and polyhaline.

Hydroid: YR (GP, Pages Rock). Common in summer on sponges. May-November.

Medusa: YR (GP). June-September.

## Family Zancleidae

Zanclea costata Gegenbaur, 1856. Polyhaline.Hydroid: CB (Fisherman's Is.). One record, 29-VIII-67, on Schizoporella errata.

Medusa: Medusa buds on hydroid.

## Suborder Filifera

## Family Clavidae

Cordylophora caspia (Pallas, 1771). Limnetic and oligohaline.

Hydroid: JR (Deep Water Shoal to Jamestown Is.), MR (Indian Reservation), RR (Tappahannock).

Turritopsis nutricula McCrady, 1856. Meso- and polyhaline.

Hydroid: CB (Fisherman's Is.), JR (Hampton Roads), YR (TML, GP, Pages Rock). Common on sponges. May-November.

Medusa: YR (GP). Common late summer, early autumn. August-October.

## Family Hydractiniidae

Hydractinia arge (Clarke, 1882). Meso- and polyhaline.Hydroid: YR (Perrin, GP), RR (near Norris Bridge). Common on Zostera. May-December.

Medusa: YR (GP). Lives only a few hours. June-September.

Hydractinia echinata (Fleming, 1828). Polyhaline.

Hydroid: CB (Fisherman's Is., Kiptopeke, Cape Charles, New Point Comfort), JR (Hampton Roads), YR (Guinea Neck).

Podocoryne minima (Trinci, 1903). Polyhaline.

Medusa: YR (GP). September-October.

## Family Rathkeidae

Rathkea octopunctata (M. Sars, 1835). Meso- and polyhaline.

Medusa: YR (GP), Severn R. Common to abundant late autumn, early winter. November-December.

## Family Bougainvilliidae

Bougainvillia carolinensis (McCrary, 1857). Polyhaline.

Medusa: CB (Kiptopeke). In VIMS plankton sample taken 10-X-61.

Bougainvillia rugosa Clarke, 1882. Meso- and polyhaline.

Hydroid: JR (Hampton Roads), YR (Ellen Is., GP). Common to abundant on pilings. April-December.

Medusa: YR (GP). Abundant late summer, autumn. Egg armed with nematocysts. May-November.

Garveia cerulea (Clarke, 1882). Polyhaline.

Hydroid: JR (Hampton Roads).

Garveia franciscana (Torrey, 1902). Oligo- and mesohaline.

Hydroid: JR (Deep-water Shoal). Easily confused for and possibly synonymous with G. cerulea. Either or both species very widespread and abundant in mesohaline.

Aselomaris michaeli Berrill, 1948. Meso- and polyhaline.

Hydroid: JR (Hampton Roads), YR (GP). Frequently common at water line of floating objects. October-June, gonophores November-June.

Nemopsis bachei L. Agassiz, 1849. Very euryhaline species.

Hydroid: Young stage obtained from planulae in the lab. Not seen in nature.

Medusa: CB (C00 to TML), JR (Hampton Roads), YR (TML to West Point), RR (Urbanna). Most conspicuous hydromedusa in lower bay. Common to abundant sporadically throughout the year.

## Family Pandeidae

Amphinema dinema (Peron and Lesueur, 1809). Polyhaline.

Hydroid: CB (Fisherman's Is., Cape Charles). Collected twice during August, 1967, on Acyonidium verrilli.

Medusa: Liberated in lab from hydroids and reared to maturity. One specimen from plankton, GP, August 1970.

## Family Proboscidactylidae

Proboscidactyla ornata (McCrary, 1857). Meso- and polyhaline.

Hydroid: JR (Hampton Roads), YR (GP). Commensal with Sabella microphthalma. April-January.

Medusa: YR (GP). Common in summer, June-September.

## Family Eudendriidae

Eudendrium album Nutting, 1898. Meso- and polyhaline.

Hydroid: JR (Hampton Roads), YR (GP, Pages Rock). Common in Hampton Roads during summer. May-November, gonophores June-September.

Eudendrium carneum Clarke, 1882. No data available.

Hydroid: JR (Hampton Roads). Not recorded locally since described by Clarke (1882).

Eudendrium ramosum (Linnaeus, 1758). Polyhaline.

Hydroid: JR (Hampton Roads), YR (off Vepco Yorktown).

## Order Leptomedusae (Thecata)

## Family Haleciidae

Halecium gracile Verrill, 1874. Polyhaline.

Hydroid: CB (C00). Specimens in bottom plankton sample taken 13-XII-67 by V. G. Burrell, Jr.

## Family Campanulariidae

Clytia cylindrica L. Agassiz, 1862. Polyhaline

Hydroid: JR (Hampton Roads), YR (TML, Perrin, Vepco Yorktown, GP).

Clytia edwardsi (Nutting, 1901). Meso- and polyhaline.

Hydroid: CB (Bridge-Tunnel, Thimble Shoal, Willoughby Bank), JR (Hampton Roads), YR (GP, Bell Rock). October-July, common in winter and spring.

Medusa: Liberated from hydroid in lab during April, 1966 and 1967.

Clytia hemisphaerica (Linnaeus, 1767). Euryhaline.

Hydroid: JR (Hampton Roads, Deep-water Shoal, Hog Is.), PR (P-35).

Clytia kincaidi (Nutting, 1899). Polyhaline

Hydroid: JR (Hampton Roads), YR (GP). Evidently rare.

Clytia paulensis (Vanhöffen, 1910). Meso- and polyhaline.

Hydroid: CB (Bridge-Tunnel), JR (Old Point Comfort, Hampton Roads), YR (TML, Ellen Is., off Vepco Yorktown, GP, Page's Rock). Common to abundant. May-December.

Medusa: Obtained in lab from hydroid, summer 1967.

- Obelia bicuspidata Clark, 1876. Polyhaline.  
Hydroid: JR (Hampton Roads), YR (Veeco Yorktown)  
Medusa: Obtained in lab from hydroid, September 1967.
- Obelia commissuralis McCrady, 1857. Meso- and polyhaline.  
Hydroid: CB (Bridge-Tunnel, mid-bay--37°15'N, 76°10'W),  
JR (Hampton Roads), YR (GP).  
Medusa: Obtained in lab from hydroid, May, September, 1966.
- Obelia dichotoma (Linnaeus, 1758). Meso- and polyhaline.  
Hydroid: CB (Kiptopeke, New Point Comfort), YR (TML, GP).  
Common near mean low water on pilings during summer at GP.  
May-November.  
Medusa: Obtained in lab from hydroid, June 1966.
- Obelia longissima (Pallas, 1766). Polyhaline.  
Hydroid: CB (Bridge-Tunnel, Fisherman's Is.).  
Medusa: Obtained in lab from hydroid, March 1968.
- Obelia spp. Meso- and polyhaline.  
Medusa: YR (GP). The various species of Obelia medusae cannot  
be distinguished at present. May-October.
- Goncthyraea loveni (Allman, 1859). Meso- and polyhaline.  
Hydroid: Abundant throughout the lower bay and tributaries.  
November-June, gonophores November-June.
- Hartlaubella gelatinosa (Pallas, 1766). Meso- and polyhaline.  
Hydroid: CB (Bridge-Tunnel, Thimble Shoal, Willoughby Bank),  
JR (Hampton Roads), YR (GP, Pages Rock). November-June.
- Family Lovenellidae
- Eucheilota ventricularis McCrady, 1857. Polyhaline.  
Medusa: JR (Hampton Roads), YR (GP). September-October.
- Lovenella gracilis Clarke, 1882. Meso- and polyhaline.  
Hydroid: JR (Hampton Roads), YR (Ellen Is., Perrin, GP, Pages  
Rock, Bell Rock). April-October.  
Medusa: YR (GP). Also obtained from hydroid and reared in lab.  
July-October.
- Family Phialellidae
- Opercularella pumila Clark, 1876. Meso- and polyhaline.  
Hydroid: JR (Hampton Roads), YR (GP). Common to abundant in  
Hampton Roads. September-May, gonophores present December-May.
- Family Phialuciidae
- Phialucium carolinae (Mayer, 1900). Polyhaline.  
Medusa: YR (GP). August-September.
- Incertae Sedis
- Blackfordia virginica Mayer, 1910. Polyhaline.  
Medusa: JR (Hampton Roads), recorded by Mayer (1910), RPC.  
October-November.
- "Campanopsis" sp. Polyhaline.  
Hydroid: YR (GP).
- "Campanulina" sp. 1. Polyhaline  
Hydroid: YR (TML). Coll. 14-VIII-67.
- "Campanulina" sp. 2. Oligo- and mesohaline.  
Hydroid: NR (Newman's Pt.), JR (Pig Pt., Bennett's Creek, Deep  
Water Shoal, Hog Is.), YR (Pages Rock, Bell Rock), PR (West  
Point, P-35).  
Medusa: Obtained in lab from hydroid, July, August, 1967.
- Family Eutimidae
- Eutima mira McCrady, 1857. Polyhaline.  
Medusa: CB (Kiptopeke). In VIMS plankton sample taken 10-X-61.
- Family Sertulariidae
- Dynamena cornicina McCrady, 1857. Meso- and polyhaline.  
Hydroid: CB (Cape Charles, Little Creek Jetty), JR (Hampton Roads),  
YR (TML, Perrin, GP, Pages Rock). Abundant on Zostera. April-  
November, gonophores June-September.
- Sertularia argentea Linnaeus, 1758. Meso- and polyhaline.  
Hydroid: Abundant throughout lower bay and tributaries on sandy  
and shelly bottoms. September-June, gonophores November-May.



- Family Plumulariidae  
Schizotricha tenella (Verrill, 1874). Meso- and polyhaline.  
 Hydroid: Common to abundant throughout lower bay and tributaries, particularly on pilings, etc. May-December, gonophores May-October.
- Order Limnomedusae  
 Family Olindiidae  
Maeotias inexpectata (Ostroumov, 1896). Oligo- and mesohaline.  
 Medusa: PR (West Point, P-40). Collected by V. G. Burrell, Jr., October and November 1968, September 1970.
- Order Trachymedusae  
 Family Geryonidae  
Liriope tetraphylla (Chamisso and Eysenhardt, 1821). Polyhaline.  
 Medusa: YR (TML, GP). Absent in 1967, exceedingly abundant 1970. August-November.
- Family Rhopalonematidae  
Aglantha digitale (O. F. Müller, 1776). Polyhaline.  
 Medusa: CB (C00). In VIMS plankton sample taken 13-III-61.
- Order Narcomedusae  
 Family Cuninidae  
Cunina octonaria McCrady, 1857. Polyhaline.  
 Actinula: YR (GP). Parasitic on medusae of Turritopsis nutricula.  
 Medusa: YR (GP). Common. September-October.
- Order Siphonophora  
 Suborder Cystonectae  
 Family Rhizophysaliidae  
Physalia physalis (L., 1758). Virginia Beach, VIII-62, WGH.
- Suborder Disconectae  
 Family Chondrophoridae  
Porpita linnaena Lesson. On beach at Sand Bridge, WGH.
- Class Scyphozoa  
 Order Semaestomeae  
 Family Pelagiidae  
Chrysaora quinquecirrha (Desor, 1848). Meso- and polyhaline.  
 Abundant, lower bay and tributaries. Ephyrae usually appearing late April, early May, medusae disappearing September, rarely lasting into November.
- Family Cyaneidae  
Cyanea capillata (Linnaeus, 1758). Meso- and polyhaline.  
 Abundant, lower bay and tributaries. Ephyrae usually appearing late November or early December; medusae disappearing May or June.
- Family Ulmaridae  
Aurelia aurita (Linnaeus, 1758). Meso- and polyhaline.  
 Common to abundant in lower bay and tributaries. Ephyrae appearing late May or early June; medusae disappearing November.
- Order Rhizostomeae  
 Family Rhizostomatidae  
Rhopilema verrilli (Fewkes, 1887). Polyhaline. Occasionally seen from York River entrance to GP, and along barrier islands, ES, autumn, early winter. Large specimen (45 cm diameter, 12 kg), Chincoteague, Va., 1-I-71.
- Class Anthozoa  
 Subclass Alcyonaria  
 Order Gorgonacea  
 Family Gorgoniidae  
Leptogorgia virgulata (Lamarck, 1815). Meso- and polyhaline.  
 Whip coral common to Y10, MW. Colonies in York River purple, much-branched, short; in Ches. Bay near mouth, colonies yellow or tan with long, whip-like branches.
- Subclass Zoantharia (Members of the first two orders have been determined from this area by Charles E. Cutress).

## Order Actiniaria

## Family Edwardsiidae

Edwardsia elegans Verrill, 1869. Mesohaline. Small, abundant in sandy-mud. Y-5, 0-105 feet, to 400/m<sup>2</sup>.

Nematostella vectensis Stephenson, 1935. Oligohaline in CB. Common in Machodoc Creek in silt, 1963. Not yet found elsewhere in CB.

## Family Ilyanthidae

Haloclava producta (Stimpson, 1856). YR (Channel off Yorktown, one specimen.

## Family Actinostolidae

Paranthus rapiformis (LeSueur, 1817). Upper poly- and euhaline. West of Cape Charles City, Virginia in sand, MW. CB (mouth), common, DFB.

## Family Diadumenidae

Diadumene leucolena (Verrill, 1866). Upper meso- and polyhaline. Common green-brown anemone above low water line on pilings; often pink in deeper water, as on oyster rocks, MW.

## Family Aiptasiidae

Aiptasia eruptaurantia (Field, 1949). Upper mesohaline. York River, burrowing, rare.

## Family Aiptasiomorphidae

Aiptasiomorpha luciae (Verrill, 1898). Upper meso- and polyhaline. Dark, yellow-striped anemone abundant on pilings and shells. YR (Mumfort Is.) abundant on Zostera May-December. (See Woods Hole Keys for alternate name of this species.)

## Order Cerianthidea

## Family Cerianthidae

Ceriantheopsis americanus (Verrill, 1864). Polyhaline. In silty-clay at depths of 20-70 feet.

## Order Madreporaria

## Family Astreaeidae

Astrangia danae Agassiz, 1847. Euhaline. RPC, mouth of Chesapeake Bay, scarce. ES (Hog Island Bay) common, winter, 1964, PC.

## ADDENDUM

## Class Scyphozoa

## Order Semaestomeae

## Family Pelagiidae

Pelagia noctiluca (Forsk., 1775). Euhaline. Wachapreague Inlet, X-71, VGB.

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#### PHYLUM CTENOPHORA

##### Class Tentaculata

###### Order Lobata

Mnemiopsis leidyi A. Agassiz, 1865. Meso- to euhaline. Common to abundant most of the year. CB, less common, apparently because of predation by Beroe, VB.

##### Class Nuda

###### Order Beroidea

Beroe ovata Chamisso and Eysenhardt, 1821. Upper meso- and polyhaline. CB, late summer and fall, abundant, VB. Potomac River, III and IV, FS.

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## PHYLUM PLATYHELMINTHES

Information on the Class Turbellaria, except for the triclads and polyclads, is from Ferguson and Jones (1949) unless otherwise indicated. All records are from the Lafayette River, Norfolk, Virginia, brackish shallows, unless otherwise noted. Freshwater rhabdocoels are omitted. The list has numerous errata in other groups, but literature was not available to check the accuracy of this class

The Turbellaria are obviously one of the most poorly known large groups of meiofauna in the Chesapeake Bay. Interested students should consult the "Woods Hole keys" and Libbie Hyman's works.

## Class Turbellaria

## Order Acoela

## Family Convolutidae

Childia groenlandica (Levinson, 1879). C. spinosa in Ferguson and Jones (1949).

Aphanostoma sp. Possibly A. diversicolor Oersted, 1845.

## Family ?

Monochoerus sp.

## Order Rhabdocoela

## Family Microstomidae

Macrostomum beaufortensis Ferguson, 1937.

Macrostomum ruebushi var. kepneri Ferguson and Jones 1940. Tanner's Creek, Norfolk, Virginia (Ferguson and Jones, 1940).

## Family ?

Omalostomum schultzei Claparede, 1863.

## Family Graffillidae

Vejdovskya sp.

## Family Dalyelliidae

Jensenia lewisi Jones and Ferguson, 1948. Mason's Creek, Norfolk, Virginia, 1939.

## Family Proxenetidae

Proxenetes sp.

## Family Trigonostomidae

Trigonostomum sp.

## Family ?

Tauridella sp. Euhaline. Ocean shallows, Seashore State Park, Norfolk.

## Family Polycystididae

Phonorhynchus pearsei Ferguson, Stirewalt, and Kepner, 1940. YR, 12 mi. from Williamsburg, less than 3 ppt; spring, 1939. (Ferguson et al, 1940).

## Order Alloecoela

Cylindrostomum triste (Graff).

Enterostomula graffi (Beauchamp)

Plagiostomum wilsoni Graff.

## Family Monocelididae

Monocelis sp.

Archiloa wilsoni Stirewalt, Kepner and Ferguson, 1940.

## Order Tricladida

## Family Bdellouridae

Bdelloura candida (Girard, 1850). Euhaline. Commensal on Limulus

## Order Polycladida

## Family Stylochidae

Coronadena mutabilis (Verrill, 1873). Poly- and euhaline. YR (VIMS pier), numerous specimens; JR (Pier 12, Norfolk); ES (Cherrystone Creek) (Adrian Lawler, 1969).

Stylochus ellipticus (Girard, 1850). Upper meso- and polyhaline.

To 100 ft., 340/m<sup>2</sup>, preys on oysters and barnacles.

Stylochus zebra (Verrill, 1882). Poly- and euhaline. Commensal with

Pagurus pollicaris, 8-XI-66, Morris Roberts.

## Family Leptoplanidae

Euplana gracilis (Girard). Ocean View, Norfolk, Va., algal masses.

YR (Mumfort Is.), on Zostera, June to Nov.; absent in winter, GAM.

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## PHYLUM RHYNCHOCOELA

(Members of this group were determined by William E. McCaul.)

## Class Anopla

## Order Paleonemertini

## Family Tubulanidae

Tubulanus pellucidus (Coe, 1895). Polyhaline. Lower CB, mud, 16 m; littoral habitats, usually among bryozoans, tunicates and algae; relatively abundant.

## Family Carinomidae

Carinoma tremaphoros Thompson, 1900. Poly- and euhaline. CB (Rapp. Shoals channel), 0.5mm sieve, silt-clay, abundant (175/m<sup>2</sup>), MW.

Carinomella lactea Coe, 1905. Poly- and euhaline. Lower CB and GP, below 8m, mud, scarce.

## Order Heteronemertini

## Family Lineidae

Cerebratulus lacteus (Leidy, 1851) Polyhaline. Lower CB and YR to Y10, occasionally abundant in shallow fine sand; scarce at 10 m.

Cerebratulus luridus Verrill, 1873. Poly- and euhaline. Lower CB and GP, below 8 m, clayey-silt, scarce.

Lineus bicolor Verrill, 1892. Polyhaline. YR, 13 m, mud, rare.

Lineus pallidus Verrill, 1879. Euhaline. ES (Burton's Bay), silty-clay, one specimen.

Lineus socialis (Leidy, 1855) Polyhaline. YR (Yorktown), subtidal sand, rare.

Micrura leidyi (Verrill, 1892). Upper meso- and polyhaline. YR, intertidal sand and mud, abundant.

Micrura rubra Verrill, 1892. Polyhaline. CB, (off RR) one specimen, 15 m, mud.

Parapollia aurantiaca Coe, 1895. Euhaline. ES (Hog I. Bay), sand-silt, one specimen.

Zygeupollia rubens (Coe, 1895). Upper poly- and euhaline. ES, intertidal sand, abundant, lower CB, 18 m, rare.

## Class Enopla

## Order Hoplonemertini

## Family Carcinonemertidae

Carcinonemertes carcinophila (Kolliker, 1945). Meso-to euhaline. Lower CB and tributaries, juveniles common on gills of blue crabs of all sizes and both sexes; adults common on gills and ripe egg masses of ovigerous crabs and on gills of previously spawned females; adult worms absent from male crabs, SH, WAVE.

## Family Prosorhochmidae

Oerstedtia dorsalis (Abildgaard, 1806). Polyhaline. CB (Off RR), 20 m, sandy-silt, rare; GP, on Zostera, occasional.

## Family Amphiporidae

Amphiporus bioculatus (McIntosh, 1873). Polyhaline. Lower YR, sandy-silt, 1-30 m, occasionally common.

Amphiporus caecus Verrill, 1892. Upper meso- and polyhaline. CB (off RR), coarse sand, 6 m, one specimen. YR (Mumfort I.) 3 specimens on Zostera, GAM.

Amphiporus ochraceus Verrill, 1873. Upper meso- and polyhaline. GP, common on Zostera. YR (Mumfort I.), most common in June, GAM.

Amphiporus rubropunctus McCaul, 1963. Upper meso- to lower polyhaline. YR (Yorktown), one specimen; (Mumfort I.), two specimens; all on Zostera.

## Family Tetrastemmatidae

Tetrastemma candidum (Muller, 1774). Lower polyhaline. GP, frequent on Zostera. (Not found by GAM).

Tetrastemma elegans (Girard, 1852). Upper meso- and lower polyhaline. GP, abundant on Zostera. YR (Mumfort I.), second most abundant nemertean on Zostera, GAM.

Tetrastemma jeani McCaul, 1963. Upper mesohaline. YR (Mumfort I.), four specimens, WM; two specimens, GAM.

Tetrastemma vermiculus (Quatrefages, 1846). Upper meso- and lower polyhaline. YR, (GP) on Zostera, scarce; Mumfort I., one specimen, GAM.

Zygonemertes virescens (Verrill, 1879). Upper meso- and lower polyhaline. YR, on Zostera, very abundant; Mumfort I., most abundant nemertean, GAM.

## Order Bdellonemertini

## Family Malacobdellidae

Malacobdella grossa (Muller, 1776). Upper meso- and polyhaline. Commensal in mantle cavity of bivalves: the hard clam, Mercenaria mercensria; the soft clam, Mya arenaria, and the oyster, Crassostrea virginica; occurrence spotty.

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## PHYLUM NEMATODA

The free-living nematodes are included for the first time in this checklist. The records are from the pioneer work of Timm (1952) the later study by Wieser (1959), both in Maryland, Chitwood, 1951 (one species). Apparently no nematodes have been identified from the Chesapeake estuary in over a decade. Nematodes are variously organized by different authorities, the scheme of Wieser (1956-59) being used here. Anyone interested in studying nematodes should consult the recent works of Wieser and Hopper, who are working toward a monograph of the free-living marine nematodes of the eastern coast of North America. Since 96 species were found by Timm and Wieser, mostly in mesohaline areas with low diversity, it seems not unreasonable to expect ca 400 species in the Chesapeake estuary and tidal waters.

## Order Enoploidea

## Family Rhabditidae

Rhabditis marina (Bastian, 1865). Chesapeake Beach, Md., eurytopic, frequent, WW.

## Family Leptosomatidae

Anticoma limalis Bastian, 1865. Cambridge, Md., mud, RT.

## Family Oxystomidae

Halalaimus alatus Timm, 1952. Annapolis, Md., mud.

Halalaimus gracilis de Man, 1888. Chesapeake Beach, Md., offshore mud, RT.

Halalaimus scleratus Timm, 1952. SI, Md., mud.

Oxystomina elongata (Butschli, 1874). Annapolis and SI, Md., mud, RT.

## Family Enoplidae

Enoplodes brunetti Gerlach, 1957. South Beach, Chesapeake Beach, Md., fine sand, rare, WW.

Enoplolaimus litoralis Schulz, 1936. Chesapeake Beach, Md., coarse sand, abundant, WW.

Enoplus schulzi Gerlach, 1953. North Beach, Chesapeake Beach, Md., coarse sand, rare, WW.

## Family Iroidae

Ironella cobbi Timm, 1952. SI, Md., mud.

## Family Dorylaimidae

Dolicholaimus benepapillosus Schulz, 1935. South Beach, Chesapeake Beach, Md., fine sand, rare, WW.

Dorylaimus aestuarii Timm, 1952. SI, Md., on sponge and Membranipora, RT. Chesapeake Beach, Md., eurytopic, scarce, WW.

## Family Oncholaimidae

Adoncholaimus lepidus (de Man, 1889). "Throughout the Bay, but in small numbers", RT.

Anoplostoma demari Timm, 1952. Annapolis, Md., mud.

Anoplostoma exceptum Schultz, 1935. North Beach, Chesapeake Beach, Md., coarse sand, common, WW.

Anoplostoma viviparum (Bastian, 1865). Plum Point and SI, Md., very abundant on barnacles and benthic debris, RT.

Metoncholaimus unguentarius Wieser, 1959 (nomen nudum). South Beach, Chesapeake Beach, Md., fine sand, common, WW.

Oncholaimium oxyure (Ditlevsen, 1911). Offshore sand and on barnacles throughout CB, but absent in winter, RT. Chesapeake Beach, Md., eurytopic, abundant, WW.

Oncholaimium priapulius Wieser, 1959 (nomen nudum). North Beach, Chesapeake Beach, Md., coarse sand, rare, WW.

Oncholaimus nigrocephalatus Cobb, 1930. Ubiquitous, abundant in decaying detritus, RT.

Viscosia brachylaimoides Chitwood, 1937. SI, Md., mud, RT.

Viscosia papillata Chitwood, 1951. Kent Narrows, Md., mud, RT.

## Family Enchelidiidae

Eurystomina minutisculae Chitwood, 1951. SI, Md., sponge, RT.

Eurystomina paralittorale Timm, 1952. Plum Point and Chesapeake Beach, Md., mud.

Polygastrophora heptabulba Timm, 1952. Plum Point, Md., mud.



## Family Cyatholaimidae

Ascolaimus elongatus (Butschli). The family placement of this species could not be determined). North Beach, Chesapeake Beach, Md., coarse sand, rare, WW.

Halichoanolaimus duodecimpapillatus Timm, 1952. Annapolis, Md., mud.

Paracanthonchus caecus (Bastian, 1865). CB, "present in every collection, the most abundant species in the Bay". An ovoviparous species, RT. "Most eurytopic of all species, WW."

## Family Desmodoridae

Metachromadora parasitifera Timm, 1952. Annapolis, Md., mud, rather abundant in rich detritus, extremely sluggish. All specimens had Thecacinetia suctorian commensals on the cuticle.

Micromicron luticola Timm, 1952. Annapolis and Plum Point, Md., mud, common. Coiled into tight ball when disturbed.

Monoposthia ornata Timm, 1952. SI, Md., mud.

Neonyx obesus (Chitwood, 1936) Crisfield and Cambridge, Md., mud, RT.

## Order Chromadoroidea

## Family Chromadoridae

Chromadora quadrilineoides Chitwood, 1951. SI, Md., sponge and Membranipora, RT.

Chromadorita crassa Timm, 1952. Annapolis, Md., mud; Plum Pt., Md., tidepool. In one specimen the "intestinal cells" were filled with brown, vibrating bodies which Timm believed to be the first finding of Zooxanthellae in nematodes.

Chromadorita schuurmans-stekhoveni Timm, 1952. Chesapeake Beach, Md., mud.

Euchromadora sp. (Timm, 1952). SI, Md., pile scrapings and Membranipora.

Graphonema biserialis Wieser, 1959 (nomen nudum). North Beach, Chesapeake Beach, Md., coarse sand, common.

Graphonema tentabunda (de Man). Chesapeake Beach, Md., eurytopic, rare, WW.

Hypodontolaimus carinatus (Cobb, 1920) Kent Narrows, Cambridge and Annapolis, Md., mud, RT.

Hypodontolaimus schuurmans-stekhoveni Gerlach, 1951. Chesapeake Beach, Md., most abundant species in fine sand of South Beach, rare in coarse sand, WW.

Prochromadorella chitwoodi Timm, 1952. Chesapeake Beach and Plum Point, Md., mud, RT.

Prochromadorella viridis (von Linstow, 1876). Sandy Point, Md., offshore sand. (An abundant freshwater species in Europe), RT.

Spilophorella paradoxoides Timm, 1952. Chesapeake Beach, Annapolis, and Kent Narrows, Md., mud, abundant.

Spilophorella simplex Wieser, 1959. (nomen nudum). North Beach, Chesapeake Beach, Md., coarse sand, rare.

Timmia parva (Timm, 1952). (Parachromadora parva in Timm.) "Throughout the Bay", very abundant on barnacles and Membranipora; absent in winter.

## Family Comesomatidae

Dorylaimopsis metatypicus Chitwood, 1936. SI, Md., mud, RT.

Sabatieria americana Timm, 1952. SI, Md., bottom mud.

Sabatieria clavicauda Filipjev. (S. punctata in Timm, 1952). SI, Md., mud, RT.

## Order Axonolaemoidea

## Family Axonolaimidae

Axonolaimus demani de Coninck and Stekhoven 1933. Sandy Point, Md., offshore sand, RT.

Axonolaimus filipjevi Timm, 1952. SI, Md., mud.

Axonolaimus spinosus (Butschli, 1874). Throughout Bay, mud, very abundant, one ovoviparous female observed, RT.

Axonolaimus steineri Timm, 1952. Sandy Point and Chesapeake Beach, Md.

Odontophora axonolaimoides Timm, 1952. Kent Narrows, Md., mud, RT. South Beach, Chesapeake Beach, Md., fine sand, scarce, WW.

Odontophora setosa (Allgen, 1929). Annapolis, Md., mud, RT.

Odontophora setosoides Timm, 1952. Kent Narrows, Md., mud.

Paradontophora cobbi (Timm, 1952). Annapolis, Plum Point and SI, Md.

Pseudolella breviamphida Timm, 1952. SI, Md., mud.

Pseudolella paragranelifera Timm, 1952. Rice Creek (lower Patapsco R.), Md.

## Family Leptolaimidae

Leptolaimus papilliger de Man, 1876. Annapolis, Md., mud, RT.

## Family Camacolaimidae

Aphanolaimus pulcher G. Schneider, 1906. Sandy Point, Md., offshore sand, RT.

Camacolaimus propinquus Allgen, 1929. Cambridge, Md., mud, RT.

Nemella ocellata Cobb, 1920. Cambridge, Md., mud, RT.

## Family Tripyloididae

Bathylaimus assimilus de Man, 1922. Sandy Point, Md., shore sand, RT.

Bathylaimus parafilicaudatus Timm, 1952. Cambridge, Md., mud.

Tripyloides gracilis (Ditlevsen, 1919). Sandy Point, Md., shore sand, RT. South Beach, Chesapeake Beach, Md., fine sand, frequent, WW.

Tripyloides granulatus (Cobb, 1913). "Potomac River, brackish", (Chitwood, 1951). See Wieser, 1956.

## Order Monhysteroidea

## Family Linhomeidae

Emorpholaimus chesapeakeensis Timm, 1952. Cambridge and Crisfield, Md., mud.

Eleutherolaimus stenosoma (de Man, 1907). Crisfield and SI, Md., mud, RT.

Paralinhomoeus conicaudatus Allgen, 1930. Cambridge, Md., mud, RT.

Paralinhomoeus paraconicaudatus Timm, 1952. Kent Narrows, Md., mud, RT.

Terschellingia communis de Man, 1888. Crisfield and SI, Md., mud; one specimen "packed with elliptical sporezoans", RT.

Terschellingia longicaudata de Man, 1907. SI, Md., mud, RT.

## Family Sphaerolaimidae

Sphaerolaimus balticus G. Schneider, 1906. Crisfield, Md., mud, RT.

## Family Monhysteridae

Diplolaimella allgeni W. Schneider, 1937. Sandy Point, Md., offshore sand. Kent Narrows and Cambridge, Md., mud, RT.

Diplolaimella punicea Timm, 1952. Sandy Point, Md., offshore sand.

Color "beautiful pink" due to intestinal cell inclusions. Chesapeake Beach, Md., floating debris; globular inclusions bright green.

Diplolaimella schneideri Timm, 1952. Plum and Kent Narrows, Md., bottom mud.

Monhystera chesapeakeensis Timm, 1952. Chesapeake Beach, Md., offshore debris.

Monhystera dahli Wieser. North Beach, Chesapeake Beach, Md., coarse sand, seven specimens, all in one sample, WW.

Monhystera denticulata Timm, 1952. Crisfield, Md., mud.

Monhystera elegantula Stekhoven, 1935. SI, Md., fine organic detritus, abundant, RT.

Monhystera filicaudata Allgen, 1929. Cambridge, Md., benthic detritus, RT.

Monhystera heteroparva Micoletzky, 1924. Plum Point, Md., decaying algae on shore; Crisfield, Md., mud, RT.

Monhystera louisae Bresslau and Stekhoven, 1935. Crisfield, Md., mud, RT.

Monhystera microphthalma de Man, 1880. Cambridge, Md., mud, RT.

Theristus alternus Wieser, 1956. South Beach, Chesapeake Beach, Md., fine sand, common.

Theristus biarcospiculum Timm, 1952. SI, Md., mud.

Theristus camelopardalis Wieser, 1959 (nomen nudum). Chesapeake Beach, eurytopic, abundant, WW.

Theristus marylandicus Timm, 1952. Sandy Point, Md., offshore sand, RT.

Theristus normandicus (de Man, 1890). Annapolis, Md., barnacles, RT.

Theristus oitospiculum Allgen. North Beach, Chesapeake Beach, Md., coarse sand, frequent, WW.

Theristus otoplanobius Gerlach. South Beach, Chesapeake Beach, Md., fine sand, abundant, WW.

Theristus oxycercus (de Man, 1888). Cambridge, Md., mud, RT.

Theristus oxyuroides (Stekhoven, 1931). Cambridge, Md., mud, RT.

Theristus paraelaboratus Timm, 1952. Annapolis (abundant), and SI, Md., mud.

Theristus parambronensis Timm, 1952. Annapolis and Plum Point, Md., mud.

Theristus paranormandicus Timm, 1952. Cambridge and Kent Narrows, Md., mud.

Theristus parvulus Timm, 1952. Cambridge, Md., mud.

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- Sasser, J. N. and W. R. Jenkins, Ed. *Nematology. Fundamentals and recent advances with emphasis on plant parasitic and soil form.* Univ. of N. C. Press, Chapel Hill, N. C. 480 p. Contains good review of nematode ecology by R. D. Winslow.
- Timm, Richard W. 1952. A survey of the marine nematodes of Chesapeake Bay, Maryland Ches. Biol. Lab. Publ. No. 95, 70 p. Lists 78 species in 44 genera from mid-Chesapeake Bay, of which one genus and 35 species were new to science and 60 were new to North America.
- Wieser, W. 1953-1959. Free-living marine nematodes. Chile reports 10, 17, 26, and 34. *Lunds Univ. Arrskr. N. F. Avd. 2.* The four reports include 559 pages and are needed by anyone studying nematodes.
- Wieser, W. 1959. A note on subterranean nematodes from Chesapeake Bay, Md. *Limnol. and Oceanogr.* 4:225-227. Lists 23 species, five of which are new to science (*nomina nuda*) and 17 of which are new to Chesapeake Bay.

## PHYLUM ECTOPROCTA

## Order Cyclostomata

## Family Crisiidae

Crisia eburnea (Linnaeus, 1758). Polyhaline. Lower CB, RCO.

## Order Ctenostomata

## Family Alcyonidiidae

Alcyonidium parasiticum (Fleming, 1828). Polyhaline. CB (mouth to Potomac R.), rare, RCO. YR, Wormley Rock, WGH.

Alcyonidium polycom (Hassall, 1841). Polyhaline. On shells, crab tests and larger algae.

Alcyonidium verrilli Osburn, 1912. Upper meso- (13 ppt) and polyhaline, RCO. Lower CB, abundant in winter, especially in crab dredging area, MW.

## Family Nolellidae

Nolella stipata Gosse, 1855. Polyhaline. Single record from Chincoteague Bay, RCO. GP, on Zostera in August, WGH.

Victorella pavida Kent, 1870. Oligo- to polyhaline (3-27 ppt, optimum ca 14 ppt), summer, abundant, RCO.

Anguinella palmata Van Beneden, 1844. Upper meso- (13 ppt) and polyhaline, RCO. GP, on Molgula and sponges, WGH.

## Family Vesiculariidae

Amathia convoluta Lamouroux, 1816. Polyhaline (above 22 ppt), lower CB, RCO. TML, 50 ft., WGH.

Amathia vidovici (Heller, 1867). Upper meso- (11 ppt), and polyhaline, RCO. Lower JR (Norfolk), F. J. S. Maturo.

Bowerbankia gracilis Leidy, 1855. Upper meso- and polyhaline, RCO.

## Family Valkeriidae

Aeverrillia armata (Verrill, 1874). Upper meso- (12 ppt) and polyhaline, RCO. ES (Hog Island Bay), FJSM. HR, on Libinia dubia, MW.

## Family Triticellidae

Triticella elongata (Osburn, 1912). Commensal in gill chambers of crabs and externally on crabs commensal with Chaetopterus, RCO.

## Order Cheilostomata

## Family Aeteidae

Aetea anguina (Linnaeus, 1758). Polyhaline. TML, rare, RCO.

## Family Membraniporidae

Membranipora membranacea (Linnaeus, 1766). Lower mesohaline (6-13 ppt). Scarce, only on Ruppia, RCO.

Membranipora tenuis Desor, 1848. Meso- and polyhaline (above 6 ppt), abundant in shallow water, RCO.

Membranipora tuberculata (Bosc, 1802). Euhaline. On Sargassum, RCO.

Conopeum truitti Osburn, 1944. Encrusting Ruppia, RCO.

## Family Electrinidae

Electra crustulenta (Pallas, 1766). Meso- to euhaline (6-32 ppt).

Most abundant bryozoan in shallow waters of CB, from Baltimore to near mouth; serious oyster competitor, RCO.

Electra hastingsae Marcus, 1938. Polyhaline. Lower CB and Chincoteague Bay, on shells, scarce.

Electra pilosa (Linnaeus, 1766). Upper meso- (11 ppt) and polyhaline, scarce, RCO.

Cupuladria canariensis Busk, 1859. Polyhaline, CB (York Spit), 30 feet, WGH.

## Family Bicellarieellidae

Bugula turrita (Desor, 1848). Polyhaline. Lower CB, RCO.

## Family Hippothoidae

Hippothoa hyalina (Linnaeus, 1767). Upper meso- (above 11 ppt) and polyhaline. Lower CB, common; to mouth of Patuxent, occasional, RCO.

## Family Schizoporellidae

Schizoporella unicornis (Johnston, 1847). Polyhaline. CB (mouth), common, less so at 18 ppt, RCO. GP, on oyster shell, MW.

## Family Microporellidae

Microporella ciliata (Pallas, 1766). Polyhaline (above 20 ppt), RCO.

## PHYLUM ENTOPROCTA

## Family Pedicellinidae

- Pedicellina cernua (Pallas, 1771). Upper meso- (15 ppt) and polyhaline. Lower CB, scarce; Chincoteague Bay, abundant, RCO. ES (Hog Is. Bay), FJSM. YR, Wormley Rock, abundant, WGH.
- Barentsia discreta (Busk, 1886). Upper polyhaline. CB (near mouth) RCO. Tentatively assigned to B. timida Verrill, 1900 by Maturo and Schopf, (1968).
- Barentsia laxa (Kirkpatrick, 1890). Polyhaline. Chincoteague Bay, common, RCO.
- Barentsia gracilis (Sars, 1835). Small colony, doubtfully reported, RCO.

## PHYLUM PHORONIDEA

- Phoronis architecta Andrews. Upper meso- and polyhaline. Common in silty sand and fine sand to 60 feet; numbers to 90/m<sup>2</sup> at 15 feet and 18 ppt, MW.

## References

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- Osburn, R. C. 1944. A survey of the Bryozoa of Chesapeake Bay. Maryland Dept. Res. Educ. Chesapeake Biol. Lab. Publ. No. 63, 55 p. A comprehensive account of Chesapeake forms, particularly those from less saline waters. Includes a glossary and keys to families.

## PHYLUM ANNELIDA

Class Archiannelida /Placed in order Archiannelida by Hermans (1969)/

## Family Dinophilidae

Dinophilus gyrociliatus C. Schmidt. Found swarming over dead fish in aquarium by John L. Wood, February 1961.

Dinophilus jagersteni Jones and Ferguson, 1957. Shallow waters of brackish swamps and creeks at Norfolk (Jones and Ferguson, 1957).

## Class Polychaeta

## Family Ampharetidae

Asabellides oculata (Webster, 1879). Oligo-euhaline. Sandy silt, 20-50 feet; YR off VIMS, 200/m<sup>2</sup>, ½ mm sieve, 19-VI-62; CB off RR, 1 mm sieve, 1200/m<sup>2</sup>, VI-62; MW. YR mouth, Zostera bed, rare, RO.

Lysipiddes grayi (Pettibone, 1953). Oligo- and mesohaline. Frequent in Machodoc Creek. YR (above bridge), rare; Guinea Marsh shore, common, Thomas Duncan. See Day, 1964 for name change.

Melinna maculata Webster, 1879. Upper meso- and polyhaline. Zostera bed, Chincoteague, 120/m<sup>2</sup>, mid-III-70, RO; CB off RR, 96 ft., fine sand, 135/m<sup>2</sup>, MW.

## Family Amphinomidae

Pseudeurythoe paucibranchiata Fauvel, 1932. Upper meso- and polyhaline.

Widespread, evenly distributed and abundant in silty sand to 105 ft.

Zostera beds, YR, mouth and Mumfort I, 160/m<sup>2</sup>, VI-70, RO. CB off RR, 59 ft., 300/m<sup>2</sup>, sand, MW, MP, HR, 600/m<sup>2</sup>, V-69, sand, DFB. Cove Pt., Md., silt-clay, 25-35 ft., scarce, D. H. Hamilton.

Samythella elongata (Verrill, 1873). Polyhaline. ES (Bayside, Cherry-stone Island, near Cape Charles), 23-VIII-65, 3, MW.

## Family Arabellidae

Arabella iricolor (Montagu, 1804). Upper meso- and polyhaline. Local.

Scarce in mud-shell areas of YR; off VIMS, 14-VIII-63, 12/m<sup>2</sup>, MW.

Drilonereis filum (Claparede, 1868). Upper meso- and polyhaline. Abundant in intertidal fine sand, MW. HR, 15, DFB.

Drilonereis longa Webster, 1879. Poly-euhaline. CB mouth, DFB; York-town, sand, 5 feet, rare, J.K.

Notocirrus spiniferus (Moore, 1906). Polyhaline. Rare; HR, 2, V-69, 38 feet, sand, DFB. Young parasitic in Diopatra cuprea (Pettibone, 1963).

## Family Arenicolidae

Arenicola cristata Stimpson, 1856. Meso-euhaline. GP, intertidal sand, uncommon, MW. Mobjack Bay, Severn R. mouth, fairly common, 1966, Langley Wood. Chincoteague (Tom's Cove), Frank Schwartz.

## Family Capitellidae

Capitella capitata (Fabricius, 1780). Meso-polyhaline. Uncommon, GP, 25 feet, 33/m<sup>2</sup>, VI-62, MW. Seldom reported, but Orth (1971) reported a capitellid from his YR stations in III at nos. to 190/m<sup>2</sup> at Mumfort I. Further systematic work seems needed on minute capitellids.

Heteromastus filiformis (Claparede, 1864). Oligo-euhaline. Often abundant, esp. in areas enriched thermally or with sewage effluent. HR, V-69; 38 feet, sand, 1325/m<sup>2</sup>, DFB. YR, VEPCO nearshore, 23-III-64, 400/m<sup>2</sup> (this species and Nereis succinea only survivors in VIII at station nearest heated water outfall), MW. YR, Clay Bank, Zostera bed, VII-70, 400/m<sup>2</sup>; CB, ES, the Gulf, VII-70, 2000/m<sup>2</sup>, RO. Cove Pt., Md., 10-20 ft., fine sand, abun., D.H. Hamilton.

Notomastus latericius Sars, 1851. Oligo-euhaline. HR, 38 ft., sand, 25/m<sup>2</sup>, DFB. YR, shallows, common, MW.

## Family Chaetopteridae

Chaetopterus varlopedatus (Renier, 1804). Meso-euhaline. Lower CB, YR, scarce to common below 25 ft., silty-clay, MW.

Spiochaetopterus costarum oculatus (Gitay, 1969). Oligo-euhaline. Abundant in low intertidal, scarce with depth. YR, Mumfort, Zostera bed, VII-70, 9800/m<sup>2</sup>, RO. HR, Willoughby Bay, VII-69, 11 ft., sand, 700/m<sup>2</sup>, DFB.

## Family Chrysopetalidae

Paleanotus heteroseta Hartman, 1945. Poly-euhaline. Rare to fairly common, HR, 14 ft., sand, 65/m<sup>2</sup>, DFB. Rare at GP and Rapp. Shoals.

## Family Cirratulidae

Cirratulus grandis Verrill, 1873. Meso-polyhaline. YR, GP, 25 ft., sandy-silt, 225/m<sup>2</sup>; 570/m<sup>2</sup>, at greater depths; CB off RR, 44 ft., 190/m<sup>2</sup>; dominates biomass and sometimes numbers in YR channel.

- Cossura sp. York Spit Channel, 21-XI-63, silt, 1; GP, 25-IX-63, 25 ft., 1, MW, MP.
- Tharyx setigera Hartman, 1945. Oligo-polyhaline. GP, common, 110/m<sup>2</sup>, 14-VIII-62. HR, sand, 140/m<sup>2</sup>, DFB.
- Family Dorvilleidae
- Stauronereis rudolphii (delle Chiaje, 1828). Upper mesohaline. GP, 15 ft., fine sand, 1, MW, MP. Elizabeth R., VIII-69, 1, MR.
- Family Eunicidae
- Marphysa sanguinea (Montagu, 1815). Meso-polyhaline. GP, VII-61, 1 in wrack, MW. HR, VIII-69, 38 ft., sand, 2, DFB. ES, the Gulf, 21-VI-65, 1; Chincoteague, Zostera bed, 12-IX-65, 3; Oyster, 7-IX-65, 11, MW.
- Family Flabelligeridae
- Pherusa affinis (Leidy, 1855). Poly-euhaline. CB, near York Spit Channel, east of York Spit light, 3-VII-68, DFB.
- Pherusa inflata (Treadwell, 1914). Upper poly-euhaline. Chincoteague, Zostera bed, 12-VIII-65, 5, MW.
- Family Glyceridae
- Glycera americana Leidy, 1855. Meso-polyhaline. Zostera bed, V-70, 70, RO. YR, VEPCO, near shore, 2-III-64, 70/m<sup>2</sup>, MW. Fairly common in sandy shallows and in Clymenella community.
- Glycera dibranchiata Ehlers, 1868. Oligo-euhaline. CB, Back R., Zostera bed, III-70, 100/m<sup>2</sup>, RO. YR, GP, 25-IX-63, 25 ft., 18/m<sup>2</sup>, MW. HR, VIII-69, 23 ft., clayey sand, 220/m<sup>2</sup>, DFB.
- Glycera robusta Ehlers, 1868. Chincoteague Bay area (Pettibone, 1963).
- Family Goniadidae
- Glycinde solitaria (Webster, 1879). Oligo-euhaline. YR, VEPCO area, 23-III-64, 70/m<sup>2</sup>. GP, 25-IX-63, sandy silt, 85/m<sup>2</sup> (90% in 1.5 mm screen), MW. HR, V-69, 9 ft., sand, 100/m<sup>2</sup>. Cove Pt., Md., widespread; 2, 40 ft., winter, silt-clay, abundant, D.H. Hamilton.
- Family Hesionidae
- Amphidura sp. CB, Rapp. Shoals Channel, XI-63, silty-clay, 5 (only record), MW, MP.
- Gyptis vittata (Webster and Benedict, 1887). Oligo-polyhaline. YR, 18-VI-63, 25 ft., sandy silt, 70/m<sup>2</sup>, MW. CB, Zostera beds, Back R., 55/m<sup>2</sup>; The Gulf (ES), 42/m<sup>2</sup>, RO.
- Parahesion luteola (Webster, 1880). Upper meso-polyhaline. YR, Zostera bed, VII-69, 2, RO.
- Podarke obscura Verrill, 1873. Upper meso-polyhaline. On sponges, Zostera and in detritus. YR, Mumfort I., VII-X-68, 1-4/g Zostera, GAM. CB, Back River, III-VI-7, 60/m<sup>2</sup>, RO.
- Family Lumbrineridae
- Lumbrineris tenuis (Verrill, 1873). Poly-euhaline. CB, common in intertidal, MW. Zostera beds, scarce in CB, YR; abundant at Chincoteague, 850/m<sup>2</sup>, RO.
- Family Lysaretidae
- Lysarete brasiliensis Kinberg, 1865. Euhaline. Habitat unknown, several in wrack at Virginia Beach after Ash Wednesday storm, III-62, Clarence Richards, MP.
- Family Magelonidae
- Magelona rosea Moore, 1907. Upper polyhaline. CB mouth, DFB.
- Family Maldanidae
- Clymenella torquata (Leidy, 1855). Meso-euhaline. GP, 400/m<sup>2</sup> in Clymenella community beyond Zostera beds, MW. HR, II-V-69, 14 ft., sand, 185/m<sup>2</sup>, DFB. CB, Rapp. Shoals area, VI-62, 40 ft., sand, 225/m<sup>2</sup>, MW. YR, Clay Bank, Zostera bed, V-70, very fine sand, 170/m<sup>2</sup>, RO.
- Clymenella zonalis (Verrill, 1874). (Formerly Euclymene collaris, see Mangum, 1962). Meso-euhaline. CB, Rapp. Shoals area, VII-62, 50 ft., sand, 115/m<sup>2</sup>. HR, V-69, 38 ft., sand, 10/m<sup>2</sup>, DFB.
- Maldanopsis elongata (Verrill, 1873). Meso-euhaline. Sand-sandy silt, 25-90 ft. GP, 10-VII-62, 25 ft., 15/m<sup>2</sup>; CB, Rapp. Shoals, VII-62, 50 ft., sand, 80/m<sup>2</sup>.
- Family Nephtyidae
- Aglaophamus verrilli (McIntosh, 1885). Poly-euhaline. CB, off RR, VI-62, 102 ft., clayey silt, 90/m<sup>2</sup>; YR, 18-V-62, 25 ft., sandy silt, 27/m<sup>2</sup>, MW. HR, II-69, 9 ft., sand, 10/m<sup>2</sup>, DFB.
- Nephtys bucera Ehlers, 1868. Euhaline. CB mouth, common, DFB. Cove Pt., Md., winter, sand, occasional, D.H. Hamilton.

- Nephtys incisa (Malmgren, 1865). Upper meso-euhaline. 25-105 ft., silt-sand. CB, off RR, VI-62, 9500/m<sup>2</sup>, YR, GP, 23-IV-64, 550/m<sup>2</sup>, MW.
- Nephtys magellanica (Augener, 1912). Upper meso-euhaline. CB, off RR, VI-62, 50 ft., silt, 180/m<sup>2</sup>; YR, GP, 5-IV-65, 20/m<sup>2</sup>, MW. HR, V-69, 22 ft., sand, 35/m<sup>2</sup>, DFB. This species is not yet known elsewhere on this coast. Nephtyids are difficult to identify and further systematic work might be beneficial.
- Nephtys picta (Ehlers, 1858). Poly-euhaline. CB, Rapp. Shoals, VI-61, sand, 110/m<sup>2</sup>, MW.
- Family Nereidae
- Ceratonereis irritabilis (Webster, 1879). Euhaline. ES, Hog I. Bay, common, MW.
- Laeonereis culveri (Webster, 1879). Oligo-mesohaline. YR, intertidal, mouth to fresh water; sand, abundant, MW.
- Lycastopsis pontica (Bobretzky, 1872). Euryhaline. Norfolk, in drift on beaches (Pettibone, 1963).
- Nereis arenaceodonta Moore, 1903. Polyhaline. CB, off RR, 37 ft., sand, rare, MW, MP.
- Nereis grayi Pettibone, 1956. Polyhaline. CB, off RR, VI-61, 100% sand, 2, MW, MP.
- Nereis succinea (Frey and Leuckart, 1847). Euryhaline. Ubiquitous estuarine nestler. Abundant on eel grass, sponges, bottom debris and oyster rocks; swarms mainly in May. Probably most widely disposed polychaete in Ches. estuary. CB, Cove Pt., Md., 34 ft., sand, 1000/m<sup>2</sup>, D.H. Hamilton; Rapp. Shoals, 98 ft., clayey silt, 90/m<sup>2</sup>, MW. HR, V-69, 16 ft., clayey sand, 290/m<sup>2</sup>, DFB. YR, Mumfort I., 28-VII-68, 11/g Zostera, GAM.
- Platynereis dumerilii (Audouin and Milne Edwards, 1833). Meso-euhaline. Abundant on eel grass, scarce elsewhere. YR, Mumfort I., abundant on Zostera, VI-XII (IV-I in deeper water), occurs all year, 10/g Zostera, 8-X-58, GAM.
- Family Onuphidae
- Diopatra cuprea (Bosc, 1802). Upper meso-euhaline. CB, off RR, 90 ft., silt, 1; YR, GP, 25 ft., 27/m<sup>2</sup>, MW. YR, Clay Bank, II-69, 60/m<sup>2</sup>, RO. See Mangum et al, 1968.
- Family Opheliidae
- Ophelia bicornis (Savigny, 1818). Poly-euhaline. CB, off RR, sand, taken once, MW.
- Travisia carnea (Verrill, 1873). Poly-euhaline. CB, off RR, 28 ft., sand, rare, MW.
- Family Orbiniidae
- Orbinia ornata (Verrill, 1873). Poly-euhaline. ES, rare, MW.
- Scoloplos fragilis (Verrill, 1873). Meso-polyhaline. ES, GP, fairly common, intertidal-15 ft., MW.
- Scoloplos robustus Verrill, 1873. Meso-euhaline. HR, V-69, 23 ft., 45/m<sup>2</sup>, DFB. YR mouth, Zostera bed, VII-70, 400/m<sup>2</sup>, RO. ES, bayside creeks and Chincoteague, fairly common, MW.
- Family Oweniidae
- Owenia fusiformis (Delle Chiaje, 1844). Polyhaline. CB, Rapp. Shoals, 40 ft., sand, 80/m<sup>2</sup>, MW.
- Family Paraonidae
- Aricidea jeffreysii (McIntosh, 1879). Poly-euhaline. HR, V-69, sand, 20, DFB. YR, 23-IV-64, 10/m<sup>2</sup>, MW.
- Aricidea wassi Pettibone, 1965. Polyhaline. CB, 370° 34' N. 75° 55' W., 8 fms., silty sand; JR (Hampton Bar), MW, MP.
- Family Pectinariidae
- Pectinaria gouldii (Verrill, 1873). Upper meso- and polyhaline. Sand to silty clay, subtidal to 100 ft.; Tangler Sound, VII-62, 87 ft., over 30, 000 juv/m<sup>2</sup>, MW.
- Family Phyllodocidae
- Eteone lactea Claparede, 1868. YR, VEPCO, 2-III-64, 30/m<sup>2</sup>; MW. Cove Pt., Md., sporadic in sand and mud, D.H. Hamilton.
- Eteone heteropoda Hartman, 1951. Meso-polyhaline. CB, Back R.; Zostera bed, III-70, 2000/m<sup>2</sup>. HR, V-69, sand; 85/m<sup>2</sup>, DFB. CB, Rapp. Shoals, 43 ft., silt, 30/m<sup>2</sup>, MW.



- Eumida sanguinea (Oersted, 1843). Meso-polyhaline. CB, Kiptopeke, 1963, 30 ft., sand, scarce; YR, VEPCO, 2-III-64, 2, MW. JR, HR, Middle Ground, sand, scarce, DFB. YR, Mumfort I., VII, X, 2, GAM.
- Nereiphylla fragilis (Webster, 1879). Meso-euhaline. Frequent on live oysters, MW. ES (Franklin City), abundant, George Griffith; (Nandua Creek), abundant, MP. TR (Mumfort Is.), scarce on Zostera, VIII-X, GAM.
- Paranaitis speciosa (Webster, 1870). Upper meso- and euhaline. YR, Sarah's Creek, mud-detritus, MW, MP.
- Phyllodoce arenae Webster, 1879. Meso-polyhaline. CB, off RR, VI-62, 87 ft., 45/m<sup>2</sup>; YR, VEPCO, 2-III-64, 30/m<sup>2</sup>, MW. HR, VIII-69, 9 ft., sand, 60/m<sup>2</sup>, DFB. Elizabeth R., VIII-69, 12 ft., clayey sand, 170/m<sup>2</sup>, MR. YR, Clay Bank, Zostera bed, VIII-70, 190/m<sup>2</sup>, RO.
- Phyllodoce mucosa Oersted, 1843. Poly-euhaline. Elizabeth R., VIII-69, 20 ft., sand-silt-clay, 160/m<sup>2</sup>, MR.
- Family Pilargidae (See Pettibone, 1966).
- Ancistrosyllis hartmanae Pettibone, 1966. Polyhaline. CB, off RR, 35 ft., silt, 21-VI-61, 1 specimen, MW, MP. HR, VIII-69, 24 ft., clayey sand, 1, DFB.
- Ancistrosyllis jonesi Pettibone, 1966. Meso-polyhaline. CB, off RR, 35 ft., 21-VI-61, 3, MW, MP. YR, GP & Clay Bank, rare, DFB.
- Cabira incerta Webster, 1879. Poly-euhaline. CB, off RR, 35 ft., silt, 5, MW, MP. None found since. Webster collected it on seaside, ES.
- Sigambra tentaculata (Treadwell, 1941). Meso-polyhaline. YR (GP), mud, common. CB (off RR), sand, MW, MP. YR & Hampton Roads, mud, common, DFB.
- Sigambra wassi Pettibone, 1966. CB, off RR, VI-61, Sand-silt-clay, 2, MW, MP. Large species not taken since.
- Family Polynoidae
- Harmothoe acanellae Verrill, 1881. Polyhaline. CB (Pettibone, 1963). Evidently associated with Leptogorgia.
- Harmothoe extenuata (Grube, 1840). Poly-euhaline. HR, V-69, 38 ft., sand, 200/m<sup>2</sup>, DFB. ES, Hog I. Bay, 23-VI-60, 3, SH, MP. GP, 9-XI-60, 25 ft., 9/m<sup>2</sup>. CB, off RR, VI-62, clayey silt, 30/m<sup>2</sup>, MW, MP.
- Harmothoe imbricata (Linnaeus, 1767). Polyhaline. Elizabeth R., V-69, oyster reef, 8 ft., clayey sand, 5/m<sup>2</sup>, MR.
- Harmothoe sp. Polyhaline. YR, silty sand to silt-clay, to 60/m<sup>2</sup>, color rose. Possibly the only undescribed polychaete in CB.
- Lepidametria commensalis Webster, 1879. Polyhaline. Commensal with Amphitrite and Loimia, scarce. Rapp. Shoals, VI-62, 34 ft., silt, 1; GP, 25-IX-63, 25 ft., 1, MW.
- Lepidonotus squamatus. (Linnaeus, 1758). Euhaline. ES (Rogues Is., Hog Is. Bay), 23-VI-60, 1, SH, MP.
- Lepidonotus sublevis Verrill, 1973. Meso-euhaline. HR, V-69, 15 ft., clayey sand, 15/m<sup>2</sup>, DFB. Elizabeth R., oyster reef, I-69, 13 ft., clayey sand, 65/m<sup>2</sup>, MR. Rapp. Shoals, VI-62, 90 ft., silt, 3, MW. YR, 18-VI-63, 25 ft., 28/m<sup>2</sup>, MW. YR, Diopatra microcommunity (Mangum et al, 1968).
- Lepidonotus variabilis Webster, 1879. Upper meso- and polyhaline. ES, Little Gulf, 23-VI-60, 1, SH, MP. YR, Mumfort Is., 19-VIII-68, 0.5/g Zostera, GAM.
- Family Sabellariidae
- Sabellaria vulgaris Verrill, 1873. Meso-polyhaline. GP, 18-VI-63, 25 ft., MW. HR, VIII-69, 38 ft., sand, 2325/m<sup>2</sup>, DFB. YR, Mumfort Is., 8-X-68 .07/g Zostera, GAM. Elizabeth R., oyster reef, V-69, 8 ft., clayey sand, 7465/m<sup>2</sup>, MR. CB, Back River, III-70, sand, 42/m<sup>2</sup>, RO.
- Family Sabellidae
- Fabricia sabella (Ehrenberg, 1837). Polyhaline. Y-O, on Libinia, VII, WGH.
- Potomilla neglecta (Sars, 1851). GP, 19-VI-62, 30 ft., silt-clay, 1, rare, MW. YR, Mumfort Is., 1-XI-68, one on Zostera, GAM.
- Sabella microphthalma Verrill, 1873. Polyhaline. Elizabeth R., oyster reef, V-69, 8 ft., clayey sand, 5815/m<sup>2</sup>, MR. YR, Mumfort Is., 19-VIII-68 24/g Zostera, GAM. GP, VEPCO, 23-III-64, 100/m<sup>2</sup>, MW. Rapp. Shoals, VI-62, 28 ft., sand, 2, MW. HR, II-69, 15 ft., clayey sand, 495/m<sup>2</sup>, DFB. YR mouth, Zostera bed, VI-70, 630/m<sup>2</sup>, RO.
- Family Serpulidae
- Hydroides dianthus (Verrill, 1873). Upper meso-polyhaline. HR, VIII-69, 38 ft., sand, 475/m<sup>2</sup>, DFB. Elizabeth R., oyster reef, 30-VIII-69, 8 ft., clayey sand, 150/m<sup>2</sup>, MR. YR, Mumfort Is., 19-VIII-68, 3/g Zostera, GAM.

## Family Sigalionidae

Sthenelais boa (Johnston, 1839). Poly-euhaline. Rapp. Shoals, VI-62, 75 ft., silt, 1, MW, MP. YR, VEPCO, 22-X-64, 1, MW.

Sthenelais limicola (Ehlers, 1864). Polyhaline. Wachapreague, oyster ground, MW.

## Family Spionidae

Boccardia hamata (Webster, 1879). Described from ES seaside.

Polydora commensalis Andrews, 1891. Mesohaline. GP, 25-V-65, found in egg mass of female Pagurus longicarpus, by Morris Roberts.

Polydora ligni Webster, 1879. Oligo-euhaline. YR, Mumfort Is., 13-V-68, 146/g Zostera, GAM. Elizabeth R., V-69, oyster reef, 13 ft., clayey sand, 1500/m<sup>2</sup>, MR. GP, VEPCO, 2-III-64, 400/m<sup>2</sup>, MW. Rapp. Shoals, VI-62, 25 ft., 75/m<sup>2</sup>, MW. HR, II-69, 15 ft., sand, 1280/m<sup>2</sup>, DFB. YR mouth, III-70, 7450/m<sup>2</sup>, RO.

Polydora websteri Hartman, 1943. Abundant in shells of living oysters, MW.

Prionospio heterobranchia Moore, 1907. Oligo-euhaline. YR, 28-VI-68, 22/g Zostera, GAM. GP, VEPCO, 22-IV-64, 50/m<sup>2</sup>, MW. CB, Back R., Zostera bed, III-70, 7500/m<sup>2</sup>, RO.

Paraprionospio pinnata (Ehlers, 1901). (See Cramer, 1969). Euryhaline. Elizabeth R., I-69, 11 ft., sand-silt-clay, 240/m<sup>2</sup>, MR. CB, Rapp. Shoals, VI-62, 99 ft., silt, 10/m<sup>2</sup>, MW. GP, VEPCO, 2-III-64, 360/m<sup>2</sup>, MW. HR, V-69, 23 ft., sand-silt-clay, 410/m<sup>2</sup>, DFB. YR, mouth, V-70, 1150/m<sup>2</sup>, RO.

Scolecoides viridis (Verrill, 1873). Oligo-mesohaline. Elizabeth R., oyster reef, V-67, 10 ft., clayey sand, 1, MR. CB, Rapp. Shoals, VI-62, 390/m<sup>2</sup>, MW. GP, IV-5-65, 25 ft., 6/m<sup>2</sup>, MW. HR, II-69, 9 ft., sand, 1, DFB.

Scolecoides bousfieldi Pettibone, 1963. Poly-euhaline. GP, 23-IV-64, 25 ft., sandy silt, 360/m<sup>2</sup>, MW.

Spio filicornis (O.F. Muller, 1766). Polyhaline. CB (off RR), common, MW.

Spio setosa (Verrill, 1873). Meso-euhaline. Elizabeth R., oyster reef, V-69, 10 ft., clayey sand, 3, MR. Rapp. Shoals, VI-62, 90/m<sup>2</sup>, MW. YR, VEPCO, 22-IV-64, 42/m<sup>2</sup>, MW. HR, V-69, 9 ft., sand, 145/m<sup>2</sup>, DFB.

Spiophanes bombyx (Claparede, 1870). Meso-euhaline. YR, VEPCO, 22-IV-64, 28/m<sup>2</sup>; CB, Rapp. Shoals, VI-62, 34 ft., sand, 420/m<sup>2</sup>, MW. HR, VIII-69, 9 ft., sand, 1670/m<sup>2</sup>, DFB. YR, Clay Bank, IV-70, 3800/m<sup>2</sup>, RO.

Streblospio benedicti Webster, 1879. Euryhaline. Elizabeth R., oyster reef, V-69, 10 ft., clayey sand, 3200/m<sup>2</sup>, MR. GP, 18-VI-63, 27/m<sup>2</sup>, MW. Rapp. Shoals, VI-62, 37 ft., sand, 163/m<sup>2</sup>, MW. HR, V-69, 15 ft., clayey sand, DFB. YR, Clay Bank, III-70, 6470/m<sup>2</sup>, RO.

## Family Syllidae

Autolytus cornutus A. Agassiz, 1863. Poly-euhaline. Lower CB (New Point Comfort), 30 ft. CB (mouth), 25-V-66, 1 taken in meter net, 6.1 m.

Autolytus prolifer (Muller, 1783). Meso-euhaline. CB (Barren Is. and mouth), MP.

Brania clavata (Claparede, 1863). Meso-polyhaline. YR, Mumfort Is., 28-VI-68, 13/g Zostera, GAM. GP, 23-IV-64, 6/m<sup>2</sup>, MW. CB, Back R., VI-70, 2, RO.

Brania wellfleetensis Pettibone, 1956. Polyhaline. CB, Rapp. Shoals Channel, XI-69, 0.5 mm screen, 40 ft., rare, MW.

Exogone dispar (Webster, 1879). Meso-euhaline. YR, 28-VI-68, 0.6/g Zostera, GAM. GP, 25-V-63, 1, MW. ES, Chincoteague, III-70, 1800/m<sup>2</sup>, RO.

Odontosyllis fulgurans Claparede, 1864. YR, 19-VIII-68, 1.1/g Zostera, GAM. ES, Chincoteague, II-70, 70/m<sup>2</sup>, RO.

Parapionosyllis longicirrata (Webster & Benedict, 1884). Mesohaline. GP, specimen taken in bottle trap, MW.

## Family Terebellidae

Amphitrite ornata (Leidy, 1855). Meso-euhaline. Rapp. Shoals, VI-62, 103 ft., silt, 30/m<sup>2</sup>, MW. CB, Back R., Zostera bed, III-70, 840/m<sup>2</sup>, RO.

Enoplobranchius sanguineus (Verrill, 1873). Meso-polyhaline. Apparently confined to Zostera beds (abundant) and intertidal, MW. Not taken by Orth (1971).

Loimia medusa (Savigny, 1818). Meso-euhaline. Elizabeth R., VIII-69, 26 ft., clayey sand, 3, MR. Rapp. Shoals, 43 ft., silt, 165/m<sup>2</sup>, MW. GP, 24-V-62, 21/m<sup>2</sup>, MW. HR, VIII-69, 9 ft., sand, DFB. CB, Back R., III-70, 100/m<sup>2</sup>, RO.

- Lysilla alba (Webster, 1879). Meso-polyhaline. GP, Zostera bed, rare, MW.  
Pista cristata (Muller, 1776). Polyhaline. Rapp. Shoals, VI-62, 53 ft., sand, 150/m<sup>2</sup>, rare, MW.  
Pista maculata (Dalyell, 1853). Polyhaline. CB, off RR, rare, MW.  
Pista palmata (Verrill, 1873). Meso-polyhaline. YR, 19-VIII-68, 0.5/g  
Zostera, GAM. GP, 18-VI-63, 33/m<sup>2</sup>, MW. Rapp. Shoals, VI-62, 50 ft., silt, 1, MW.  
Polycirrus eximius (Leidy, 1855). Elizabeth R., VIII-69, 13 ft., clayey sand, 1, MR. Rapp. Shoals, VI-62, 28 ft., sand, 2910/m<sup>2</sup>, MW. GP, 18-VI-63, 3, MW. HR, V-69, 18 ft., sand, 290/m<sup>2</sup>, DFB. YR, Clay Bank, Zostera bed, 70/m<sup>2</sup>, RO.

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## PHYLUM ANNELIDA

## Class Oligochaeta

## Family Tubificidae

- Pontodrilus bermudensis Richards, 1931. Cape Charles, sand above intertidal. Apparently identified by J. Percy Moore.  
Peloscolex gabriellae Marcus, 1950. Upper meso- and polyhaline. Lower CB, common, to Y-20, silty sand, DFB.

## Class Hirudinea

## Family Piscicolidae

- Myzobdella lugubris Leidy, 1851. Taken from blue crabs at Tangier and York River, rare, WVE. GP, on wet table, 16-VII-62, MW. Sarah's Creek, on blue crab, 8-VIII-69, A.R. Lawler.  
Ichthyobdella funduli Verrill, 1872. GP, found swimming free, MW.  
I. rapax (Verrill, 1873). GP, collected from Palaemonetes pugio by William McCaul, 1963.  
Piscicola punctata Verrill. CB. JPM in Cowles, 1930.  
Trachelobdella vividus (Verrill, 1872). One specimen taken swimming free by Robert Black, II-61, GP beach. Lower JR, on lip of Opsanus, 23-IV-66; four in trawl, 20-IV-66, MW.

## PHYLUM TARDIGRADA

(See McGinty and Higgins, 1968)

## Batillipedidae

- Batillipes mirus Richters, 1909. Most abundant tardigrade found at Sandy Pt., Y8, MM.  
Batillipes bullacaudatus McGinty, 1968. With B. mirus, MM.  
Stygarcus bradypus Schulz, 1951. As above.  
Halechiniscus remanei Schulz, 1955. One specimen, as above.

## PHYLUM ECHIURIDA

## Family Thallasemidae

- Thallasema hartmani Fisher, 1947. Upper meso- and polyhaline. CB, off Rapp. Spit, coll. by "Fish Hawk", 23-VIII-20, 12.8 fms. Occasional in YR below Clay Bank in depths below 10 feet. Type locality is Beaufort, N. C. and Chesapeake Bay may be the northern limit.

"White echiurid". This small, white species is common in channel mud of the lower YR. Mary E. Rice, National Museum of Natural History, believes it is undescribed.

## PHYLUM SIPUNCULIDA

- Phascolopsis gouldi (Pourtales, 1851). Four specimens taken at Virginia Beach after storm tides, March 1962.  
Phascolion strombi (Montagu, 1804). ES, Wachapreague Inlet, 1 adult, MW, Edward B. Cutler.

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## PHYLUM MOLLUSCA

## Class Pelecypoda

## Subclass Protobranchia

## Order Palaeoconcha

## Family Solemyidae

Solemya velum Say, 1822. Poly- and euhaline. Scarce to frequent, Zostera beds, sand, JDA. Chincoteague Bay, PC.

## Order Nuculacea

## Family Nuculidae

Nucula proxima Say, 1822. Polyhaline. CB (off RR), fine to silty sand, scarce to 675/m<sup>2</sup>; lower YR and JR, scarce, MW.

## Family Nuculanidae

Yoldia limatula (Say, 1831). Polyhaline. Lower CB (off RR), aggregated, to 1500/m<sup>2</sup>; YR (GP), 30 feet; lower JR (HR); usually rare, MW.

## Subclass Septibranchia

## Order Poromyacea

## Family Cuspidariidae

Cardiomya gemma Verrill and Bush, 1898. (Previously listed as C. glypta Bush, a distinctly different species perhaps confined to subtropical waters). Polyhaline. CB (off RR), Wolftrap, silt-clay, rare to 45/m<sup>2</sup>. One specimen, YR (GP), 30 feet, MW.

## Subclass Polysyringia

## Order Arcacea

## Family Arcidae

Anadara transversa (Say, 1822). Polyhaline. CB (off RR), to 400/m<sup>2</sup> as small epifauna. YR (Mumfort Is.), epifauna, frequent in summer on Zostera, GAM. JR (Hampton Roads), common DFB.

Anadara ovalis (Bruguiere, 1792). Polyhaline. Lower CB, common, YR, rare, (86 feet off Yorktown), JDA. JR (Hampton Roads), common, DFB.

Noetia ponderosa (Say, 1822). ES, common, WGH. Upper polyhaline, YR (86 feet, off Yorktown), rare, JDA.

## Order Mytilacea

## Family Mytilidae

Arcuatula demissa (Dillwyn, 1817). Poly-euhaline. Associated with Spartina alterniflora on marshy shores.

Brachidontes recurvus (Rafinesque, 1820). Meso- to euhaline.

Abundant on oyster rocks, JDA.

Amygdalum papyria (Conrad, 1846). Meso- and polyhaline. Scarce, JDA. Common ES (bayside), PC.

Mytilus edulis Linnaeus, 1785. Polyhaline- to euhaline. Lower CB, sets in winter on bridge tunnel structures, often surviving through summer; "wrap-up" sets have occurred on blue crabs in winter. ES (seaside inlets). YR (rarely to GP in winter, never surviving summer), MW.

## Order Pectinacea

## Family Pectinidae

Aequipecten irradians (Lamarck, 1819). Upper poly- and euhaline. ES, abundant before demise of Zostera, increasing (Cobham Bay), MC. Chincoteague Bay, Md., FS.

## Order Anomiidae

## Family Anomiidae

Anomia simplex Orbigny, 1845. Upper meso- to euhaline. On oyster shells and other solid substrates, common, JDA.

## Order Ostreacea

## Family Ostreidae

Crassostrea virginica (Gmelin, 1792). Upper oligo- to euhaline. Historically, the most valued seafood in CB. Range of commercial production decreased in last decade by the parasite, Minchinia nelsoni (MSX), greatest harvest now in mesohaline waters. Set of larvae and survival of spat very erratic. Amounts of seed oysters produced by mariculture increasing. The Virginia oyster occurs mainly in deeper water, except on seaside of the ES where many are grown intertidally. See Galtsoff (1964), JDA.

## Order Cardititacea

## Family Carditidae

Venericardia tridentata Say 1826. Euhaline. CB (mouth), rare, JDA.

## Family Corbiculidae

Polymesoda caroliniana Bosc, 1830. Oligo- and lower mesohaline. JR (Jamestown and Mulberry Is. area), intertidal marsh and river bank). May no longer occur, since searchers have failed to find it in the last few years. See Andrews and Cook (1951).

## Family Cyrenoididae

Cyrenoida floridana (Dall, 1896). Oligo- to polyhaline. CB, Md.: Grasonville, Queen Anne Co., Dailsville; near Elliott, Dorchester Co., (gullet of black duck, F. M. Uhler); Deale, Anne Arundel Co., Sollers, Calvert Co., (Va.): RR (near mouth of Greenvale Creek, Molluks, Lancaster Co.; 1 mi. east of Saxis. Accomack Co., Bayford, Northampton Co.. Intertidal, under decaying plants; ovoviviparous. JPEM.

## Order Dreissenacea

## Family Dreissenidae

Congeria leucophaeta (Conrad, 1831). Oligohaline. On submerged plant stems, oyster shells and other firm substrates, JDA.

## Order Lucinacea

## Family Lucinidae

Lucina multilineata Tuomey and Holmes, 1857. Polyhaline. CB (off RR), common, to 450/m<sup>2</sup>; Y05, scarce, 5-30 feet, MW.

## Order Erycinacea

## Family Montacutidae

Montacuta elevata (Stimpson, 1851). Polyhaline. YR (off VIMS pier), commensal with Clymenella, to 270/m<sup>2</sup>, MW. See Gage (1969), for life history.

Mysella bidentata (Montagu). This European species is conspecific with M. planulata Stimpson (Dr. Charles Jenner, personal communication). Polyhaline. CB (off RR), VI-62, rare, MW.

## Order Cardiacea

## Family Cardiididae

Laevicardium mortoni (Conrad, 1830). Polyhaline. CB (below Tangier Is.), sand, 30 feet, 90/m<sup>2</sup>; lower YR, sand near shore, scarce, MW.

## Order Veneracea

## Family Veneridae

Dosinia discus Reeve, 1850. Polyhaline. CB (York Spit) recent valves; YR, Finley Coates found a 2½ inch specimen near GP, 10-II-70, while digging soft clams, MW.

Cyclinella tenuis Recluz, 1852. Polyhaline. YR (Yorktown and off VIMS) 10-25 feet; CB (Rapp. Shoals), ES (seaside), rare. XB.

Mercenaria mercenaria (Linnaeus, 1758). Polyhaline. Abundant in various sediments, long-lived; juveniles normally rare except on ES (seaside), MW.

Mercenaria campechiensis (Gmelin, 1792). Polyhaline. Lower CB, scarce, Dexter Haven.

Pitar morrhuana (Linsley, 1848). Poly- and euhaline. Lower YR, 20 feet, VII-69, DFB. ES (Hog Island Bay, Kegotank Bay), rare, PC.

Gemma gemma (Totten, 1834). Meso- and polyhaline. YR (TML), 10 feet, common; (Y25), rare; CB (off RR), occasional aggregates to 450/m<sup>2</sup>, MW.

## Family Petricolidae

Petricola pholadiformis (Lamarck, 1818). Polyhaline. YR (Goodwin Is.); common in intertidal peat, PC. Shape differs with habitat (Turgeon, 1868).



## Order Mactracea

## Family Mactridae

Spisula solidissima (Dillwyn, 1817). Euhaline. Offshore, washed in by severe storms. Supports sizeable industry on ES, MC.

Mulinia lateralis (Say, 1822). Upper meso- and polyhaline (above 8 ppt). Peak populations in silt areas but low reservoir populations apparently in nearshore sand, to 22,000/sq. m., Tangier Sound, MW.

Rangia cuneata (Gray, 1831). Oligo- and lower mesohaline. Found near N. C. line, 1960, WGH. JR, several larger specimens, III-63, John Shidler. Back Bay, 1962, abundant after March washover, James Kerwin. RR, introduced ca 1964, abundant by 1968, MW. Potomac R., (introduced prior to 1964, Pfitzenmeyer and Drobeck, 1964). Upper CB (Pfitzenmeyer, 1970), abundant, although subject to die-offs.

## Family Donacidae

Donax fossor Say, 1822. Euhaline. ES (north end of Parramore Is.), 101 juv. "in 2 and 3 feet of water 10 to 30 feet offshore", 23-II-70, JPEM. Morrison (1970) Western Atlantic Donax, Proc. Biol. Soc. Wash. 83:545-568 cites evidence to refute the findings of Chanley (1969) who synonymized this species with D. variabilis Say.

Donax roemeri protracta Conrad, 1849. Morrison (1970) has substituted this name for the long used Donax variabilis, which he found preoccupied. Euhaline. Occurs intertidally from Virginia Beach south, JPEM.

## Family Semelidae

Abra aequalis (Say, 1822). CB (Old Plantation Flats), 30 feet, rare, prob. straggler from ocean, WGH.

## Order Tellinacea

## Family Tellinidae

Tellina agilis Stimpson, 1858. Polyhaline. Abundant ES, CB (Hampton Bar, York Spit); YR (Yorktown, common), MW, KM.

Macoma balthica (L., 1758). Lower mesohaline. Abundant, intertidal to 80 feet, MW. Y25, to 2000/m<sup>2</sup>, DFB. Apparently suffers in competition with Rangia (Pfitzenmeyer, 1970).

Macoma mitchelli Dall, 1895. (M. phenax is a synonym, fide J. P. E. Morrison, personal communication). Mesohaline. Abundant in brackish creeks, YR (Sarah's Creek), 270/m<sup>2</sup>; Potomac R., (Machodoc Creek), MW.

Macoma tenta Say, 1834. Polyhaline. Lower CB and rivers, 20-40 feet, silt-clay, habitat not overlapping that of congeners, common, MW.

## Family Sanguinolariidae

Tagelus plebeius (Solander, 1786). Upper meso- and lower polyhaline. YR (GP), abundant, 0-5 feet, silty sand, JDA.

Tagelus divisus (Spengler, 1794). Polyhaline. CB (mouth), ES (Hog Is. Bay, abundant), YR Yorktown, scarce) JDA.

## Order Solenacea

## Family Solenidae

Ensis directus Conrad, 1843. Polyhaline. ES, abundant (seaside), sporadic elsewhere, 2-50 feet, sand JDA, MW. Over 30,000 juveniles/m<sup>2</sup>, CB (off RR), VI-62, identified by Dr. William J. Clench, MCZ.

Solen viridis Say, 1821. Euhaline. ES (Cedar Is.), plentiful in restricted patches, PC.

## Order Myacea

## Family Myacidae

Mya arenaria (Linnaeus, 1758). Upper meso- and polyhaline. Abundant sand to silty sand, 0-25 feet; breeding spring and fall, but spring set seems usually lost to predators, MW.

## Family Corbulidae

Paramya subovata (Conrad, 1845). Euhaline. ES (20 yds off north end of Parramore Is.), II-70. Species unchanged since Miocene. Commensal of echiurid worm Thalassema hartmani. See Jenner and McCrary (1969). JPEM.

- Order Adesnacea
- Family Pholadidae
- Cyrtopleura costata (Linnaeus, 1758). Upper meso- to polyhaline. YR (above bridge, common, soft-sediments near shore), MW.
- Barnea truncata (Say, 1822). YR (Goodwin Is., peat, abundant); ES (Cedar Is.), PC.
- Diplothyra smithi Tryon, 1862. Polyhaline. Boring in wood, rare, JDA.
- Martesia cuneiformis (Say, 1822). Occasional straggler in driftwood (Turgeon, 1968).
- Family Teredinidae
- Bankia gouldi Bartsch, 1908. YR (GP, setting June through September, occasionally last week in May and first in October), abundant. See Scheltema and Truitt, 1954.
- Teredo navalis Linnaeus, 1758. ES (seaside, common); euhaline in Va., perhaps because of higher temperatures, PC. Reports from GP by Clapp Laboratories for 4 years undoubtedly erroneous.
- Order Pandoracea
- Family Lyonsiidae
- Lyonsia hyalina Conrad, 1831. CB (off RR, fine sand to sandy silt, to 1200/m<sup>2</sup>); ES (bayside, abundant), MW.
- Family Pandoridae
- Pandora trilineata Say, 1822. CB (off RR, sand, rare (patchily distributed), to 100/m<sup>2</sup>, MW.
- Class Gastropoda
- Subclass Prosobranchia
- Order Archaeogastropoda
- Family Fissurellidae
- Diodora cayenensis (Lamarck, 1822). ES, rare, WGH.
- Order Mesogastropoda
- Family Littorinidae
- Littorina irrorata (Say, 1822). Upper meso- to euhaline.
- Spartina marshes, intertidal, JDA. See Gibson (1969).
- Family Vitrinellidae
- Cyclostremiscus pentagona (Gabb, 1873). YR (off GP), 30-60 feet, silt-clay, rare, MW, DM.
- Solariorbis infracarinata (Gabb, 1881). As above.
- Teinostoma cryptospira Verrill, 1884. As above.
- Family Caecidae
- Caecum pulchellum Stimpson, 1851. Polyhaline. CB (off RR) sand, 30 feet, scarce, 60/m<sup>2</sup>, MW.
- Family Epitonidae
- Epitonium multistriatum (Say, 1826) Polyhaline. CB (mouth), 30 feet, sand, scarce; VI-66, rare, MW.
- Epitonium rupicolum (Kurtz, 1860). Upper meso- and polyhaline.
- Zostera bed to 40 feet, common (to 30/m<sup>2</sup>).
- Family Melanellidae
- Melanella intermedia Conraine, 1835. Polyhaline. JR (Navy pier 12), VII-65, 40 feet, mud, 1 specimen, John Kraeuter; (Hampton Roads, rare, 5-II-69), DFB.
- Family Rissoidae
- Sayella chesapeakea Morrison, 1939. Oligo- and mesohaline.
- Type locality: Patuxent R., near Broome's Is., Md. Other NMNH records from Little Choptank R., near Cambridge, Md., R. W. Jackson, (sandy Chesapeake Beach, Md.), St. Mary's R., St. Inigoes, Md., Potomac R., Cobb Is., Md., Colonial Beach, Va., CB: off Harvey's Creek, Northumberland Co., Bayside, Mobjack Bay, JPEM.
- Family Hydrobiidae
- Hydrobia truncata (Vanatta 1924). Oligo- and lower mesohaline type locality. Little Choptank R. Town Point, Dorchester Co., Md., R. W. Jackson; Broome's., Patuxent R., and St. Inigoes, St. Mary's R., Md., JPEM. CB (off Harvey's Creek, Northumberland Co.); RR (Greenvale Creek, Mollusk, Lancaster Co.) JPEM.

Hydrobia jacksoni Bartsch 1953. Oligo- to euhaline. Type locality: Little Choptank River, Town Point, Dorchester Co., Md. R. W. Jackson. NMNH has types, also specimens from Deal, Anne Arundel Co., Md.; Tedious Creek (on eel grass), Crocheron, Dorchester Co., Md.; Chincoteague, Va. (southwest end, on oysters); Lafayette River and Edgewater District, (salt marsh), Norfolk, Va., JPEM.

Family Cerithiidae

Bittium varium Pfeiffer, 1840. Upper meso- and polyhaline. YR (Mumfort Is., most abundant animal on Zostera), GAM. See E. Wulff, (1970), for taxonomy and zoogeography of this genus.

Cerithiopsis greeni (C. B. Adams, 1839). Upper meso- and polyhaline. YR (Mumfort Is.), abundant on Zostera, July-December, GAM.

Family Triphoridae

Triphora nigrocincta C. B. Adams, 1839. Upper meso- to polyhaline. YR, Mumfort Is., abundant on Zostera, VII-XII, GAM. ES (The Gulf) CB (Back River), RO.

Family Calyptraeidae

Crepidula fornicata (L., 1767). Polyhaline. Oyster rocks, common to abundant, JDA.

Crepidula convexa Say, 1822. Upper meso- to polyhaline. YR (Mumfort Is., abundant on Zostera all year), GAM.

Crepidula acuta H. C. Lea 1842. Mesohaline. RR (near mouth of Greenvale Creek, Mollusk, Lancaster Co., Va.), I-58, numerous specimens with developed gonads, length 3 mm, on eel grass. Possibly a dwarf form of C. convexa. JPEM.

Crepidula plana Say, 1822. Polyhaline. On shells and other solid substrates, JDA.

Family Naticidae

Polinices duplicatus Say, 1822. Euhaline. Lower CB (mouth, common; York Spit, scarce) JDA.

Sinum perspectivum Say, 1831. Euhaline. Along outer beaches, JDA.

Tectonatica pusilla (Say, 1822). Euhaline. CB (mouth), sand, scarce, MW.

Family Synceratiidae

Syncera succinea (Pfeiffer, 1840). (S. modesta Johnson) Oligo- to euhaline, NMNH has specimens from Crisfield and Huggins' Pt. (Potomac R.), Md., from RR (Mollusk, Lancaster Co.), Shell Bay, W. of Chincoteague, Accomack Co., Willis Wharf, Bayford, Cherrystone, Oyster, Smith Is. and Fisherman's Is., Northampton Co., Western Branch of the Elizabeth R., 11-III-45; and Willoughby Spit, 15-VIII-43. The last two collections were by Leslie Hubricht, all other Va. collections JPEM from 1935 to 1958. This species has "crawl-away" young and has apparently been transferred by oyster shell traffic, JPEM.

Order Neogastropoda

Family Muricidae

Eupleura caudata (Say, 1822). Polyhaline. Common but less so than Urosalpinx; larger on ES. Zostera beds and oyster rocks, to 30 feet, JDA.

Urosalpinx cinerea (Say, 1822). Upper meso- to euhaline. Common drill above 12-15 ppt, abundant and much larger on ES, JDA.

Thais haemastoma subsp. floridana Conrad, 1837. Euhaline. ES, Sieling, 1960. Subsp. haysae Clench, 1927, S. H. Hopkins and J. D. Andrews.

Family Columbelloidea

Anachis avara (Say, 1822). Polyhaline. Rare, JDA.

Anachis translirata Ravenel, 1861. Polyhaline. CB (off RR to bay mouth, 20-40 feet, common, to 60/m<sup>2</sup>), MW. JR (Hampton Roads), rare, DFB.

Mitrella lunata (Say, 1826). Upper meso- to polyhaline. YR (Mumfort Is., common all year on Zostera, abundant in deepest beds), GAM.

Family Melongenidae

Busycon carica (Gmelin, 1790). Poly- and euhaline. Lower CB, frequent to abundant, 34 in one crab dredge haul at 37°16'N, 76°08'W, 45 ft., 22-IV-71, Paul Haefner.

Busycon canaliculatum (L., 1758). Poly- and euhaline. Lower CB (mouth, common), 12 in one dredge at 36°57'N, 76°05'W, 12 ft., IV-71, Paul Haefner.

Busycon sinistrum Hollister, 1958. Euhaline. ES, beach of Assateague Is., III-69, numerous fresh shells, JPEM. Assateague and Wallops Is., 1966, Lyle Campbell. Live specimens apparently not yet found.

Family Nassariidae

Nassarius vibex (Say, 1822). Upper meso- and polyhaline.

Abundant in Zostera and Clymenella communities, often aggregated to 50 ft.

Nassarius trivittatus (Say, 1822). Upper meso- and polyhaline. CB (mouth), ES (seaside), to 35 feet, sand, common MW.

Nassarius obsoletus (Say, 1822). Upper meso- to euhaline.

Abundant, not found beyond Zostera beds, mainly confined to eel grass beds in winter, in shoaler water later, aggregating toward fall (400/m<sup>2</sup>), ES (seaside), abundant in some marsh creeks. Shells always with longitudinal eroded furrows and epiphytic growth, MW.

Family Neptunidae

Colus pygmaeus Gould, 1841. Euhaline. ES (north end of Parramore Is.), 23-II-70, dead specimen, JPEM.

Family Marginellidae

Marginella denticulata Conrad, 1830. Upper polyhaline. Lower CB, rare, MW.

Marginella guttata Dillwyn. Upper polyhaline. Lower CB, above Cape Charles, ca. 30 feet, 6-VI-68, common but local, range very small, MW.

Family Terebridae

Terebra dislocata Say, 1822. Euhaline. Very rare, JDA; no recent records, MW.

Family Turridae

Mangelia cerina Kurtz and Stimpson, 1851. Polyhaline. Kiptopeke, 30 feet, sand 3 specimens, MW. CB (mouth), common, DFB.

Mangelia plicosa C.B. Adams, 1840. Polyhaline. Oyster rocks, common, JDA. Zostera and Clymenella communities, common to abundant, MW.

Subclass Opisthobranchia

Order Pyramidellacea

Family Pyramidellidae

Odostomia bisuturalis Say, 1821. Polyhaline. Common, esp. in Clymenella communities, 0-30 feet, to 400 m<sup>2</sup>, MW.

Odostomia impressa Say, 1822. Upper meso- to polyhaline.

Ectoparasite on oysters and other bivalves, common on oyster and Zostera beds, JDA. Upper CB, J. M. Odell.

Odostomia dux Dall and Bartsch, 1906. Polyhaline. YR (Vepco area). Sporadic, scarce, MW, Harry Wells.

Odostomia trifida Totten, 1834. Polyhaline. Oxford, Maryland. (See Hanks, 1968). O. impressa may be mistaken for this species, MW.

Pyramidella candida Morch, 1875. Polyhaline. CB (off RR); GP, rare, MW.

Pyramidella fusca C. B. Adams, 1839. ("cf fusca"), Joseph Rosewater. Polyhaline. Lower CB, YR (Yorktown), MW.

Turbonilla interrupta Totten, 1835. Polyhaline. Fine sand, abundant in Clymenella community, 150/m<sup>2</sup>, 5-30 feet, MW.

Turbonilla stricta Verrill, 1874. Polyhaline. CB (off RR), YR, rare to common, silt, MW.

Order Cephalaspidea

Family Acteonidae

Acteon punctostriatus C. B. Adams, 1840. Polyhaline. Lower CB, abundant, 10-60 feet, silt-clay, MW. Joseph Rosewater.

- Family Atyidae  
Haminoea solitaria (Say, 1822). Polyhaline. Lower YR, sand, to 15 feet, 300/m<sup>2</sup>, MW.
- Family Retusidae  
Acteocina canaliculata (Say, 1822). Polyhaline. CB (off RR), abundant in silty-sand, 5-15 feet, decreasing with depth, to 100 feet, Y06, to 3000/m<sup>2</sup>.
- Family Scaphandridae  
Cylichna alba Brown, 1827. Polyhaline. YR (mouth) and off Wolftrap, 40-75 feet, rare, MW.
- Order Sacoglossa (All sacoglossans and nudibranchs were determined by Dr. David R. Franz, U. of Conn., unless otherwise noted).
- Family Hermaeidae  
Hermaea cruciata Gould, 1870. Upper meso- lower polyhaline. Two specimens found by G. Alex Marsh at Mumfort Is. have been tentatively identified as this species. (See Vogel, 1971).  
Stiliger fuscatus Gould, 1870. Lower polyhaline. YR (Mumfort Is.), extremely abundant in VI-VII, otherwise absent.
- Family Elysiidae  
Elysia catula Gould, 1870. Lower polyhaline. Only seen on Zostera, except for two on surface film, X-61, MW. YR (Mumfort Is.) abundant on Zostera, except in winter, GAM.  
Elysia chlorotica Gould, 1870. Mesohaline. Reported from Solomons Is., Md. by Pfitzenmeyer (1960) and from Oxford, Md. by Hanks (1968). It seems most unusual that E. catula, abundant in Va., has never been found in Maryland, and that E. chlorotica is unknown from Va.
- Order Nudibranchia
- Family Dorididae  
Doris verrucosa Linnaeus, 1758. Polyhaline. YR (Mumfort Is.), five taken on Zostera in autumn, GAM.
- Family Corambidae  
Doridella obscura Verrill, 1870. Meso- and polyhaline. Lower CB, most common nudibranch, often abundant on Alcyonidium. Cory (1968) reported (as Corambella) feeding on Acanthodesia and Membranipora.
- Family Polyceridae  
Polycerella conyma Marcus, 1957. Upper meso- and lower polyhaline. YR (Mumfort Is., abundant VI-VII on Zostera), GAM. Apparently feeds on Bowerbankia (Franz, 1968b).
- Family Onchidoridae  
Acanthodoris pilosa (Abildgaard, 1789). Polyhaline. Lower JR, abundant on Halichondria, JBF. Probably benefited by jetty construction (Franz, 1968).
- Family Favorinidae  
Cratena pilata (Gould, 1870). Meso- to polyhaline. Hampton R., intertidal on Agardhiella and Ceramium, scarce, JBF. YR (Mumfort Is., common VI-VII on Zostera), GAM. Cory (1967) reports the genus from the Patuxent R., Maryland (see Franz, 1968b).
- Family Aeolidiidae  
Aeolidia papillosa (Linnaeus, 1761). Euhaline. Ocen City, Maryland (Franz, 1968b).
- Family Goniodoridae  
Cargoa cupella Vogel and Schultz 1970. (See ref.) Lower poly- and upper mesohaline (20 ppt). YR (Aberdeen Rock, about Y25), species is probably rare although the four specimens were found on a single oyster shell.
- Subclass Pulmonata
- Order Basommatophora
- Family Ellobiidae  
Phytia myosotis Draparnaud, 1801. Meso- and polyhaline. NMNH has material from: (Md.), mouth of St. Leonard's Creek, Patuxent R., Carson's Slip, Crisfield. (Va.), Shellbay, west of Chincoteague, Watt's Bay, Accomack Co.; and in Northampton Co., Willis Wharf, and Fisherman's Is.; RR, mouth of Greenvale Creek, Mollusk, Lancaster Co.; "swamps" at Bosservain Ave., Norfolk, JPEM.

## Family Melampidae

Melampus bidentatus Say, 1822. Upper meso- and polyhaline.

Intertidal salt marshes, mostly associated with Distichlis and Spartina patens, often abundant, MW.

Detracia floridana (Pfieffer, 1856). Upper meso- and polyhaline. Difficult to distinguish from M. bidentatus. Dr.

Morrison found a few specimens in a sample which contained over 100 M. bidentatus. The sample was from less than a m<sup>2</sup> area in Poropotank River marsh.

## Class Amphineura

## Order Chitonida

## Family Ischnochitonidae

Chaetopleura apiculata (Say, 1830). Euhaline. ES (Hog Is. Bay oyster bed), rare, WGH.

## Class Cephalopoda

## Order Decapoda

## Family Lolliginidae

Lolliguncula brevis Blainville. CB (mouth), occasionally common, MW. Tangier Sound, common throughout the year, (Schwarz, 1960b).

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## PHYLUM ARTHROPODA

In accordance with a new set of river abbreviations devised by Richard Moncure, VIMS, the following symbols are used in this section.

CL - Lower Chesapeake Bay  
 CU - Upper Chesapeake Bay  
 JC - Chickahominy River  
 JA - James River  
 MP - Mattaponi River  
 MB - Mobjack River  
 PM - Pamunkey River  
 PX - Patuxent River  
 PK - Piankatank River  
 PO - Potomac River  
 RA - Rappahannock River  
 YK - York River  
 WA - Wachapreague

The following abbreviations used generally in the checklist are used in certain parts of the arthropod section.

CB - Chesapeake Bay  
 ES - Eastern Shore  
 GP - Gloucester Point  
 JK - James River  
 SI - Solomons Island  
 YR - York River

## Class Merostomata

Limulus polyphemus (L., 1758). Upper meso- to euhaline. CL, frequent, occasional to Indian Creek, above mouth of RA. YK, most numerous in Guinea Islands in 50 years, 1967, John West; Clay Bank, many young-of-year taken by the Allen sisters, VIII-68; Guinea Marshes (Hog Island) and below Amoco Pier, one newly hatched from each site, 7-VIII-71; Guinea Marsh, 15 from .07 m<sup>2</sup>, 15-VII-71, Thomas Duncan.

## Class Arachnida

## Order Acari

## Family Halacaridae

## Subfamily Rhombognathinae

Rhombognathus magnirostris Trouessart, 1889. Mesohaline PX (SI). (Newell, 1947).

## Subfamily Halacarinae

Halacarus anomalus Trouessart, 1894. Mesohaline. PX (SI). (Newell, 1947).

Agauopsis borealis Newell, 1947. Mesohaline. PX (SI). (Newell, 1947).

Species unknown: Oligohaline, occasional strays to 7 ppt. PM (Lee Marsh to White House), IV-X. (Van Engel and Joseph, 1968).

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Class Pycnogonida  
Willard A. Van Engel

Unless otherwise noted, the list of pycnogonids is that of Hedgpeth (1968). Most of the depths given by Hedgpeth are in fathoms and are in error: those cited here, and the station location and hydrographic data are from the cruises of the Fish Hawk (Wells, Bailey and Henderson, 1929).

Family Pallenidae

Callipallene brevirostris (Johnston, 1837). Meso- and polyhaline. CL, Fish Hawk station 8821, "Sandy Pt.", 37°59'36"W. 8 meters, 17.7 ppt, 24.8C, VII; station 8898, "Thimble Shoal", 37°00'35", 76°15'24", 28 meters, 22.69 ppt (20 meters), 10.1C, XII. YK, common on hydroids, MW.

Family Phoxichiliidae

Anoplodactylus parvus Giltay, 1934. Polyhaline. CL, Fish Hawk station 8826, "Plantation Light", 37°04'54", 42 meters, 25.53 ppt, 21.9C, VII; station 8887, off Rappahannock Spit, 37°35'20", 76°09'07", 13 meters, 25.21 ppt, 19.2C, X.

Anoplodactylus pygmaeus (Hodge, 1864). Meso- and polyhaline (?). JA, (Norfolk, WHOI fouling collections), VIII. YK (VEPCO intake), X, MW.

Family Endeidae

Endeis spinosa (Montagu, 1808). Polyhaline. CL, Fish Hawk station 8841, "Plantation Light", 37°15'50", 76°07'44", 28 meters, 24.34 ppt, 25.0C, VIII.

Family Tanystylidae

Tanystylum orbiculare Wislon, 1878. CL, Fish Hawk station 8341, off Wolf Trap, 37°22'12", 76°10'25" 9.5 meters, X; station 8506, off New Point Comfort 37°16'50", 76°14'27", 5.5 fathoms, V; on Lynnhaven Trolley Bridge, VI; Virginia Beach, on mast washed ashore, X. YK, Gloucester Point, on Molgula and sponges, MW.

References

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## CLASS CRUSTACEA

Subclass Cephalocarida  
Willard A. Van Engel

Hutchinsoniella macracantha Sanders, 1955. Euhaline.  
ES (inside Wachapreague Inlet), 31.5 ppt, two  
ovigerous specimens, 8-VI-66, 6m, soft mud.  
(Daugherty and Van Engel, 1969).

Subclass Branchiopoda  
Willard A. Van Engel

## Superorder Diplostraca

## Order Cladocera

## Suborder Haplopoda

## Family Leptodoridae

Leptodora kindtii (Focke, 1884). Oligohaline, occasional  
strays to 5.8 ppt. CB, Turkey Point and mouth of  
Sassafras, PX30-31. (Goodwyn, 1968; Herman et al, 1968).  
PO45-101, RA 24, 39, 41-95, MP40-63, PM30-70, often  
very abundant, IV-IX; males, V-VII. (Chambers, Burbidge  
and Van Engel, 1970).

## Suborder Eucladocera

## Superfamily Sidoidea

## Family Sididae

Sida crystallina (O. F. Muller, 1785). Oligohaline.

PM40, abundant, V. (Van Engel and Joseph, 1968).

Diaphanosoma brachyurum (Lieven, 1848). Oligohaline.

PM35-50, abundant VI-VII, present VIII. (Van Engel  
and Joseph, 1968).

Penilia avirostris Dana, 1849. Poly- and euhaline.

CL, common and occasionally abundant IV, VII-IX, XI;  
in adjacent continental shelf waters; WA Channel and  
Inlet, occasional, VIII. (Van Engel and Joseph, 1968).

## Superfamily Chydoroidea

## Family Bosminae

Bosmina sp. Oligohaline. PX31, I-VI. (Herman et al, 1968).

## Family Daphnidae

Daphnia pulex (Leydig, 1860). Richard, 1896. Oligo-  
haline. PM40-50, dominant cladoceran I-V. (Van Engel  
and Joseph, 1968).

Daphnia sp. Oligohaline. PX31, IV-VI. (Herman et al,  
1968).

Daphnia longispina (O. F. Muller, 1785). Oligohaline.

PM (Lee Marsh), rare, III. (Van Engel and Joseph,  
1968).

Simocephalus exspinosus (Koch, 1841). Oligohaline. PM50,  
rare, VI. (Van Engel and Joseph, 1968).

Ilyocryptus sordidus (Lieven, 1848). Oligohaline. PM50,  
rare, IX. (Van Engel and Joseph, 1968).

## Superfamily Polyphemoidae

## Family Polyphemidae

Podon polyphemoides Leuckart, 1859. Euryhaline CL, mouth  
and adjacent offshore waters, occasional. (Van Engel  
and Joseph, 1968). Herman et al (1968) report it from  
below Chalk Point in the lower part of Patuxent River,  
Maryland; spring and fall, thus extending range to  
oligohaline (?) waters.

Evadne nordmanni Loven, 1836. Poly- and euhaline. CL,  
V; YK00-10 V and VIII; common, found with but more  
abundant than E. spinifera and E. tergestina. (Van  
Engel and Joseph, 1968).

Evadne spinifera P. E. Muller, 1868. (See E. nordmanni).  
(Van Engel and Joseph, 1968).

Evadne tergestina Claus. (See E. nordmanni). (Van Engel  
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## Subclass Ostracoda

The following list is mainly from the papers of Tressler and Smith (1948) and Elliot, Ellison and Nichols (1966), which are referred to by the symbols WT and HE.

## Subclass Ostracoda

## Order Myodocopa

## Family Cylindroleberidae

Cylindroleberis mariae (Baird, 1850). Mesohaline. YK (GP, Yorktown), infauna, abundant in subtidal sand, MW.

## Family Sarsiellidae

Sarsiella texana Kornicker and Wise, 1962. Upper mesohaline -polyhaline. YK(GP), silt-clay, 30 feet to 30/m<sup>2</sup>, MW.

Sarsiella zostericola Cushman, 1906. Found with S. texana, 5 to 10 times as abundant, MW.

## Order Podocopa

## Family Darwinulidae

Darwinula aurea Brady and Robertson. Freshwater. RA, common, HE.

## Family Cytheridae

Cythere sclerochilus Tressler and Smith, 1948. Mesohaline. PX (SI), I-VII, X, intertidal sand, WT.

Cythere triangularis Tressler and Smith, 1948. Mesohaline. PX (SI), XI, rare; Tar Bay, VI, soft bottom, scarce, WT.

Sarsocythere patuxiensis Tressler and Smith, 1948. Mesohaline. PX (SI), VII, scarce, 15 feet, in weeds, WT.

## Family Cytherideidae

Clythrocytheridea sp. Mesohaline. RA (depths less than 18 ft.), rare, HE.

Cushmanidea seminuda Cushman. Meso- and polyhaline. RA00-27, sand, abundant, HE.

Cyprideis beaveni Tressler and Smith, 1948. PX and Mill Creek, 1-3 feet, weeds and detritus, rare, WT.

Cyprideis castas Benson. RA, rare, HE.

Cyprideis littoralis (Brady, 1869). PX (SI), spring and summer, in plant growth, WT.

Cyprideis torosa Jones, 1857. Mesohaline. RA19-27, HE.

Cytheridea papillosa (Bosquet, 1852). Mesohaline. PX (SI), common fall to spring, WT.

- Cytheridea punctillata (Brady, 1865). Mesohaline. PX (SI), abundant all year, WT.
- Perissocytheridea brachyforma Swain. Mesohaline. RA00-27, scarce, HE.
- Pontocythere sulcata (Puri, 1958). Mesohaline. RA00-22, shallow sand, common, HE.
- Family Cytheruridae
- Cytherura gibba (O. F. Muller, 1785). Mesohaline. PX (SI), most of the year; most common, WT. RA00-22, sand, common, HE.
- Family Hemicytheridae
- Hemicythere strandentia Tressler and Smith, 1948. Mesohaline. PX (SI), VI, numerous, intertidal, WT.
- Hemicythere truitti Tressler and Smith, 1948. Mesohaline. PX (SI), 15 feet, sand, all year, WT.
- Family Leptocytheridae
- Leptocythere macallana (Grady and Robertson, 1869). Mesohaline. PX (SI), common all year, WT.
- Family Loxoconchidae
- Loxoconcha impressa (Baird, 1850). Mesohaline. PX (SI), littoral zone, summer and early fall, WT. YK (GP), common on Zostera, MW. RA00-22, apparently confined to Zostera and Ruppia, HE.
- Cytheromorpha fuscata (Brady, 1869). Freshwater - oligohaline. PX (SI), winter, WT. RA33-40, scarce, HE.
- Cytheromorpha pascagoulaensis Mincer. Oligo- and polyhaline. RA00-33, abundant (45% of total ostracods), more common in deeper water, HE.

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- Van Morkhoven, F. P. 1962-63. Post-paleozoic Ostracoda. *Am. Elsevier*. Vol. 1, 204 p.; Vol. 2, 478 p.

## Subclass Mystacocarida

- Derocheilocaris typicus Pennak and Zinn, 1953. Polyhaline. YR (Sandy Point) abundant, sand beach (McGinty and Higgins, 1968).

## References Cited

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## SUBCLASS COPEPODA

(Calanoida and Cyclopoida)  
Victor G. Burrell, Jr.

(Harpacticoida)  
David E. Zwerner

C. B. Wilson (1932a) authored the sole comprehensive study of the copepods of Chesapeake Bay. Papers dealing with specific localities or particular groups have augmented our knowledge of copepods (Burrell, 1968; Davis, 1944; Herman et al., 1968; Jeffries, 1962, 1964, 1967; Heinle, 1965, 1969; Yeatman, 1970). Salinity and temperature ranges, when given, are from a survey by V. G. Burrell, Jr. from January 1969 to January 1970. Dr. H. C. Yeatman identified all cyclopoid copepods and his comments on the species have been included. (Parasitic copepods are included in the parasites section.)

## Order Calanoida

## Family Calanidae

Calanus finmarchicus (Gunnerus, 1765). Euhaline (above 28 ppt).  
CB (mouth).

Eucalanus pileatus (Giesbrecht, 1888). Upper poly- and euhaline  
(24-31 ppt). First record for CB. CB (mouth) summer, scarce.

## Family Paracalanidae

Paracalanus crassirostris Dahl, 1894. Upper meso- to euhaline  
(14-32 ppt). Lower CB, all year; lower YR, spring and fall.  
Spawns in summer (Davis, 1944).

Paracalanus indicus Wolfenden, 1905. Poly- and euhaline (above 21  
ppt). Lower CB, fall and winter, spawning probably occurring  
throughout this period. First record for CB.

Paracalanus parvus (Claus, 1863). Euryhaline. Upper CB, abundant,  
autumn. This species may actually be P. indicus and P. quasimodo  
lumped together (Bowman, 1971).

Paracalanus quasimodo Bowman, 1971. Poly- and euhaline (21-32 ppt).  
Lower CB, fall and winter, spawning throughout stay in area.  
Present with P. indicus.

## Family Pseudocalanidae

Pseudocalanus minutus (Kroyer, 1840). Meso- to euhaline (above 8 ppt).  
CB and lower YR, winter and spring. Wilson (1932a) called this  
species P. elongatus, but With (1915) found the two species to be  
the same (Wilson, 1932b), HPJ.

## Family Temoridae

Temora discaudata Giesbrecht, 1880. CB, rare, CBW.

Temora longicornis (Muller, 1792). Poly- and euhaline (19-32 ppt).  
CB (mouth), fall and spring, VGB. Breeding season protracted, CBW.

Temora stylifera (Dana, 1849). Euhaline (above 29 ppt). CB (mouth),  
early fall, rare, VGB. First record for CB.

Temora turbinata (Dana, 1849). Upper-polyhaline and euhaline  
(above 27 ppt). CB (mouth), fall, rare. Although Wilson (1932a)  
listed this species as abundant in fall and winter, present  
information indicates he may have confused this species with T.  
longicornis, a congener abundant in CB.

Eurytemora americana Williams 1906. Poly- and euhaline (about 23  
ppt). Middle and lower CB, winter and spring, rare.

Eurytemora affinis (Poppe, 1880). Freshwater to polyhaline  
(to 20 ppt). Middle and upper CB, abundant, breeds throughout  
year. Most American records of E. hirundoides are probably this  
species according to M. S. Wilson (1959).

## Family Centropagidae

Centropages furcatus (Dana, 1852). Upper poly- and euhaline  
(above 24 ppt). CB (mouth), late summer, rare. First record for CB.

Centropages hamatus (Lilljeborg, 1853). Meso- to euhaline (above  
8 ppt). Winter and spring form, spawns in winter.

Centropages typicus Kroyer, 1849. Polyhaline (above 19 ppt).

Lower CB, present all year except mid-summer, often found with C.  
hamatus; breeds in winter. First record for CB.

## Family Diaptomidae

Diaptomus reighardi Marsh, 1895. Freshwater. JR, summer, Richard G. Burbidge.

Diaptomus spatulacrenatus Pearse, 1906. Freshwater. Stump Point, Md., Davis, 1944.

Pseudodiaptomus coronatus Williams, 1906. Freshwater. All year, more abundant in fall. Breeding season protracted.

## Family Pseudocyclopidae

Pseudocyclops sp. Polyhaline? One female of this bottom dwelling genus was caught at the mouth of CB in February. A description awaits the collection of more specimens.

## Family Candaciidae

Candacia armata Boeck, 1872. Polyhaline. Lower CB, abundant, GDG; Govenor's Run, Md., CBW.

## Family Pontellidae

Labidocera aestiva Wheeler, 1889. Upper meso- and polyhaline (above 12.7 ppt). Lower CB, common, CBW.

Labidocera wollastoni Lubbock, 1857. Euhaline. CB (mouth), rare, CBW.

Pontella pennata Wilson, 1932. Euhaline, CB (mouth), rare. This species may be synonymous with Pontella meadi (Fleminger, 1957).

## Family Acartiidae

Acartia clausi Giesbrecht, 1892. Oligo- to polyhaline. Common in bay and tributaries almost to fresh water in winter and early spring, replacing Acartia tonsa in the lower portions; breeding throughout period of occurrence. Wilson (1932) confused this species with Acartia tonsa and Acartia longiremis (Bowman, 1961).

Acartia longiremis Lilljeborg, 1853. Polyhaline. Lower CB, present and breeding late winter and spring, rare.

Acartia tonsa Giesbrecht, 1892. Euryhaline. Most abundant copepod replaced by Acartia clausi in lower CB in winter and spring, apparently breeds all year, (Bowman, 1961).

## Family Tortanidae

Tortanus discaudatus (Thompson and Scott, 1897). Meso- and polyhaline (above 8 ppt). Lower CB and tributaries, late winter and spring, probably breeds in spring in the Bay.

## Order Harpacticoida

## Family Canuellidae

Canuella canadensis Willey, 1923. Oligo- and lower mesohaline (fresh water to 10.5 ppt). Upper YR and Pamunkey R. present all year, most abundant winter and spring and usually benthic, 3.8 to 27.5°C. Juveniles and ovigerous females not found. Bloody Point, Md., rare, CBW.

## Family Ectinosomidae

Ectinosoma curticorne Boeck, 1872. Euryhaline. Abundant, CBW.

Ectinosoma normani T. & A. Scott, 1894. Mesohaline. Lower Potomac R., "about 30 females", CBW.

Microsetella norvegica (Boeck, 1864). Euhaline. CB (mouth), scarce, CBW.

## Family Tachidiidae

Euterpina acutifrons (Dana, 1848). Poly- to euhaline (19-31ppt). Lower YR and CB, all year except coldest period, 7-27C, most common in bottom samples. Females with eggs and spermatophores in summer. VGB, HCY.

Microarthridion littorale (Poppe, 1881). Upper mesohaline. Love Point, Md., rare, CBW.

## Family Harpacticidae

Harpacticus chelifer (O. F. Müller, 1776). Euhaline. CB (mouth), two females, CBW.

Harpacticus gracilis Claus, 1863. Upper meso- and polyhaline. YR (GP and Guinea Marshes), on sponges Halichondria bowerbanki and Microciona prolifera (Yeatman, 1970). Winter and spring, CBW.

Harpacticus littoralis Sars, 1910. Mesohaline. Barren Is. and James Is., Md., sporadic, CBW.

## Family Tisbidae

Tisbe furcata (Baird, 1837). Upper meso- and lower polyhaline. GP and Guinea marshes, on Halichondria and Microciona (Yeatman, 1970). Lower CB, sporadic, CBW.



## Family Peltidiidae

Alteutha oblonga (Goodsir, 1845). Polyhaline. Lower CB /as A. depressa (Lang, 1948) rare, CBW. Lower YR, summer, few specimens, 20.1-21.60 ppt, 24C, UGB, HCY.

## Family Thalestridae

Dactylopodia tisboides (Claus, 1863). Upper meso- and polyhaline. CB (lower mid-bay), surface tow, 10-VII-67, HCY. GP and Guinea Marshes, on Halichondria and Microciona, summer (Yeatman, 1970). Paradactylopodia brevicornis (Claus, 1866). Mesohaline. Point Lookout, Md. two specimens, CBW.

## Family Parastenhelliidae

Parastenhelia spinosa (Fischer, 1860). Euryhaline, scarce, CBW.

## Family Diosaccidae

Amphiascopsis cinctus (Claus, 1866). Lower polyhaline. GP and Guinea Marshes on sponges Halichondria and Microciona "... apparently grazes on algae and feeds also as a scavenger, because no sponge cells were visible in the gut." (Yeatman, 1970).

Amphiascus parvus Sars, 1906. Lower polyhaline. GP and Guinea Marshes, summer, Halichondria and Microciona apparently feeding as does its congener. (Yeatman, 1970).

Diosaccus tenuicornis (Claus, 1863). Euhaline. CB (mouth), one specimen, CBW.

Pararobertsonia chesapeakeensis (Wilson, 1932). Mesohaline. Off Governor's Run, Md., March, several specimens (only one female), CBW.

## Family Ameiridae

Nitocra sp. Polyhaline. GP, late fall, an oyster larvae culture contaminant.

## Family Cletodidae

Cletodes longicaudatus (Boeck, 1872). Mesohaline. Barren Is., Md., 148 feet, CBW.

## Family Laophontidae

Paralaophonte brevirostris (Claus, 1863). Upper meso- and polyhaline. GP and Guinea Marshes, on Halichondria and Microciona (Yeatman 1970).

Paralaophonte congenera (Sars, 1908). Upper meso- and polyhaline. Yeatman (1970) on the sponges Halichondria and Microciona at GP and Guinea Marshes in summer.

## Order Cyclopoida

## Family Oithonidae

Oithona brevicornis Giesbrecht, 1891. Polyhaline (above 20 ppt). Lower CB, abundant, breeds in winter and spring, CBW.

Oithona similis Claus, 1866. Polyhaline. Eurythermal, most abundant in spring, occurs with Oithona brevicornis, breeds spring and fall, CBW.

Oithona spinirostris Claus, 1863. Euhaline. CB (mouth), rare.

## Family Cyclopidae

Halicyclops fosteri Mildred Wilson, 1958. Oligohaline (below 5 ppt). Pamunkey R., II-XI, abundant.

Cyclops gracilis Lilljeborg, 1853. Love Point, Md., (Wilson, 1932a). Questionable record, not reported elsewhere in North America, may be one of the Mesocyclops listed below (H. C. Yeatman personal communication).

Cyclops vernalis Fischer, 1853. Oligohaline (below 4 ppt). Stump Point, Md. (Davis, 1944). Pamunkey R., spring-fall, abundant, breeding season protracted. First record for Va.

Mesocyclops edax (Forbes, 1891). Oligo- and lower mesohaline (below 13 ppt). Pamunkey R., II-XI; common, breeds in summer. First record for Va.

Mesocyclops leukarti (Claus, 1857). Oligo- and lower mesohaline (below 7 ppt). Pamunkey R., summer. First record for Va.

Eucyclops agillis Kock, 1838. Freshwater. Pamunkey R., IX. First record for Va.

## Family Clausidiidae

Hemicyclops adhaerens (Williams, 1907). Polyhaline (22-30 ppt). Lower CB, VII-VIII, rare. Gooding (1960) examined Wilson's (1932a) specimens of Hemicyclops americanis from Chesapeake Bay and found them identical to this species.

## Family Lichomolgidae

Leptinogaster major (Williams, 1907). Meso- and polyhaline (7-30 ppt). Lower Pamunkey R., to mouth of CB, spring and summer, rare. Present in Tagelus, H. C. Yeatman.

## Family Oncaeiidae

Oncaea mediterranea Claus, 1863. Poly- and euhaline (above 20 ppt). Lower CB, summer and fall, breeds in fall, scarce. First record for CB.

Oncaea minuta Giesbrecht, 1892. Polyhaline. Lower and middle CB, scarce, CBW.

Oncaea venusta Philippi, 1843. Euhaline. CB (mouth), rare, CBW.

## Family Corycaeiidae

Corycaeus amazonicus F. Dahl, 1894. Euhaline (above 30 ppt). CB (mouth), IX-XII.

Corycaeus elongatus Claus, 1863. CB (York Spit), scarce, CBW.

Corycaeus venustus (Dana, 1853). Polyhaline. Lower CB, fall and winter, rare, CBW.

Farranula gracilis (Dana, 1853). Upper meso- to euhaline (16-31 ppt).

Lower CB, breeds early fall. Wilson (1932a) called this species

Corycella carinata Giesbrecht. However, Gonzales and Bowman (1965) reexamined his specimens and found them to be this species.

## Family Artotrogidae

Cryptopontius gracilis Wilson, 1932. Upper meso- and polyhaline.

Lower CB, Cape Charles City, winter, 145 ft., six specimens, CBW. GP, summer, on sponges, shallow water; winter, on Microciona, deeper water, abundant, MW, HCY.

## Family Ergasilidae

Ergasilus cerastes Roberts, 1969. Oligohaline (to 6ppt), Pamunkey R. A parasite of catfish (Ictalurus sp.) according to Roberts (1970), however all local specimens have been caught in plankton nets. First record for Va.

Ergasilus labricis Kroyer, 1863. Euryhaline. James R. on gills of striped bass, Morone saxatilis, WGH.

## Family Bomolochidae

Bomolochus eminens Wilson, 1911. Mesohaline. Point No Point, Md., fish parasite, local host unknown, (Wilson, 1932a).

## Family Asterocheridae

Asterocheres jeanyeatmanae Yeatman, 1970. On sponges Halichondria and Microciona prolifera at GP and Guinea Marshes in summer.

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## SUBCLASS CIRRIPIEDIA

Willard A. Van Engel

## Order Lepadomorpha

## Family Lepadidae

Octolasmis lowei Darwin, 1854. Meso- to euhaline. Piankatank, RA00 to C00 and beyond, all months, occasional, on gills of aged adult female blue crabs, WAVE.

## Order Thoracica

## Suborder Balanomorpha

## Family Chthamalidae

Chthamalus fragillis Darwin, 1854. Upper meso- and polyhaline. YK, abundant in high intertidal on pilings and Spartina. ES (seaside), very abundant on tall Spartina, JDA.

## Family Balanidae

Balanus amphitrite Darwin, 1854. Polyhaline. CL (mouth) scarce, JDA.

Balanus eburneus Gould, 1841. Upper meso- and polyhaline. Common on pilings in intertidal, JDA.

Balanus improvisus Darwin, 1854. GP, most common barnacle below intertidal, JDA.

Chelonibia patula (Ranzani, 1818). Meso- to euhaline. CL, all months, occasional, on carapace of aged adult female blue crab; YR00-25, rare, I-V, IX-X, in some years, WAVE.

Chelonibia testudinaria (L., 1758). Poly- and euhaline. CL, on sea turtles, WAVE.

Platylepas hexastylus (Fabricius, 1798). Poly- and euhaline. CL, once on blue crab, WAVE. Chincoteague Bay, on green turtle (Schwartz, 1960).

## Order Rhizocephala

Loxothylacus panopaei (Gissler, 1884). Meso- to euhaline. CB, Deal Island (Md.) to Elizabeth R. (Va.), RR00-40, YR00-35, JR00-32, frequent on abdomens of Eurypanopeus depressus and Rhithropanopeus harrisi since 1964; single specimen on E. depressus from Chincoteague Bay. (Daugherty, 1969), WAVE.

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## SUBCLASS MALACOSTRACA

## Order Mysidacea

## Family Mysidae

- Neomysis americana (S. I. Smith, 1873). Euryhaline.  
Abundant in rivers, less so in bay and on ES, perhaps cyclic or sporadic (Hopkins, 1965), all depths, MW. Usually 10-100 times more abundant on bottom than surface both day and night in York River. (Van Engel and Joseph, 1968).
- Mysidopsis bigelowi Tattersall, 1926. Meso- to euhaline.  
Mobjack Bay, frequent, GG. YK (Mumfort Is.), common on eelgrass in deeper water, X - XI, GAM. WA, common, WAVE.
- Heteromysis formosa (S. I. Smith, 1873). Poly- to euhaline.  
ES (Cedar Island), intertidal, 31.8 ppt, 22-VII-66, Morris Roberts. Hampton Roads, VIII-64, DFB.

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## Order Cumacea

Willard A. Van Engel

The cumaceans of the Chesapeake Bay area have not been adequately studied. Numerous specimens have been collected with meter net and by bottom grabs from the lower Chesapeake Bay and several tributaries, from inlets on the seaside of the Eastern Shore and by meter net in inner continental shelf waters. Specimens have been taken from oligohaline to euhaline waters. At least six genera and six to nine species appear to be represented. Identification has lagged, due to uncertainty of specific differences.

## Family Bodotriidae

- Mancocuma altera Zimmer, 1943. Polyhaline. CL (numerous locations), Fish Hawk stations, 24.4-29.3 ppt, (Zimmer, 1943).
- Mancocuma stellifera Zimmer, 1943. Euhaline. Inner continental shelf, VII-62, rare, WAVE.
- Cyclaspis pustulata Zimmer, 1943. Polyhaline. CL (Cape Charles Light), Fish Hawk station 8827, 37°03'22"N, 75°58'24"W, 18 m., 25.4 ppt., 18.2 C, 9-VII-20, (Zimmer, 1943).
- Cyclaspis varians Calman, 1912. Upper meso- to euhaline. Inner continental shelf, 36-37°N, 74°57'-75°47'W, surface-18 m, common, WAVE; YK (Clay Bank), VII-66, 3 specimens, eelgrass bed, RO. Elizabeth R. rare, Michael Richardson.
- Leptocuma minor Calman, 1912. Euhaline. Inner continental shelf, 36°00'-36°30'N, 75°22'-75°47'W, VII-62, surface-18 m, abundant, WAVE; 37-38°N, 74°47'-75°47'W, VII-62, surface-18 m, rare to common, WAVE; CL mouth, sand, V-70, rare, DFB.

## Family Leuconidae

Leucon americanus Zimmer, 1943. Meso- to euhaline. CB( numerous locations), Fish Hawk stations, above 9.16 ppt., (Zimmer, 1943); lower YK, silt-clay, rare; Sarah's Creek, 800/m<sup>2</sup>; upper YK, abundant; lower PM, common to abundant; RA25-30; JA13-15 (Deep Creek), 13-III-67, ovigerous, Elizabeth R, rare; DFB, DG, JBF, MR, MW; P018 (Tall Timbers), 28-III-68, J. E. Benedict.

Leucon nasica (Krøyer, 1841). Euhaline. Inner continental shelf, 37°N, 75°35'-47'W, surface-18 m, VII-62, rare, WAVE.

## Family Diastylidae

Diastylis polita S. I. Smith, 1879. Euhaline. Inner continental shelf, 36-38°N, 74°44'-75°37'W, surface-18 m, VII-62, occasional, WAVE; CL mouth, DFB.

Oxyrostylis smithi Calman, 1912. Upper meso- to euhaline. Inner continental shelf, 36°00'-37°30'N, 74°57'-75°47'W, surface-18 m, VII-62, common to abundant, WAVE; CL mouth, sand, rare, DFB; YK00-15, silt-clay, rare, DFB; lower YK(VEPCO area), sand, to 600/m<sup>2</sup>, MW. Md:(Chincoteague Bay), sand, rare, RO.

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## Order Tanaidacea

## Family Tanaidae

Leptochelia savigny (Kroyer, 1842). YK (Yorktown), sand, common, John Kraeuter; (Mumfort I.), rare, GAM.

## Order Isopoda

## Suborder Anthuridea

## Family Anthuridae

Cyathura polita (Stimpson, 1855). Oligo and mesohaline. Common on debris-covered shallow sand, scarcer in deeper water, MW.

Cyathura burbancki Frankenberg, 1965. Poly and euhaline. CL (off RA), medium-coarse, frequent, MW. JA (Middle Ground), abundant, DFB.

Ptilanthura tenuis (Harger, 1880). Poly- and euhaline. CL (off RA), sand, 1 specimen, sand, MW, DG.

## Suborder Flabellifera

## Family Cymothoidae

Aegathoa oculata (Say, 1818). Polyhaline. CL (mouth), plankton tow, GG.

Aegathoa medialis Richardson, 1900. Mesohaline? CU (Barren Is.) species described from single specimen. May represent a juvenile stage of Lironeca ovalis. (Sandifer, Zwerner, and Kerby, unpublished).

Irona nana Schioedte and Meinert, 1883-84. Euhaline? Sand Bridge Beach, summer, from gill of Membras martinica, GG.

Lironeca ovalis (Say, 1818). Probably euryhaline. Common fish parasite throughout bay and rivers. Low salinity tolerance indicated by records from JA (Jamestown Beach), JHK; gill parasite of bluefish (Pomatomus), WGH; also common gill parasite of striped bass (Morone saxatilis) and silver perch (Bairdiella chrysura); occasionally on other fish species.

Olencira praegustator (Latrobe, 1802). Euryhaline? Sand Bridge, abundant mouth parasite of menhaden (Brevortia), MW; one record from Jamestown Beach, PAS, JHK.

## Family Sphaeromidae

Ancinus depressus (Say, 1818). Euhaline. Sand Bridge, WGH. CL (Thimble Shoals), rare.

Paracerceis caudata (Say, 1818). Upper meso- to euhaline. ES (the Gulf), 4 males, 14 females, 8-VII-60; 4 males, 3 females, II-VII-61, SH, TEB. ES (Chincoteague), on Zostera, 32 males, 38 females, 12-VIII-65, MW. YK (Mumfort I.) abundant on Zostera all year, especially late summer and autumn, GAM. This species has probably been often misidentified as Sphaeroma quadridentatum (Marsh, 1970).

Sphaeroma destructor Richardson, 1897. Polyhaline? RA (Urbanna) in hull of boat recently arrived from Florida, VI-62, WGH, TEB. Stray, unlikely to become established.

Sphaeroma quadridentatum Say, 1818. Oligo- to polyhaline. CL, Richardson (1905) recorded this species from Cape Charles City. Other records: YR (GP), under stones, WGH; among intertidal barnacles and algae, common, MW. Pamunkey 35-50 (Van Engel and Joseph, 1968). True abundance and occurrence of this form unknown, since, as noted above, it has probably been confused with P. caudata.

Cassidinidea lunifrons (Richardson, 1900). Upper meso- and polyhaline. YK (Sandy Pt.), intertidal, four live specimens in mantle cavities of mussels Modiolus demissus, 1968-9, PAS.

## Suborder Valvifera

## Family Idoteidae

- Chiridotea almyra Bowman, 1955. Mesohaline. West Point and lower PM, plankton, frequent, MW; P35, (Van Engel and Joseph, 1968).
- Chiridotea caeca (Say, 1818). Meso- to euhaline. PM, rare, MW. Off CB, plankton, GG.
- Chiridotea tuftsi (Stimpson, 1853). Poly- or euhaline. Offshore plankton, GG.
- Erichsonella attenuata (Harger, 1873) Upper meso- and polyhaline. YK (Mumfort I.), abundant, GAM.
- Erichsonella filiformis (Say, 1818). Upper poly- and euhaline. Habitat unknown, SH, TEB.
- Idotea baltica (Pallis, 1772). Poly- and euhaline. On Zostera, common to abundant in summer, but less than E. attenuata, GAM.
- Idotea metallica Bosc, 1802. Euhaline. Abundant in off-shore plankton, GG.
- Edotea triloba (Say, 1818). Near euryhaline. CL (Back R.) Zostera bed, 540/m<sup>2</sup>, III-70, Robert Orth. YK (Mumfort I.), common on Zostera, GAM. Rare in deeper water but 600/m<sup>2</sup> found in Tangier Sound at 87 feet, MW. YK25-PM35 (Van Engel and Joseph, 1968).

## Suborder Oniscoidea

## Family Ligidiidae

- Ligia exotica Roux, 1828. Upper meso- to euhaline. YK (GP), abundant on shaded pilings and rock rip-rap, MW.

## Suborder Epicaridea (Bopyroidea)

## Family Bopyridae

- Bopyrina latreuticola (Gissler, 1882). Euhaline. Off ES, branchial parasite of Latreutes fucorum, PAS.
- Probopyrus pandalicola (Packard, 1879). Polyhaline. ES, fairly common branchial parasite of Palaemonetes, WAVE, PAS.
- Pseudione upogebiae (Hay, 1917). Polyhaline. YK (Sandy Point), one male and one female collected 17-III-69 on gill of Upogebia affinis, PAS.
- Pseudione furcata Richardson, 1904. Poly- and euhaline. Richardson (1905) states that four females were collected from Virginia's ES by H. E. Webster, male unknown, host unknown, PAS.
- Family Entoniscidae
- Cancrion (?) sp. Polyhaline. YK (GP) two females and one male endoparasitic in Eurypanopeus depressus, WAVE; apparently represents a new species of Cancrion, PAS.

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#### Order Amphipoda

Suborder Gammaridea [See Feeley and Wass (1971) for further information]

##### Family Ampeliscaidae

Ampelisca abdita Mills, 1964. Upper meso- to euhaline.

YK (Mumfort I.) Zostera bed, 5600/m<sup>2</sup>, VII-70, Robert Orth.

Ampelisca vadorum Mills, 1963. Upper meso- to euhaline. CL

(Back River), Zostera bed, 4200/m<sup>2</sup>, III-70, RO. JA(HR), 1500/m<sup>2</sup>, DFB.

Ampelisca verrilli Mills, 1967. Poly- and euhaline. Lower

YK, sand - silty sand, 350 m<sup>2</sup>, MW. ES(Chincoteague Bay, Md.), Zostera bed, 130/m<sup>2</sup>, RO.

##### Family Ampithoidae

Ampithoe longimana Smith, 1873. Upper meso- polyhaline.

YK (Mumfort I.), abundant on Zostera all year, especially in late summer and early fall, GAM. Not reported from Eastern Shore.

Ampithoe valida Smith, 1873. Mesohaline. CB (Leonardtown,

Md.), 23 specimens, VI-69, S. L. H. Fuller, J. K. Lowry. (Warwick R.), 2 specimens, JKL.

Cymadusa compta (Smith, 1873). Meso- polyhaline. YK

(Mumfort I.), common on Zostera all year, abundant in shallow water, less so to 30 ft., GAM.

##### Family Aoridae

Lembos smithi (Holmes, 1903). Poly- and euhaline. ES

(Hog Island Bay), 1 specimen, SH, TEB. YK (Gloucester Pt.), 4 specimens, 11-67, algae detritus in Zostera bed.

Leptocheirus plumulosus Shoemaker, 1932. Oligo- mesohaline.

Upper YK, lower PM, muddy shallows, abundant, JF. YK (Sarah's Creek), 600/m<sup>2</sup> in leafy debris, MW.

Rudilemboides sp. Upper meso- and polyhaline. YK (Mumfort

I.), frequent on Zostera, especially in summer, GAM.

##### Family Bateidae

Batea catharinensis Muller, 1865. Upper meso- euhaline.

Epifaunal on hydroids, bryozoans and sponges, 10-40 ft., often abundant. Color variations from the usual spotted to solid purple are frequent, MW.

##### Family Corophiidae

Cerapus tubularis Say, 1817. Upper meso- and polyhaline.

YK (GP), 30 ft., silt-clay, abundant, MW. YK10, very abundant in trawl net, WAVE.

Corophium acherusicum Costa, 1857. Poly- and euhaline. YK,

JA, abundant on hydroids and Zostera, 1970, DFB. YK (Mumfort I.), on Zostera, sporadic, occasionally abundant, VIII-X. ES (Wachapreague), over 600 in sponge, SH, TEB.

Corophium lacustre Vanhoffen, 1911. Oligo- and lower meso-

haline. PM40, marsh detritus, 10-40 ft., 4800/m<sup>2</sup>, MW.

Corophium simile Shoemaker, 1934. (See reference). Polyhaline.

YK(Mumfort I.), frequent on Zostera especially at deepest station, VI-X, GAM.

- Corophium tuberculatum Shoemaker, 1934. (See reference).  
Polyhaline. JA and CL (mouth). This species is difficult to separate from C. acherusicum but is apparently common only in higher salinities, DFB.
- Corophium sp. Oligohaline. J. B. Feeley recognized this large species as different but had only a few specimens. It is presumably being described from Georgia. It's closest relative may be European.
- Erichthonius brasiliensis Dana, 1855. Polyhaline. Tubicolous on hydroids and bryozoa. YK, abundant (400/m<sup>2</sup>), 15-70 ft., MW. YK (Mumfort I.), rare, GAM.
- Unciola inermis Shoemaker, 1945. Euhaline. CL (mouth), 1920, few small specimens, deeper water, CRS.
- Unciola irrorata Say, 1818. Poly- and euhaline. CL and lower YK, silt-clay and detritus, common, MW.
- Unciola serrata Shoemaker, 1945. Euhaline. CL, CRS.
- Unciola spicata Shoemaker, 1945. Euhaline. CL (mouth).  
The three Unciola species described from the CB mouth area, have not been taken by VIMS personnel.
- Family Gammaridae
- Elasmopus levis Smith, 1873. Upper meso- and polyhaline. YK (Mumfort I.), on Zostera, abundant all year, especially in summer, GAM. YK, most abundant gammarid, JBF. JA(HR) abundant on Aeverrillia armata, XI-63, MW.
- Gammarus daiberi Bousfield, 1969. /Gammarus annulatus in 1965 checklist, Gammarus fasciatus in Cronin et al, 1962.7  
Oligo- and mesohaline. Most abundant in lower salinities. Most common on hydroids and bryozoans, also in marsh creeks, JBF.
- Gammarus fasciatus Say, 1818. Freshwater. PM40 & 50, occasional, JBF.
- Gammarus tigrinus Sexton, 1939. Oligohaline. Bousfield (1969) lists numerous specimens from Md. and two from the Potomac. It has yet to be definitely identified from Virginia.
- Gammarus palustris Bousfield, 1969. Euryhaline? YK (West Point), specimens taken in seaweed debris, IV-69. Bousfield gives many records from the upper Ches. Bay, others from Mobjack Bay, ES and Norfolk. However, it appears that this species prefers oligo- mesohaline shallows and intertidal zones.
- Gammarus mucronatus Say, 1818. Upper meso- and lower polyhaline. YK (Mumfort I.), abundant on Zostera except in autumn, when it was absent; greatest numbers at deepest station, GAM. ES (Swash and Hog I. Bays), common on oyster ricks, IV-VI, 1960, SH, TEB.
- Gammarus sp. 1 /See Bousfield, 1969 for these undescribed gammarids./ This is a small amphipod similar to G. mucronatus but found ovigerous although lacking mucronations.
- Gammarus sp. 2 Bousfield reported a single male from St. Mary's Co., Md.
- Rivulogammarus sp. 1. A large species known from three specimens taken in Md.
- Rivulogammarus sp. 2. A small species known from two specimens from Ches. Beach, Md.. Bousfield (personal communication) has emphasized the great variation in members of this genus on the mid-Atlantic coast, particularly in fresh and oligohaline waters.
- Melita appendiculata (Say, 1818). Upper meso- haline. YK, on sponges, hydroids and bryozoans, JBF. YK (Mumfort I.), common to abundant in autumn on Zostera at deeper stations, JBF. ES (Seaside and Bayside), 3 specimens, 1960, SH, TEB.

- Melita nitida Smith, 1873. Upper oligo- to midpolyhaline. YR (Terrapin Pt. marsh), abundant in creek, VII-70, MW. At bases of hydroids and bryozoans in deeper water, JBF.
- Family Haustoriidae
- Acanthohaustorius intermedius Bousfield 1965. Upper poly- and euhaline. HR (Newport News Bar, Sewells Pt. Spit), CL (mouth), sand, rare, DFB, ELB.
- Acanthohaustorius millsii Bousfield, 1965. Upper poly- and euhaline. HR (Newport News Bar), sand, rare, DFB, ELB.
- Amphiporea virginiana Shoemaker, 1933. Euhaline. Virginia Beach, intertidal, abundant, CRS, Sand Bridge, but not in CR, MW.
- Bathyporeia sp. Polyhaline. HR, one specimen, sand, DFB, ELB.
- Haustorius sp. Polyhaline? (See Croker, 1966, and Dexter, 1969). CL (Ocean View), abundant, ELB.
- Lepidactylus dytiscus Say, 1818. Euryhaline. ES (The Gulf), MW, ELB. CU (Fox Point, Rhode R.), John Vogel. JA (Cobham Bay), shallow sand, frequent, Richard Peddicord.
- Neohaustorius biarticulatus Bousfield, 1965. Euhaline. ES (Cedar I., bayside beach), sand, intertidal, common, 4-IV-67, JBF.
- Neohaustorius schmitzi Bousfield, 1965. Oligo- to euhaline. CU (Locust Point, Rhode R., near Annapolis, Md.), sand, John Vogel, ELB.
- Family Ischyroceridae
- Jassa falcata (Montagu, 1808). Poly- and euhaline. CL (Bay Bridge-Tunnel), ES (Wachapreague Inlet), abundant on pilings, YK mouth and HR, rare, JBF.
- Family Liljeborgiidae
- Idunella sp. Poly- and euhaline. Bousfield (personal communication) has determined this species and stated that it is probably commensal. YK (GP), one specimen; ES (Hog Island Bay), nine specimens (5 males, 4 ovig. females), JBF.
- Listriella barnardi Wigley, 1966. Polyhaline. CL, YK, probably commensal with Maldanopsis elongata, MW, R. L. Wigley.
- Listriella clymenellae Mills, 1962. Polyhaline. YR, (GP), Zostera beds and beyond to ca 15 lft.; CB, rare off RR, MW, TEB. Commensal with Clymenella torquata, often abundant.
- Family Lysianassidae
- Lysianassa alba (Holmes, 1903). Polyhaline. YK, sandy-silt shallows, rare, JBF, Pierre Brunel. CL (Back River), Zostera bed, 1000/m<sup>2</sup>, Robert Orth.
- Family Oedicerotidae
- Monoculodes edwardsi Holmes, 1903. Euryhaline. YR, (to PM35), JA (to JA36), RA (to RA40), always most abundant in upper reaches. CL (off RA), frequent; PK (Stove Pt.), sand, common, JBF.
- Family Phoxocephalidae
- Paraphoxus epistomus (Shoemaker, 1938). Poly- and euhaline. YK (Tue Marsh Light), 200/m<sup>2</sup>, hard sand, MW; JA (mouth), DFB.
- Family Pleustidae
- Parapleustes sp. Upper meso- and lower polyhaline. PX, Md., ELB. YK20, specimens on hydroids and bryozoans, JBF, ELB.
- Sympleustes glaber (Boeck, 1861). Meso- and euhaline. (PM40), JA (to JA19), RA25 to RA30; ES (WA), JBF; among hydroids and bryozoans; not yet taken in CB.
- Family Stenothoidae
- Parametopella cypris (Holmes, 1903). Polyhaline. CL (off mouth of Potomac R. and off New Point Comfort), Cowles (1930). YK10 - YK15, scarce JBF.

Stenothoe gallensis (Walker, 1904). Polyhaline. ES (Cherrystone Creek), 8-VII-60, 47 specimens; (WA), 24-VI-60, 12 specimens, SH, TEB. YK (Mumfort I.), two specimens on Zostera, 8-X-69, GAM.

Stenothoe minuta Holmes, 1903. Upper meso- and euhaline. YK (VIMS pier), on Plumularia diaphana; ES (WA), on Tubularia crocea; YK15, most abundant in December, JBF.

Family Talitridae

Orchestia grillus Bosc, 1802. Meso- to euhaline? Salt-marsh amphipod, YK (GP), under eelgrass wrack; ES, (Cedar I.), JBF.

Orchestia platensis Kroyer, 1844. Upper meso- and polyhaline. Mainly under wrack on sand beaches. YK (GP), abundant, JBF.

Talorchestia longicornis (Say, 1818). Meso- to euhaline. LC, common "beach hopper", abundant in high intertidal sand of less exposed beaches, JBF.

Suborder Hyperiidea

Family Hyperiidae

Hyperia galba (Montagu, 1813). Poly- and euhaline. PX (mouth) (Bowman, et al, 1963).

Hyperoche medusarum (Krøyer). Poly- and euhaline. YK, plankton tow, JM. PX, F. J. Schwartz, TEB.

Suborder Caprelliidea

Family Caprellidae (See McCain, 1968).

Aeginina longicornis (Krøyer, 1843). Euhaline? McCain (1968) lists this on the basis of its report from lower Ches. Bay "algal masses" by Ferguson and Jones (1949). However, it has not been found since then.

Caprella penantis Leach, 1814. Upper meso- to euhaline. CL, on sponges and hydroids, abundant, JM. YK (Mumfort I.), abundant on Zostera, especially in deeper water, winter-spring; scarce to absent, summer-fall, GAM.

Caprella equilibra Say, 1818. Poly- and euhaline. YK (GP), on hydroids, sponges and bryozoans, often abundant but seasonally sporadic, JM. YK (Mumfort I.), only two specimens on Zostera, 1-XII-68, GAM.

Paracaprella tenuis Mayer, 1903. Upper meso- and polyhaline. Common on hydroids, sponges, and bryozoans, JM. Caprellid most often taken in bottom grabs, MW. YK, (Mumfort I.), scarce on Zostera, except 61 specimens, 1.2m, 8-X-69, GAM.

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## ORDER DECAPODA

Willard A. Van Engel and Paul A. Sandifer

This list of the decapod fauna of the region consists of 64 species in 26 families found within the confines of the Chesapeake Bay, and an additional 29 species in 7 families from the Continental Shelf and Slope. The expansion of the list of Bay species given in the third revision (Wass, 1965) resulted from the inclusion of one species carelessly omitted earlier, five species newly discovered, and two freshwater and land species which must be considered accidental migrants into brackish water.

The decision to include Continental Shelf and Slope decapods resulted from a growing interest in the ecology and distribution of species (fish, mollusk and crustacean) now being commercially exploited, or for which a potential fishery may exist, or which may have an association, however small, with the intricate food web of the Bay.

There is also included an addendum of 14 species which would be expected to be found in shelf waters but for which no records have appeared.

## Collectors and Authorities

|     |                   |      |                      |
|-----|-------------------|------|----------------------|
| DFB | Donald F. Boesch  | JDM  | John D. McEachran    |
| VJB | Victor J. Burrell | JAM  | John A. Musick       |
| TC  | Thomas Cain       | CER  | Clarence E. Richards |
| MC  | Michael Castagna  | MHR  | Morris H. Roberts    |
| FAC | Fenner A. Chace   | PAS  | Paul A. Sandifer     |
| PAH | Paul A. Haefner   | RS   | Rudolph Sheltema     |
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| HDH | Hinton D. Hoese   | RTT  | Roy T. Terretta      |
| LH  | Lipke Holthuis    | WAVE | Willard A. Van Engel |
|     |                   | MW   | Marvin Wass          |

## Suborder Natantia

## Section Penaeidea

## Family Sergestidae

Acetes americanus carolinae Hansen, 1933. Poly- and euhaline. YK, MB, uncommon, X-XI, DSH, WAVE, PAS.

Lucifer faxoni Borradaile, 1915. Poly- and euhaline. Inner continental shelf, 36-38°N, 73°43'-75°47'W, more abundant offshore, surface-9m, uncommon at 18m, IV, VII-IX, XII, WAVE; CL, VIII, X, XI, PAS; MB, X, PAS.

## Family Penaeidae

(A large collection of juvenile and adult shrimp has been maintained by the Crustaceology Department since 1948. Identifications of specimens of the genus Penaeus collected through 1968 were made or verified by Dr. Isabel Perez Farfante whose publication provides details of life history, ecology and distribution of the genus in the western Atlantic.)

Penaeus aztecus aztecus Ives, 1891. Meso- to euhaline, usually upper meso- and polyhaline. CB and tributaries, north to Tred Avon R., Md., numerous locations; Jamestown (JA) VIII-66, 5 ppt; VII-XI, rare to occasional, WAVE, (Perez Farfante, 1969); ES (Swash Bay), WAVE.

Penaeus duorarum duorarum Burkenroad, 1939. Upper meso- to polyhaline. CB and tributaries, north to PX, numerous locations, all months, minimum temperature 3.5°C, rare to occasional, WAVE, (Perez Farfante, 1969).

Penaeus setiferus (Linnaeus, 1767). Euhaline. CB and tributaries, numerous locations, to 1 ppt in Chickahominy R. (JA) and at PM45, V-XII, rare to occasional, WAVE, (Perez Farfante, 1969).  
Trachypenaeus constrictus (Stimson, 1871). Polyhaline. CL, eastern side, deep water, VII, IX, XII, frequent, WAVE, (Cowles, 1930).

## Section Caridea

## Family Pasiphaeidae

Leptochela serratorbita Bate, 1888. Euhaline. Inner continental shelf, 36°00'N, 74°09'-75°35'W and 37°00'N, 74°45'-75°10'W, occasional, surface-18m, WAVE.

## Family Palaemonidae

Leander tenuicornis (Say, 1818). Euhaline. Inner continental shelf, PAS; on Sargassum, (Fine, 1969); CB mouth, PAS.

Macrobrachium ohione (Smith, 1874). Oligo- and mesohaline.

JA66 (Hopewell), one ovigerous female, 16-IV-52 (Hobbs and Massmann, 1952); JA39 (mouth of Chickahominy R.), 9-VI-64, WAVE; JA36 (Jamestown), one ovigerous female, 6-VII-54, WAVE; PA50 (Lester Manor), 26-VI-69, VJB; PA45 (Cumberland Landing), 20-VI-58, WAVE.

Palaemonetes intermedius Holthuis, 1949. Meso- to polyhaline. YK00, 06 (GP), Lynnhaven Bay (Broad Bay), Pungoteague Cr., Pocomoke Sound, PX (SI, and St. Leonards Cr., 5.4 ppt), ES (Chincoteague, Isle of Wight, Assawoman bays), in eelgrass, shallow water, uncommon in Virginia, common in Maryland and ES; WAVE, RS and LH, (Schwartz, 1964), FAC.

Palaemonetes paludosus (Gibbes, 1850). Oligohaline. Several records from fresh water, Haynes Mill Pond, Gloucester Co., WAVE.

Palaemonetes pugio Holthuis, 1949. Oligo- to polyhaline. YK00-45, RA, Lynnhaven Bay (Broad Bay), Pungoteague Cr., Pocomoke Sound, Little Annemessex R., Eastern Bay (Kent Narrows), PX (SI and St. Leonards Cr., 5.4 ppt), Cove Pt., ES (Chincoteague, Sinepuxent and Isle of Wight bays, Finney Cr.), most abundant palaemonid, taken in deep water with trawl, shallow water with seine, parasitized by Probopyrus pandalicola; WAVE, RAC, RS and LH, (Herman et al, 1968).

Palaemonetes vulgaris (Say, 1818). Meso- to polyhaline. YK00-06, JAL0, Lynnhaven Bay (Broad Bay), PX (SI), ES (Chincoteague, Sinepuxent bays), less common than P. pugio in Virginia, rare in Maryland, taken in shallow and deep water, WAVE, FAC, RS and LH, (Cory, 1967).

## Family Alpheidae

Alpheus heterochaelis Say, 1818. Polyhaline. CB, YK00-06 (GP), uncommon, occasionally in holding trays of oysters, WAVE.

Alpheus normanni Kingsley, 1879. Polyhaline. CB, YK00-06 (GP), uncommon, occasionally in oyster trays, WAVE; ES (Cherrystone Cr.), FAC.

## Family Ogyridae

Ogyrides alphaerostis (Kingsley, 1879). Polyhaline (?). Kingsley described the species from a single specimen collected by H. E. Webster from Northampton County (seaside); never found again in Virginia

Ogyrides limicola Williams, 1955. Meso- to euhaline. CL, occasional, DFB; YK00-20, common, but not abundant in mud bottom, DFB, WAVE; YK06 below bridge, depth 9m, 150/sq.m., MW; MB, larvae, X, PAS; ES (Bradford Bay, Accomack Co.), 32.5 ppt, WAVE.

## Family Hippolytidae

Hippolysmata wurdemanni (Gibbes, 1850). Polyhaline. CL, not reported since Cowles (1930).

Hippolyte pleuracantha (Stimpson, 1874). CL, lower YK, numerous locations, in eelgrass, common, green-colored (occasionally red, brown, blue), WAVE, (Cowles, 1930); MB, larvae, X, PAS.

Latreutes fucorum (Fabricius, 1789). Euhaline. Inner continental shelf, 37-38°N, 74°20'-75°10', surface-9m, occasional, VII-62, WAVE; floating Sargassum (Fine, 1969); outside mouth of CB (Cowles, 1930); CB mouth, PAS.



## Family Crangonidae

Crangon septemspinosa (Say, 1918). Euryhaline. Inner continental shelf, 37°02'-38°34'N, 74°54'-75°29'W, 16-26m, 2-5C, JAM and JDM; ES (Assawoman, Isle of Wight, Sinepuxent and Chincoteague bays) (Schwartz, 1964); CB, numerous locations, outside the bay mouth to Swan Pt., Md. (39°30'N), JA13-32 (0.94 ppt), YK00-40, RA11-30, PO10-25, Choptank 10, Tangier and Pocomoke sounds, more abundant in lower Bay and in lower portions of Virginia rivers (polyhaline waters) especially XI-VI, farthest upriver in summer, occasionally in other months; ovigerous all months, fewer in summer; larvae II-V in Bay although V-VIII and X in PX, silty-sand bottoms, WAVE, PAH, RS and LH, (Cowles, 1930; Frey, 1942).

## Suborder Reptantia

## Section Macrura

## Superfamily Nephropidea

## Family Nephropidae

Nephropsis aculeata Smith. Euhaline. Inner continental shelf, 37°02'N, 74°31'W, 183m, 10C, I, JAM and JDM.

## Family Homaridae

Homarus americanus H. Milne-Edwards, 1837. Poly- and euhaline. Continental shelf, 35°52'-38°49'N, 73°23'-75°27'W, 15-274m, 4-20C, numerous, XI-IX, JAM and JDM; numerous, up to 25 lbs, frequently taken along with scup and seabass by trawlers, and by lobster pots, 60 to 200m offshore; 37-38°, 74°20'-75°22', surface, 20.7-22.2C, four early stage larvae, VII-62, WAVE; CB (Gwynn's Island, Thimble Shoals, Ocean View, Cape Charles Light) by crab dredge; Y00-Y05, J24, by crab pot, 9-13 inches total length, occasionally up to 15 lbs, WAVE.

## Family Astacidae

Cambarus diogenes Girard, 1852. Fresh, occasionally oligohaline. Stutts Cr. (37°28'N, 76°19'W), large female on oyster bar, WAVE; juveniles from Willoughby Spit, MW.

Cambarus uhleri Faxon. Gloucester County, burrowing form, small female, IX-61, WAVE.

Specimens not available for identification were collected at PM45, freshwater, 15-IX-54. Other species probably present, for 10 species are known from Maryland (Meredith and Schwartz, 1960).

## Superfamily Scyllaridea

## Family Scyllaridae

Scyllarus depressus (Smith, 1881) (= S. nearctus Holthuis). Euhaline. Continental shelf, off Cape Charles, 37°07'00"N, 74°34'30"W, 117m, Albatross station 2421, one specimen (Lyons, 1970).

## Superfamily Thalassinidea

## Family Callianassidae

Callianassa atlantica Rathbun, 1926 (= C. stimpsoni Smith). Polyhaline. ES (Cedar Island) PAS; CL (Cowles, 1930).

Callianassa sp. Polyhaline. CL, mouth, larvae, VII- IX, PAS.

## Family Upogebiidae

Upogebia affinis (Say, 1818). Polyhaline. CL, occasionally, to 20m (Cowles, 1930); lower YR frequently in shallow water by digging, MW; ovigerous VII, WAVE.

## Family Laomediidae

Naushonia crangonoides Kingsley, 1895. Euhaline. Continental shelf, 37-38°N, 73°43'-75°47'W, surface to 18m, larvae, VII, WAVE.

## Section Anomura

## Superfamily Galatheidea

## Family Galatheidae

Munida iris Milne-Edwards. Euhaline. Continental shelf and slope, 35°37'-38°17'N, 73°38'-74°50'W, 121-274m, 8-13.7C, occasional throughout the year, ovigerous V, VIII, IX, JAM and JDM; 82-128m, 1-55, CER; 78-328 meters (Cowles, 1930).

Munida caribaea Smith, 1882. Euhaline. Continental shelf, 36°38'30"-37°19'45"N, 74°26'00"-74°40'10"W, 121-179m, ovigerous III, IV (Smith, 1884).

## Family Porcellanidae

Euceramus praelongus Stimpson, 1860. Polyhaline. CL, many records, 6-14m, WAVE, (Cowles 1930); lower YR(GP), few, 1-12m, WAVE; MB, larvae, X, PAS.

- Polyonyx gibbesi Haig, 1956. Poly- and (?) euhaline. CL, many records, 9-27m, WAVE; lower YR, occasional, one at GP; MB, larvae, X, PAS; commensal with Chaetopterus.
- Porcellana sigsbeiana Milne-Edwards, 1880. Euhaline. Continental shelf, 35°21'N, 74°53'W, 101m, 18C, one specimen, II, JAM and JDM.
- Superfamily Paguridea
- Family Diogenidae
- Clibanarius vittatus (Bosc, 1802). Poly- and euhaline. ES, IX, HDH; Cape Charles City (Richards, 1931); YR(GP) rare, perhaps through introduction, WAVE; PO(Gunston, Va.), (Cowles, 1930).
- Dardanus insignis (Saussure, 1858). Euhaline. Continental shelf, 35°21'N, 74°53'W, 101m, 18C, II, JAM and JDM.
- Family Paguridae
- Catapagurus gracilis Smith. Euhaline. Continental shelf, 37°07'40"N, 74°35'40"W, 128m, 17.2C, X, 2 specimens (Smith, 1887).
- Catapagurus sharreri Milne-Edwards, 1883. Euhaline. Continental shelf, 37°07'40"-37°19'45"N, 74°26'00"-74°35'40"W, 128-179m, 17.2C, IV, X, 27 males, 14 females, 5 ovigerous (Smith, 1884, 1887).
- Pagurus acadianus Benedict, 1901. Euhaline. Continental Shelf, 37°54'-38°40'N, 73°44'-74°54'W, 24-55m, 5-7C, I, JAM and JDM.
- Pagurus annulipes (Stimpson, 1860). Euhaline. Continental shelf, 36°19'N, 75°29'W, 26m, 5C, II, JAM and JDM.
- Pagurus bernhardus L. Euhaline. Continental shelf, 37°30'48"N, 74°51'28"W, 51m, 7.2C, V, 21 specimens, 1 ovigerous (Smith, 1884).
- Pagurus kroyeri Stimpson. Euhaline. Continental shelf, 36°41'15"-37°19'45"N, 74°26'00"-74°39'50"W, 121-179m, 17.2C, IV, V, X, 4 specimens (Smith 1884, 1887).
- Pagurus longicarpus Say, 1817. Upper meso- to euhaline. Continental shelf, 37°31'N, 74°52'36"W, 53m, single specimen (Smith, 1884); CL (PO mouth to Bay mouth), 8-27m, all months (Cowles, 1930; Richards, 1931; Ferguson and Jones, 1949), WAVE; YR00-10, common, water's edge to deep water, ovigerous III-X (Roberts, 1969); MB, larvae, X, PAS.
- Pagurus politus Smith 1882. Euhaline. Continental shelf, 36°38'30"-37°19'45"N, 74°26'00"-74°40'10"W, 128-179m, 17.2C, IV, V, X, 16 specimens (Smith 1884, 1887).
- Pagurus pollicaris Say, 1817. Poly- and euhaline. Continental shelf, 37°31'N, 74°51'29" and 74°53'30"W, 51-53m, two juveniles (Smith, 1884); CL, common year-round, ovigerous IV (Cowles, 1930; Ferguson and Jones, 1949), frequent in blue crab dredge catch XII-III, WAVE.
- Superfamily Hippidea
- Family Hippidae
- Emerita talpoida (Say, 1818). Poly- and euhaline. Continental shelf, 36°-38°N, 74°07'-75°47'N, surface-18m, larvae V, VII, VIII, WAVE; Sand Bridge Beach and other outer beaches, burrowing form abundant; Lynnhaven Inlet (Ferguson and Jones, 1949); Fort Wool, (Uhler, 1879).
- Family Albuneidae
- Lepidopa websteri (?) Benedict, 1903. Poly- and euhaline. Continental shelf, larvae, 36°N, 74°09'-75°22'W, surface, VII, WAVE; CB mouth, larvae, PAS.
- Section Brachyura
- Subsection Dromiacea
- Family Homolidae
- Homola barbata (Fabricius, 1793). Euhaline. Continental shelf and slope, 36°41'05"-37°55'00"N, 74°05'00"-74°38'53"W, 102-682m, 11.4-14.4C (Smith, 1884, 1887; Rathbun, 1937).
- Subsection Oxystomata
- Family Leucosiidae
- Persephona punctata aquilonaris Rathbun, 1937. Polyhaline, perhaps euhaline. CL, two records: 37°05'N, 76°07'W, small male in arms of seastar, 14-I-70, WAVE; 37°05'N, 76°09'W, large female, 30-XI-70, RTT, WAVE.
- Family Calappidae
- Calappa flammea (Herbst, 1794). Euhaline. Continental shelf, occasional, records uncertain.

Calappa sulcata Rathbun, 1898. Euhaline. Continental shelf, 35°17'-35°21'N, 74°53'-75°03'W, 49-101m, 18-19C, XII, II, JAM and JDM.  
Hepatus epheliticus (L., 1763). Euhaline, perhaps polyhaline. CB, single male, 1880 (Rathbun, 1937); no other records north of Hatteras are known.

Hepatus pudibundus (Herbst, 1785). Euhaline, perhaps polyhaline. CL (37°04'N, 76°05'W), a single damaged specimen, 3-III-71, PAH; previously known only as far north as Georgia (Williams, 1965).

Subsection Brachygnatha

Superfamily Brachyrhyncha

Family Portunidae

Arenaeus cribrarius (Lamarck, 1818). Euhaline, perhaps polyhaline.

CB mouth (Smith's Island), five specimens; common "offshore", Cape Charles, sandy beach, 2 juv. males, 2 juv. females (Rathbun, 1930).

CL only (Cowles, 1930; Richards, 1931).

Bathynectes superba (Costa, 1853). Euhaline. Continental shelf, 37°-38°N, 128-183m (=100 fathoms), 8.2-14.4C, occasional most months (Smith, 1887; Rathbun, 1930; Cowles, 1930), JAM and JDM; ovigerous I, JAM and JDM.

Callinectes sapidus Rathbun, 1896. Euryhaline. AT and ES, common to occasionally abundant in nearshore waters; CB and tributaries, common to abundant all months, water's edge to deep water; molting, mating and ovigerous V-X, rarely IV, XI, XII; 2-32C; WAVE, (Rathbun, 1930), JAM and JDM.

Cronius ruber (Lamarck, 1818). Euhaline. AT, on floating Sargassum (Fine, 1969).

Ovalipes quadulpenis (Saussure, 1858). Euhaline. Continental shelf, 35°13'-37°31'N, 75°03'-75°30'W, 18-49m, 11-19C, JAM and JDM.

Ovalipes ocellatus (Herbst, 1799). Poly- and euhaline. Continental shelf, nearshore, 35°41'-37°48'N, 75°21'-75°30'W, 11-22m, 8-11C, occasional, JAM and JDM; common on sand bottom along ocean beaches, Md. and Va., WAVE, (Mansueti, 1962; Schwartz, 1964); CB, mouth (Cape Charles to Cape Henry), and lower bay, numerous records (Uhler, 1879; Rathbun, 1930; Cowles, 1930; Richards, 1931; Ferguson and Jones, 1949; Mansueti, 1962), WAVE; mid- and upper CB, (Crisfield and Cove Point, Md.), rare, (Rathbun, 1930; Mansueti, 1962). Mansueti (1962, Fig. 1) incorrectly plotted three records from Rathbun (1930, p. 22-23): the Smith Island record is for the mouth of the bay, not at the Md.-Va. border; the two records outside the bay mouth at approximately 37°05'N, 75°45'W cannot be verified; ovigerous IV, WAVE.

Portunus gibbesii (Stimpson, 1859). Poly- and euhaline. Continental shelf, 37°17'-35°51'N, 75°02'-75°30'W, 18-49m, 6-19C, occasional (Rathbun, 1930) JAM and JDM; CL, numerous locations, 7-46m, occasional, year-round, (Rathbun, 1930; Cowles, 1930), WAVE.

Portunus sayi (Gibbes, 1850). Euhaline. Continental shelf, 36°47'-37°56'N, 68°08'-74°33'30"W, occasional, a pelagic form found floating with Sargassum (Rathbun, 1930; Cowles, 1930).

Portunus spinicarpus (Stimpson, 1871). Euhaline. Continental shelf, 35°21'N, 74°58'W, 49m, 19C, II, ovigerous, JAM and JDM; northern record is offshore, east of Oregon Inlet, N. C. (35°42'N, 74°54'30"W), 79m, 14.1C (Rathbun, 1930; Cowles, 1930).

Portunus spinimanus Latreille, 1819. Poly- and euhaline. Continental shelf, 37°10'N, 75°08'W, 33m (Rathbun, 1930), 35°15'N, 75°03'W, 49m, 19C, JAM and JDM; ES, Chincoteague (Rathbun, 1930); ES, Hog Island Bay, two males, 15-X-70, MC; CB mouth, Smith Island (Rathbun, 1930).

Family Cancridae

Cancer borealis Stimpson, 1859. Euhaline, occasionally polyhaline. Continental shelf, numerous records from 36°-38°N, 5-183m (=100 fathoms), 3-17.2C, common most months (Smith, 1884, 1887; Rathbun, 1930; Cowles, 1930), JAM and JDM, LRS; common in lobster pots, 69-108mm females, 74-148mm males, LRS; small specimens rarely taken near mouth of Chesapeake Bay, RTT, PAH.

Cancer irroratus Say, 1917. Poly- and euhaline. Continental shelf, numerous records from 36°-38°N, 5-183m, 2-20.5C, common most months (Smith, 1884; Rathbun, 1930; Cowles, 1930), JAM and JDM, LRS, RTT,

WAVE; ovigerous I-II (JAM & JDM), IV-VI (LRS); molting I-II (JAM & JDM); 25-101mm females, 81-133mm males, IV-VI, 22-97mm females, 16-128mm males, XI-I, LRS. CL, numerous records, common all year, abundant XII-III (Rathbun, 1930), RTT, WAVE; ovigerous I, molting XII-II, RTT, PAH, WAVE.

Family Xanthidae

Eurypanopeus depressus (Smith, 1869). Meso- to euhaline, rarely oligohaline. ES, numerous records; CB, Magothy Bay (Magothy R. mouth) Md. to CB mouth, numerous records, common on oyster bars, less common since 1964 following infection with sacculinid Loxothylacus panopaei, intertidal to 48m, 4.5-33.6 (on ES) ppt, 5.3-29.4C, common year-round, ovigerous IV-IX (Cowles, 1930; Rathbun, 1930; Richards, 1931; Frey, 1946; Ferguson and Jones, 1949; Ryan, 1956; Daugherty, 1969), WAVE; PX, larvae, V-X (Herman et al, 1968).

Hexapanopeus angustifrons (Benedict and Rathbun, 1891). Poly- and euhaline. CB, Bloody Point Lt., Md. to CB mouth, numerous records though found infrequently, 7-48m, 18-32 ppt, 4.4-24.8C, ovigerous VII, VIII (Cowles, 1930; Rathbun, 1930; Ryan, 1956), WAVE.

Neopanope texana sayi (Smith, 1869). Meso- to euhaline. ES, numerous records; CB, Little Deal I, Md., to CB mouth, numerous records, the most abundant xanthid, subtidal to 45.75m, 5.88-33.6 (on ES) ppt, 5.3-29.4C, common year-round, ovigerous V-VIII, (Cowles, 1930; Rathbun, 1930; Richards, 1931; Ferguson and Jones, 1949; Ryan, 1956; Daugherty, 1969; Boesch, 1971), WAVE.

Panopeus herbstii H. Milne-Edwards, 1834. Meso- to euhaline. ES, numerous records; CB, Little Deal I, Md. on east shore, Magothy Bay, Md. (Magothy River mouth) on west shore, to Bay mouth, 4-10.7m, 5.88-34.0 (ES) ppt, 5.3-29.4C, common but not abundant year round, ovigerous VII, (Uhler, 1879; Cowles, 1930; Rathbun, 1930; Richards, 1931; Ryan, 1956; Schwartz and Cargo, 1960; Daugherty, 1969), WAVE.

Rhithropanopeus harrisi (Gould, 1841). Primarily oligo- and meso-haline, occasionally to mid-polyhaline. CB, Elk River, Md. to Cape Charles City on east shore, to Elizabeth River on south shore, numerous records, water's edge to 9m, where abundant detritus occurs, 0.08-24.3 ppt, 5.6-28.2C, common year-round, ovigerous VI-IX (Fowler, 1911; Cowles, 1930; Rathbun, 1930; Frey, 1946; Ferguson and Jones, 1949; Ryan, 1956; Daugherty, 1969), WAVE; MB, larvae X, PAS; infected with sacculinid Loxothylacus panopaei since 1964, WAVE.

Family Pinnotheridae

Dissodactylus mellitae (Rathbun, 1900). Euhaline (?). CB, (Kiptopeake Beach), VIII-61, clinging to outside of sand dollars, Mellita quinquesperforata, FAC, MW.

Pinnixa chaetopterana Stimpson, 1860. Polyhaline. CL, YR, few records, commensal of Chaetopterus variopedatus. (Cowles, 1930; Boesch, 1971), WAVE, MW.

Pinnixa cylindrica (Say, 1818). Polyhaline. CL, few records, Point Lookout Light, Md., 37m, 8.6C (Rathbun, 1918); YR(GP), one specimen with Arenicola, IV-61, MW.

Pinnixa lunzi Glassell. Euhaline. Continental shelf, inshore off ES of Virginia, 13 specimens, 10-26m (Boesch, 1971b).

Pinnixa retinens Rathbun, 1918. Polyhaline. Holotype from Poplar Island, Md., 37m, soft bottom, Fish Hawk station 8528 (Rathbun, 1918). Common in Chesapeake Bay; found only in two other areas, Florida and Texas, rare, MW.

Pinnixa sayana Stimpson, 1860. Polyhaline. CB, Barren I, Md., 48m, 7.2C; Cove Pt., Md., 7m, 11.1C (Rathbun, 1918); YR, 3-24.4m, MW, DFB; JR (Hog Pt.), TC.

Pinnixa spp. MB, larvae, X, PAS.

Pinnotheres maculatus Say, 1818. Polyhaline. PO mouth and off New Point Comfort (Rathbun, 1918; Cowles, 1930); MB, larvae, X, PAS; larvae also taken by MHR.

Pinnotheres ostreum Say, 1817. Meso-, poly- and (?) euhaline. Common parasite in oysters from medium and high salinity waters. Juveniles from Modiolus demissus in lower YR (Sandifer and Van Engel, 1970).

## Family Grapsidae

Sesarma cinereum (Bosc, 1801 or 1802). Meso- and polyhaline. Taken frequently along shores where Spartina grass or shelter occurs, MW; Arundel-on-the-bay, Md., to CB mouth (Smith I.) (Rathbun, 1918; Frey, 1942); YR (Poropotank River) (Kerwin, 1971).

Sesarma reticulatum (Say, 1817). Meso- and polyhaline marshes. Found in marshes bordering the bay and its tributaries, MW; CB mouth (Smith Island) (Rathbun, 1918); Cape Charles City (Richards, 1931).

## Family Ocypodidae

Ocypode quadrata (Fabricius, 1787). Poly- and euhaline. ES, burrowing above high tide line on outer sand beaches; CL, on western shore beaches from New Point Comfort to Fort Monroe (Rathbun, 1918), MW; YR (above GP), one male, perhaps through introduction, WAVE.

Uca minax (Le Conte, 1855). Primarily oligo- and mesohaline, perhaps euryhaline. ES and CB, found in salt marshes and along creek banks; tolerates lower salinities than other fiddler crabs, (Rathbun, 1918; Gray, 1942, Kerwin, 1971); occupies by far the most marsh area in Chesapeake Bay, MW; Poropotank R. (YR) marshes (Kerwin, 1971).

Uca pugnax (Smith, 1870). Meso-, poly- and euhaline. ES and CL, common along muddy banks and in Spartina grass areas, ranking second (to U. minax) in marsh area inhabited (Rathbun, 1918), MW.

Uca pugilator (Bosc, 1801-1802). Meso-, poly- and (?) euhaline. ES and CL, generally frequents more sandy areas than U. pugnax (Rathbun, 1918; Richards, 1931), MW.

## Family Goneplacidae

Geryon quinquidens Smith, 1879. Euhaline. Continental shelf, 38°08'N, 73°53'W, 168m, 11C, JAM and JDM.

## Superfamily Oxryhyncha

## Family Majidae

Libinia dubia H. Milne-Edwards, 1834. Poly- and euhaline. ES (Isle of Wight, Assawoman and Chincoteague bays) (Schwartz, 1964); CB, northern record Sandy Pt. Light, Md. (39°01'40"N, 76°20'36"W), southern record CB mouth (Rathbun, 1925; Cowles, 1930), WAVE; adults in lower YR and Bay; small specimens in summer in YR (Boesch, 1971a).

Libinia emarginata Leach, 1815. Poly- and euhaline. Continental shelf, 35°46'-38°43'N, 74°35'-75°24'W, 18-51m, 4-13C, occasional, JAM and JDM; ES (Isle of Wight, Assawoman and Chincoteague Bays) (Schwartz, 1964); CB, Md.-Va. border to CB mouth, numerous, often taken in blue crab dredging XII-III (Rathbun, 1925; Cowles, 1930; Richards, 1931), WAVE.

Collodes robustus Smith, 1880 (1881). Euhaline. Continental shelf and slope, 36°41'05"-37°36'00"N, 74°15'00"-74°38'53"W, 102-682m, 7.2-14.4C, ovigerous III (Smith, 1884, 1887; Rathbun, 1925).

Euprognatha rastellifera Stimpson, 1871. Euhaline. Continental shelf and slope, 36°41'15"-37°26'00"N, 74°19'00"-74°39'50"W, 102-305m, 8.2-14.4C, ovigerous III, IV, X (Smith, 1884, 1887; Rathbun, 1925).

Heterocrypta granulata (Gibbes, 1849). Poly- and euhaline. Hampton Roads, 20-22m, and "Virginia" from the J. S. Kingsley collection (Rathbun, 1925); not reported since.

Hyas coarctatus Leach, 1815. Euhaline. Continental shelf and slope, 36°41'05"-37°30'48"N, 74°38'55"-74°51'24"W, 33-682m, 7.5C (Smith, 1884; Rathbun, 1925).

Pelia mutica (Gibbes, 1850). Euhaline (?). "Eastern Shore", exact locality not given, from the J. S. Kingsley collection in Union College, Pa. (Rathbun, 1925); also reported north and south of Virginia- Maryland waters.

Rochinia crassa A. Milne-Edwards, 1879. Euhaline. Continental shelf, 37°06'N, 74°35'W, 194m, 12C, JAM and JDM.

## Superorder Stomatopoda

## Family Squillidae

Squilla empusa Say, 1818. Poly- and (?) euhaline. Common in Chesapeake Bay.

## ADDENDUM

The following list contains species reported north and/or south of Virginia and Maryland and may also occur in Virginia waters, but have not been reported, and species for which no detailed records have been located.

## Family Ophiophoridae

Acanthephyra purpurea A. Milne-Edwards. Euhaline. East and South Atlantic, 192-5394m (Rathbun, 1929).

Hymenodora glacilis (Bucholz). Euhaline. Newfoundland banks to Virginia, 251-5394m (Rathbun, 1929).

## Family Pandalidae

Dichelopandalus leptocerus (Smith). Euhaline. Newfoundland banks to North Carolina, 13-786m (Rathbun, 1929).

## Family Hippolytidae

Lebbeus polaris (Sabine). Euhaline. Atlantic America, south to Chesapeake Bay 5-518m (Rathbun, 1929).

Caridion gordonii (Bate). Euhaline. Bay of Fundy to Chesapeake Bay, 37-307m (Rathbun, 1929).

## Family Galatheididae

Munidopsis curvirostris Whiteaves. Euhaline. Gulf of St. Lawrence to Cape Fear, N. C., 137-2360m (Rathbun, 1929).

## Family Paguridae

Parapagurus pilosimanus Smith. Euhaline. Grand Bank of Newfoundland to Gulf of Mexico, 457-4061m (Rathbun, 1929).

## Family Raninidae

Lyreidus bairdii Smith, 1881. Euhaline. Reported north and south of Virginia-Maryland waters (Rathbun, 1937).

## Family Latrielliidae

Latriellia elegans Roux, 1828. Euhaline. Reported north and south of Virginia-Maryland waters (Rathbun, 1937).

## Family Dorippidae

Ethusa microphthalma Smith, 1881. Euhaline. Reported from offshore of Delaware and North Carolina (Rathbun, 1937).

## Family Leucosiidae

Myropsis quinquespinosa Stimpson, 1871. Reported from offshore Massachusetts and North Carolina (Rathbun, 1937).

## Family Portunidae

Portunus anceps (Saussure, 1858). Euhaline. Northern record is from surface waters east of Currituck Sound, N. C. (36°20'24"N, 74°46'30"W, Rathbun, 1930).

## Family Xanthidae

Eurytium limosum (Say, 1818). Poly- (?) and euhaline. Not reported north of South Carolina since 1891 (Rathbun, 1930), formerly reported from New Jersey by Say.

## Family Majidae

Rochinia tanneri (Smith, 1883). Euhaline. Reported north and south of Virginia-Maryland waters (Rathbun, 1925).

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## PHYLUM ECHINODERMATA

## Class Asteroidea

## Order Forcipulata

## Family Asteriidae

Asterias forbesi (Desor, 1848). Upper poly- and euhaline. Frequent in bay below Maryland-Virginia line (Cowles, 1930). Found recently by VIMS personnel only near bay mouth, sand bottom; formerly to York Spit Light and Wolf Trap in abundance (Sewell Hopkins).

## Family Astropectinidae

Luidia clathrata (Say, 1825). Normally euhaline. Off Great Wicomico River, 80-100 feet, 16-IX-57, one specimen, James Whitcomb, MW.

## Class Holothuroidea

## Order Apoda

## Family Synaptidae

Leptosynapta tenuis (Ayres, 1851). Upper meso- and polyhaline. Abundant in fine sand of shallows, 100/m<sup>2</sup>. Less common in deeper areas and Zostera beds. Reported swarming in spring by Dexter Haven.

## Order Dendrochirota

## Family Cucumaridae

Cucumaria pulcherrima (Ayres, 1852). Polyhaline. Occasionally abundant on old oyster rocks of lower YR and Mobjack Bay, common Hampton Roads, DFB.

Thyone briareus (LeSueur, 1824). Polyhaline. Less common than formerly, taken YR, Wormley Rock, 1955, JDA. ES (mouth of Cherrystone Creek), III-61; YR (off VIMS) 25 feet, MW. Hampton Roads, DFB.

## Class Ophiuroidea

## Order Ophiurae

## Family Ophiodermatidae

Ophioderma brevispina (Say, 1825). Euhaline. Cape Charles (Richards, 1931).

## Family Amphiuridae

Amphioplus abditus (Verrill). Upper polyhaline. Mouth of CB (Cowles, 1931); specimens from lower CB have been examined by Lowell Thomas.

Amphiodia atra Stimpson. Upper meso- and polyhaline. Lower CB and YR, abundant to YR bridge, less common to Y-10, soft bottom below 15 feet, MW, LT.

## Family Ophiothricidae

Ophiothrix angulata (Say, 1825). Polyhaline. Tangier Sound, 2 1/3-13 fms. (Koeler, 1914). Lower mid-CB, 7-I-58, J. Whitcomb, LT.

## Class Echinoidea

## Order Centrechinoida

## Family Arbaciidae

Arbacia punctulata (Lamarck, 1816). Euhaline. Willis G. Hewatt found a single test of this species on Old Plantation Flat, on sand bottom at a depth of 30 feet. Rudee Inlet, July, 1965, Robert Bailey. ES (Hog Is. Bay and Wachapreague Inlet), M. Castagna.

## Order Exocycloidea

## Suborder Cyppeastrina

## Family Scutellidae

Mellita quinquesperforata (Leske, 1778). Upper poly- and euhaline. York Spit Light (rare) and seaward. Strangely, Cowles made no mention of this species. As of 1971, apparently confined to small area near shore on lower bayside of ES, MW.

## PHYLUM CHAETOGNATHA

By George C. Grant

- Sagitta elegans Verrill, 1873. Poly- and euhaline. Abundant winter and spring; distributed well within system.
- Sagitta enflata Grassi, 1881. Upper poly-euhaline. In lower CB in summer; Mobjack Bay, August.
- Sagitta hispida Conant, 1895. Polyhaline. Sporadic inshore. Enters CB late summer, fall; Mobjack Bay, August-October.
- Sagitta tenuis Conant 1896. Poly- and euhaline. Warm season counterpart of S. elegans, extending well into CB, dominant in Mobjack Bay, August-October.

## PHYLUM HEMICHORDATA

Class Enteropneusta

Family Harrimanidae

- Saccoglossus kowalewskii (A. Agassiz, 1873). Upper meso-polyhaline. Abundant in shallow areas of fine sand bottom. Less common in deeper water. The eating of enteropneusts causes the "ticky" condition of fish i.e., smelling strongly of iodoform.

## PHYLUM CHORDATA

Subphylum Urochordata (Tunicata)

Class Ascidiacea

Order Aplousobranchia

Family Synoicidae

- Amaroucium constellatum Verrill, 1871. Upper poly- and euhaline. Chincoteague Bay, abundant on hard substrates (Schwartz et al., 1960).

Order Phlebobranchia

Family Perophoridae

- Ecteinascidia turbinata Herdman, 1880. Polyhaline (22.5 ppt). YR (near mouth), 37°15'N, 76°25'W, 2-VIII-66, 24.5C, mud-shell, specimens ovigerous (Calder et al., 1966). Only record for Virginia zoogeographic subprovince, found again the following year and in 1971.

Perophora viridis Verrill, 1871. Polyhaline. On oysters and trays at VIMS pier, summer and fall; as basal stolons in winter, JDA.

Family Botryllidae

- Botryllus schlosseri (Pallas, 1766). Polyhaline. Rare on oyster beds in lower Chesapeake Bay. Colony on Zostera by VIMS pier, June 18, 1962. Abundant at VIMS pier during higher salinities of late '60's, JDA.

Family Molgulidae

- Molgula manhattensis (DeKay, 1843). Upper meso- and polyhaline. Abundant on pilings, oyster rocks, any firm substrate above 10 ppt. Killed only by extreme cold or other adverse conditions; to 1000/m<sup>2</sup>, YR (Vepco area), MW.

Subphylum Cephalochordata

- Branchiostoma caribaeum Sundevall, 1853. Poly- and euhaline. (off RR), also lower YR; sand bottom, very rare, MW. Point Lookout, Md. (Schwartz, 1960a.).

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## Fishes of Chesapeake Bay and the Adjacent Coastal Plain

J. A. Musick

This list includes 287 species of marine, freshwater and estuarine fishes which have been reported to occur within the Chesapeake drainage below the fall-line or within tidewater. The fish fauna of the Chesapeake coastal zone may be conveniently divided into four ecological groups: diadromous species; estuarine species; marine species and freshwater species.

Eleven species of diadromous fishes occur, including ten species which are anadromous. These fishes spend most of their lives in the sea or lower estuary and ascend the tributaries to spawn in fresh water. The young of all anadromous species use the estuary as a nursery ground. The remaining diadromous species, the American eel, Anguilla rostrata is catadromous and spends most of its life in the estuary or in fresh water and descends the tributaries and migrates out into the open ocean to spawn in the region of the Sargasso Sea.

Only 27 species of estuarine fishes including three anadromous species occur. Resident fauna of the estuary consists of these 27 species plus 2 marine species. The remainder of the marine species occur only seasonally.

Of the 174 marine species, 59 are regular summer visitors. Forty-four of these occur in the Bay system both as adults and juveniles, five occur mostly as adults and ten mostly as juveniles. An additional 93 species occur rarely or sporadically during the summer. During the winter only six marine species are regular visitors and four of these occur not only as adults but also as juveniles. Sixteen additional species occur rarely or sporadically in the winter.

The freshwater component of the fish fauna includes 46 species which normally inhabit the coastal plain and 32 species which occur only occasionally as strays from above the fall line or which rarely enter the Chesapeake drainage through Dismal Swamp.

## Status of Knowledge of Fishes in the Chesapeake Bay System

**Taxonomy:** The taxonomy of those species which regularly occur is well known. Much work remains to be done at the sub-specific and racial levels. The anadromous species, in particular, bear intensive study if rational decisions are to be made in managing commercial stocks.

**Distribution and abundance:** Many papers have been published on the distribution of certain fishes in the Bay, particularly those species of importance to the commercial or sport fisheries. Much more information on distribution exists as unpublished manuscripts and as raw data in the various research institutions involved in work on the Bay. Much research needs to be done on the seasonal distribution of smaller dominant species (so called forage fishes) and on the distribution of different life history stages of all species. Least known is the seasonal occurrence of large adult marine species, particularly sharks. Commercial fisheries catch statistics provide crude estimates of the relative abundance of commercially important species from year to year. Virtually no criteria are available for accurately estimating true abundance or mortality of any commercial species, with the exception of certain populations of striped bass, Morone saxatilis. Estimates of even relative abundance of commercially unimportant species are all but non-existent.

Biology: Knowledge of various aspects of the biology of the fishes of the Bay varies tremendously with each species. It is amusing that perhaps the best known species biologically are the three-lined stickleback, Gasterosteus aculeatus, one of the least abundant and Opsanus tau one of the most abundant and ecologically most important species in the Bay. We know very little or nothing about the biology of most Bay species.

Role in Bay ecosystem: The trophic role of the adults of most major species of fishes in the Bay is known. Also qualitative aspects of community relationships for major species are known. Much work needs to be done on the quantitative inter-relationships of various life history stages of all species within entire communities (including invertebrates and plants).

Sensitivity of fishes to environmental changes wrought by man: The effects of individual environmental changes (dredging, thermal or chemical pollution, etc.) have been determined for certain species. The possible effects of each one of all the major changes which have or are likely to occur in the Bay system have not been determined for a single species. Much work needs to be done on the simple effects of the major environmental changes on various life history stages of commercially important and other dominant and ecologically important species. In particular, very little research has been done on the synergistic or chronic effects of man-made environmental changes on fishes in the Bay system.

#### Format of the Checklist

Species are arranged in the list phylogenetically. The arrangement and most of the scientific and common names are those used in "A list of common and scientific names of fishes from the United States and Canada," American Fisheries Society Special Publication No. 6, 1970. I have deviated from the arrangement and the nomenclature in the A.F.S. list, most notably within the elasmobranch fishes, simply because the A.F.S. classification does not readily reveal the phylogeny of the animals. In fact I would prefer an even greater proliferation of higher taxa than are included herein. Such actions must await completion of research in progress and precise documentation elsewhere. Other changes in classification and nomenclature were made to conform with recent publications. These changes have been justified in the text. Structure of the classification of higher categories follows Nelson (1967).

Each species account includes the following information (when available): basic habitat (freshwater, estuarine, marine); salinity range, and zone most often occupied in the estuary (oligohaline, 0.5-5 ppt.; mesohaline, 5-18 ppt.; polyhaline, 18-30 ppt.; habitats with salinities below 0.5 are considered freshwater, those with salinities above 30 ppt are considered marine); geographic occurrence within the Chesapeake Bay; abundance; seasonality; ecology; literature citations. Most data on distribution, abundance and salinity range were collected over a 15-year period by several people at the Virginia Institute of Marine Science (VIMS) and are based mostly on monthly trawl surveys, with supplementary information from gill net and seine collections. All these data have been computerized and are available as print-outs, for reference only, from the Virginia Institute of Marine Science. Literature records of ecological limits have been drawn only from works based on research in the Chesapeake region.

The compilation of this checklist has been aided by the invaluable assistance of several of my students both past and present, notably Douglas Markle, John McEachran, and Linda Pushee. This checklist employs ecological information compiled from computerized data which was accrued from projects directed by W. Jackson Davis, George C. Grant, Edwin B. Joseph, William Massman, John Merriner, Clarence Richards, and Willard A. Van Engel. Martin Wiley of the Chesapeake Biological Laboratory (CBL) has generously shared ideas and unpublished information for fishes in Maryland waters. Robert E. Jenkins of Roanoke College has provided helpful information and criticisms on the distribution of fresh water species. Marvin Wass has given editorial assistance and encouragement during all phases of the preparation of this list and Marion Hart translated my notorious handwriting into typescript.

## SUBPHYLUM VERTEBRATA

## Superclass Cyclostomata

## Class Cephalaspidomorphi

## Order Petromyzontiformes (Petromyzontia; Hyperoartii)

Family Petromyzontidae - lampreys (Bigelow & Schroeder, 1948a; McPhail & Lindsay, 1970; Moore, 1968).

Lampetra aepyptera (Abbott). Least brook lamprey. Fresh water-1.5 ppt; locally common to rare; Anne Arundel, Baltimore, Calvert, Kent, and Prince George counties, Md.; Potomac, Rappahannock, York and James drainages, Nassawadox Creek, Northampton Co., Va. (Hubbs and Trautman, 1939; Jenkins, pers. comm., 1971; Mansueti, 1951; Raney, 1941; Schwartz, 1961a; VIMS records; Wiley, 1970).

Lampetra lamottei (Lesueur). American brook lamprey. Fresh water; locally common to rare; east of Frederick, Md., Susquehanna-Patuxent R.; Potomac, Rappahannock, York drainages, Va. (Fowler, 1917; Jenkins, pers. comm., 1971; Schwartz, 1961a; VIMS records; Wiley, 1970).

Petromyzon marinus Linnaeus. Sea lamprey. Anadromous; common; probably ascends most major Chesapeake drainages in spring; larvae (ammocoetes) remain in fresh water 3-4 years; adults marine, parasitic on fishes. (Bigelow & Schroeder, 1948a).

## Superclass Gnathostomata

## Class Elasmobranchiomorphi (Bigelow &amp; Schroeder, 1948b, 1953a).

Order Lamniformes /The early record of Carcharodon carcharias (Uhler & Lugger, 1876) as abundant in the entire bay probably referred to young Carcharhinus milberti. Carcharodon does not normally enter estuaries and its occurrence is rare to occasional on the east coast of the U.S. The nearest authenticated record of Carcharodon to CB is Smith Island, Va. (Fowler, 1945)./

Family Orectolobidae - carpet sharks

Ginglymostoma cirratum (Bonnaterre). Nurse shark. Marine; rare, lower CB; (record questionable). (Bigelow & Schroeder, 1948b; Lugger, 1877).

Family Odontaspidae - sand tigers

Odontaspis taurus (Rafinesque). Sand tiger. Marine, polyhaline; occasional; summer, fall; lower CB. (Bigelow & Schroeder, 1948b; Truitt et al, 1929; VIMS records).

Family Cetorhinidae - basking sharks

Cetorhinus maximus (Gunnerus). Basking shark. Marine, polyhaline; rare, lower CB; winter. (Bigelow & Schroeder, 1948b; Massmann, 1957).

## Order Carcharhiniformes

Family Carcharhinidae - requiem sharks (Compagno, 1970; Garrick, 1967; Springer, 1950). /A report of Carcharhinus obscurus from CB by Truitt et al (1929) cannot be attributed to a definite species because their description was too general. The nearest valid record of C. obscurus to CB is 2 mi. off Wachapreague Inlet, Va. (VIMS coll.)/

Carcharhinus leucas (Valenciennes). Bull shark. Marine-fresh water; occasional to common; upper and lower CB; summer. (Bigelow & Schroeder, 1948b; Schwartz, 1959a, 1960b; VIMS records).

Carcharhinus milberti (Valenciennes). Sandbar shark. Marine-27 ppt, polyhaline; juveniles common to abundant, upper and lower CB; summer, fall. (Bigelow & Schroeder, 1948b; Hoese, 1962; Schwartz, 1960b; Springer, 1960; VIMS records).

Galeocerdo cuvieri (Peron and Lesueur). Tiger shark. Marine; rare, lower CB; summer. (Bigelow & Schroeder, 1948b; Richards & Castagna, 1970; Truitt et al, 1929).

Rhizoprionodon terraenovae (Richardson). Atlantic sharpnose shark. Marine; rare; mouth of CB; summer. (Bigelow & Schroeder, 1948b; Springer, 1964).

Mustelus canis (Mitchill). Smooth dogfish. Marine-25 ppt, polyhaline; rare, upper CB; common to occasional, lower CB; summer, fall. (Bigelow & Schroeder, 1948b; Schwartz, 1960a; VIMS records).

Family Sphyrnidae - hammerhead sharks (Gilbert, 1967a, b)

Sphyrna tiburo (Linnaeus). Bonnethead. Marine, polyhaline; occasional, lower CB; summer. (Bigelow & Schroeder, 1948b; VIMS records).

Sphyrna zygaena (Linnaeus). Smooth hammerhead. Marine, polyhaline; rare to occasional, upper CB; summer, fall. (Bigelow & Schroeder, 1948b; Hoese, 1962; VIMS records).

Order Squaliformes

Family Squalidae - dogfish sharks

Squalus acanthias Linnaeus. Spiny dogfish. Marine-20 ppt, polyhaline; occasional to abundant; lower CB; late fall, winter, early spring. (Bigelow & Schroeder, 1948b, Jensen, 1965; VIMS records).

Order Squatiniformes

Family Squatinidae - angel sharks

Squatina dumerili Lesueur. Atlantic angel shark. Marine-27 ppt, polyhaline; rare, upper CB; occasional, lower CB; summer, fall. (Bigelow & Schroeder, 1948b; Hildebrand & Schroeder, 1928; Schwartz, 1960c; VIMS records).

Order Pristiformes

Family Pristidae - sawfishes

Pristis pectinata Latham. Smalltooth sawfish. Marine, polyhaline; rare, lower CB; summer. (Bigelow & Schroeder, 1953a).

Order Torpediniformes

Family Torpedinidae - electric rays

Torpedo nobiliana Bonaparte. Atlantic torpedo. Marine; rare, lower CB; summer. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928).

Order Rajiformes

Family Rajidae - skates

Raja eglanteria Bosc. Clearnose skate. Marine, polyhaline; abundant, lower CB; summer, fall. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; Truitt et al, 1929; VIMS records).

Raja erinacea Mitchill. Little skate. Marine, polyhaline; occasional; lower CB; winter, spring. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; Truitt et al, 1929; VIMS records).

Raja laevis Mitchill. Barndoor skate. Marine; occasional; lower CB; winter, early spring. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928).

Raja ocellata Mitchill. Winter skate. Marine; occasional; lower CB; winter, early spring. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928).

Order Myliobatiformes

Family Dasyatidae - stingrays

Dasyatis americana Hildebrand & Schroeder. Southern stingray. Marine-27 ppt, polyhaline; rare, upper CB; occasional, lower CB; summer. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; VIMS records).

Dasyatis centroura (Mitchill). Roughtail stingray. Marine-20 ppt, polyhaline; rare; upper and lower CB; summer. (Bigelow & Schroeder, 1953a; Mansueti, 1960a; Uhler & Lugger, 1876).

Dasyatis sabina (Lesueur). Atlantic stingray. Marine, polyhaline; rare, upper CB; occasional, lower CB; summer, fall. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; VIMS records).

Dasyatis sayi (Lesueur). Bluntnose stingray. Marine-18 ppt, polyhaline; abundant; lower CB; summer, fall. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; VIMS records).

Family Gymnuridae - butterfly rays

Gymnura altavela (Linnaeus). Spiny butterfly ray. Marine-25 ppt, polyhaline; rare; lower CB; summer. (Bigelow & Schroeder, 1953a; Massmann, 1957).

Gymnura micrura (Bloch & Schneider). Smooth butterfly ray. Marine-25 ppt, polyhaline; common to occasional; lower CB; summer, fall. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; VIMS records).

Family Myliobatidae - eagle rays

Aetobatus narinari (Euphrasen). Spotted eagle ray. Marine; rare; lower CB; fall. (Bigelow & Schroeder, 1953a; Massmann, 1957).

- Myliobatis freminvillei Lesueur. Bullnose ray. Marine-15 ppt, polyhaline; rare, upper CB; occasional, lower CB; summer, fall. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; Schwartz, 1960c; VIMS records).
- Family Rhinopteridae - cownose rays  
Rhinoptera bonasus (Mitchill). Cownose ray. Marine-13 ppt, polyhaline; abundant to common; upper and lower CB; summer, fall. Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; Joseph, 1961; VIMS records).
- Family Mobulidae - mantas  
Manta birostris (Walbaum). Atlantic manta. Marine; rare; lower CB; summer. (Bigelow & Schroeder, 1953a; Hildebrand & Schroeder, 1928; VIMS records).
- Class Teleostomi - Bony Fishes
- Order Acipenseriformes
- Family Acipenseridae - sturgeons (Vladykov & Greeley, 1964)  
Acipenser brevirostrum Lesueur. Shortnose sturgeon. Anadromous; spring; juveniles estuarine; adults marine; rare, Potomac R., endangered. (Smith & Bean, 1899; Vladykov & Greeley, 1964).  
Acipenser oxyrhynchus Mitchill. Atlantic sturgeon. Anadromous; spring; juveniles estuarine all year; adults marine; rare to occasional, probably all major tributaries; commercial importance minor; endangered. (Hildebrand & Schroeder, 1928; Truitt et al, 1929; VIMS records; Vladykov & Greeley, 1964).
- Order Semionotiformes
- Family Lepisosteidae - gars (Suttkus, 1964)  
Lepisosteus osseus (Linnaeus). Longnose gar. Fresh water-23.4 ppt; common probably all major tributaries; occasional, lower CB. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; Schwartz, 1962a; Suttkus, 1964; Truitt et al, 1929; VIMS records).
- Order Amiiformes
- Family Amiidae - bowfins  
Amia calva Linnaeus. Bowfin. Fresh water; occasional in major Virginia tributaries, rare in Md. tributaries; swamps, backwaters, impoundments. (Mansueti & Hardy, 1967; Raney, 1950; Raney & Massmann, 1953; Truitt et al, 1929; recent CBL records Martin Wiley, pers. comm; VIMS records).
- Order Elopiformes
- Family Elopidae - ladyfishes (Berry, 1964; Greenwood, 1970; Hildebrand, 1964a).  
Elops saurus Linnaeus. Ladyfish. Marine; rare, lower CB; spring, summer, fall. (Hildebrand 1964c; Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; Richards & Castagna, 1970; Truitt et al, 1929; VIMS records).
- Family Megalopidae - tarpons (Greenwood, 1970)  
Tarpon atlanticus (Valenciennes). Tarpon. Marine, polyhaline; rare, upper CB; rare-occasional, lower CB; summer. (Greenwood, 1970; Hildebrand, 1964c; Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; Shreves, 1959; Truitt et al, 1929; VIMS records).
- Family Albulidae - bonefishes  
Albula vulpes (Linnaeus). Bonefish. Marine; rare, lower CB; recorded in spring but more likely to occur in summer, early fall. (Alexander, 1961; Hildebrand, 1964d; Mansueti & Hardy, 1967; Massmann, 1957).
- Order Anguilliformes (Apodes and Lyomeri)
- Family Anguillidae - freshwater eels (Ege, 1939)  
Anguilla rostrata (Lesueur). American eel. Catadromous; abundant, all tributaries, entire Bay; adults migrate from bay in fall to spawn in Sargasso Sea; young migrate upstream in spring; immature individuals resident in tributaries or bay all year; minor commercial importance. (Hildebrand & Schroeder, 1928; Wenner, 1972).
- Family Congridae - conger eels (Kanazawa, 1958)  
Conger oceanicus (Mitchill). Conger eel. Marine-16 ppt; polyhaline; occasional, lower CB; fall, winter, spring. (Hildebrand & Schroeder, 1928; VIMS records).
- Order Clupeiformes
- Family Clupeidae - herrings (Berry, 1964; Hildebrand, 1964a; Miller, 1960, 1969; Nelson, 1967; Svetovidov, 1952).

- Alosa aestivalis (Mitchill). Blueback herring. Anadromous; spring; juveniles, estuarine; adults, marine; abundant most major tributaries; major commercial importance. (Hildebrand, 1964a; Mansueti & Hardy, 1967).
- Alosa mediocris (Mitchill). Hickory shad. Anadromous; spring; juveniles estuarine, adults marine; common, most major tributaries; minor commercial and sport importance. Hildebrand, 1964a; Mansueti & Hardy, 1967).
- Alosa pseudoharengus (Wilson). Alewife. Anadromous; spring; juveniles estuarine, adults marine, abundant, most major tributaries; major commercial importance. (Hildebrand, 1964a; Mansueti & Hardy, 1967).
- Alosa sapidissima (Wilson). American shad. Anadromous; spring; juveniles, estuarine; adults marine; common, most major tributaries; major commercial and minor sport importance. (Hildebrand, 1964a; Mansueti & Hardy, 1967).
- Brevoortia tyrannus (Latrobe). Atlantic menhaden. Marine-freshwater; entire bay; juveniles and adults abundant to common; spring, summer, fall; major commercial importance. (Hildebrand, 1964a; Mansueti & Hardy, 1967; Reintjes, 1969).
- Clupea harengus harengus Linnaeus. Atlantic herring. Marine-17 ppt, polyhaline; adults occasional, lower CB; rare, upper CB; winter, spring; minor commercial importance. (Hildebrand, 1964a; Mansueti, 1962a).
- Dorosoma cepedianum (Lesueur). Gizzard shad. Estuarine, 0-29 ppt, oligo-polyhaline; adults and juveniles common to abundant; entire bay, most tributaries; minor commercial importance. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; Miller, 1960, 1964).
- Dorosoma petenense (Gunther). Threadfin shad. Fresh water-17 ppt, polyhaline introduced; adults and juveniles common, James River drainage; recorded Rappahannock R. (Miller, 1964; VIMS records).
- Etrumeus teres (DeKay). Round herring. Marine-28 ppt., polyhaline, adults rare to occasional, lower CB; spring, summer. (Hildebrand, 1964a; Massmann, 1960; Whitehead, 1963, 1965).
- Opisthonema oglinum (Lesueur). Atlantic thread herring. Marine-26 ppt., polyhaline; adults and juveniles, occasional to abundant; entire bay, summer; minor commercial importance. (Berry and Barrett, 1963; Hildebrand, 1964a; Schwartz, 1960d, VIMS records).
- Family Engraulidae - anchovies (Berry, 1964; Hildebrand, 1964a; Stevenson, 1955).
- Anchoa hepsetus (Linnaeus). Striped anchovy. Marine-5, meso-polyhaline; estuarine; adults & juveniles occasional, upper CB; common to locally abundant, lower CB; spring, summer, fall; pelagic. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; VIMS records).
- Anchoa mitchilli (Valencienne). Bay anchovy. Estuarine-1-33 ppt., oligo-polyhaline; adults & juveniles, pelagic, upper & lower CB and most tributaries; spring, summer, fall; deeper water, winter. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; VIMS records).
- Order Salmoniformes
- Family Salmonidae - trouts (Bigelow, 1964; Dymond, 1964). /The presence of Salmo salar in CB reported as a recent stray by some authors (Schwartz, 1967) is as yet unverified. The species has not been resident in streams south of the Connecticut River in historical times. The species was unsuccessfully introduced (as fry) into the Potomac and Susquehanna Rivers in the late 19th century. All three species of trouts below enter salt water and may be expected in upper CB during the cooler months.7
- Salvelinus fontinalis (Mitchill). Brook trout. Fresh water; native, upper reaches most tributaries; introduced, lower reaches Md. tributaries, including Patuxent R., Rock Creek, Severn R., Principio Creek, Basin Run, and Deer Creek; populations maintained by stocking in our area. (Bigelow, 1964; Schwartz, 1967).
- Salmo gairdneri Richardson. Rainbow trout. Fresh water-18.8 ppt.; introduced, lower reaches Md. tributaries; rare, upper CB; winter; populations maintained by stocking. (Dymond, 1964; Schwartz, 1967).

- Salmo trutta Linnaeus. Brown trout. Fresh water; introduced, lower reaches Md. tributaries; populations maintained by stocking. (Dymond, 1964; Schwartz, 1967).
- Family Umbridae - mudminnows
- Umbra pygmaea (DeKay). Eastern mudminnow. Fresh water-4 ppt.; locally common to abundant, most tributaries; small, sluggish, muddy streams, weed beds. (Mansueti & Hardy, 1967; Schwartz, 1964b; Truitt et al, 1929; VIMS records).
- Family Esocidae - pikes (Crossman, 1966; Dick, 1964)
- Esox americanus americanus Gmelin. Redfin pickerel. Fresh water-8.7 ppt.; common; most tributaries; small, sluggish streams, weed beds; known to hybridize with E. niger. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; Schwartz, 1960e; Truitt et al, 1929; VIMS records).
- Esox niger Lesueur. Chain pickerel. Fresh water-22 ppt.; common; most tributaries; known to hybridize with E. americanus; sluggish streams, weed beds. (Elser and Mansueti, 1961; Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; Schwartz, 1960e; Truitt et al, 1929; VIMS records).
- Order Cypriniformes (Ostariophysii - in part)
- Family Cyprinidae - minnows and carps (Eddy, 1969; Moore, 1968)
- Hybrid Notropis rubellus X Clinostomus funduloides, N. cornutus X N. rubellus, and N. cornutus X C. funduloides have been reported just below the fall line in Maryland (Tsai & Zeisel, 1969). The Ide, Leuciscus idus (Linnaeus), reported released in the lower Potomac R., by Smith and Bean (1899) probably failed to become established.
- Tinca tinca (Linnaeus). Tench. Fresh water; introduced in Potomac; probably extinct in CB system. (Schwartz, 1964; Smith & Bean, 1899).
- Carassius auratus (Linnaeus). Goldfish. Fresh water-17.0 ppt., introduced; rare to occasional; probably most tributaries. (Mansueti & Hardy, 1967; VIMS records).
- Cyprinus carpio Linnaeus. Carp. Fresh water-17.6 ppt., introduced; common to abundant, all major tributaries; occasional, upper, lower CB (Mobjack Bay). (Mansueti & Hardy, 1967; Raney & Massmann, 1953; Wiley, 1970; VIMS records).
- Exoglossum maxillingua (Lesueur). Cutlips minnow. Fresh water; rare to occasional, scattered localities on coastal plain; common, upland portions all major tributaries; clear gravelly creeks. (Fowler, 1945; Massmann et al, 1952; Schwartz, 1963a; Tsai, 1968).
- Hypognathus regius (Girard). Eastern silvery minnow. Fresh water-14 ppt.; occasional; mainstream, larger tributaries. (The trivial name regius follows use recommended by Pflieger, 1971). (Mansueti, 1950; Mansueti & Hardy, 1967; Mansueti & Scheltema, 1953; VIMS records).
- Notemigonus crysoleucas crysoleucas (Mitchill). Golden shiner. Fresh water-5.1 ppt.; common to abundant; most major tributaries; ponds, sluggish streams. (Hoener, 1969; Mansueti, 1950; Mansueti & Hardy, 1967; VIMS records).
- Pimephales promelas Rafinesque. Fathead minnow. Fresh water; introduced; cultured in Stevensville Fish Hatchery, Mattaponi drainage (York River), King and Queen County, Va. (Univ. of Richmond Coll. No. 1918; R.E. Jenkins, pers. comm.).
- Clinostomus funduloides funduloides Girard. Rosyside dace. Fresh water; rare to locally common on coastal plain; all tributaries; clear, gravelly creeks. (Mansueti, 1950; Schwartz, 1963a; Tsai, 1968; VIMS records).
- Semotilus corporalis (Mitchill). Fallfish. Fresh water; occasional to common; coastal plain, most tributaries; most abundant above fall line; longer, clear streams. (Mansueti, 1950; Mansueti & Hardy, 1967; Raney & Massmann, 1953; Tsai, 1968; VIMS records).
- Semotilus atromaculatus atromaculatus (Mitchill). Northern creek chub. Fresh water; occasional to common; most major tributaries; small, clear streams. (Raney & Massmann, 1953; Schwartz, 1963a; Tsai, 1968; VIMS records).



- Rhinichthys atratulus atratulus (Hermann). Eastern blacknose dace. Fresh water; rare to common, scattered localities on coastal plain; most abundant above fall line; all major tributaries; clear, cool creeks. (Fowler, 1945; Mansueti, 1950; Tsai, 1968; VIMS records).
- Rhinichthys cataractae (Cuvier & Valenciennes). Longnose dace. Fresh water; rare to occasional, scattered localities, mid-coastal plain; most abundant above fall-line; all major tributaries; cool, swift streams. (Moore, 1968; Schwartz, 1963a; Tsai, 1968).
- Nocomis micropogon (Cope) River chub. Fresh water-"brackish" (one record Solomons, Md., off C.B.L. dock); rare to common; coastal plain from Susquehanna south; most abundant above fall line; clear gravelly streams. (Lachner & Jenkins, 1971; C.B.L. coll., Martin Wiley, pers. comm.; Raney & Massmann, 1953; VIMS records).
- Nocomis leptocephalus (Girard). Bluehead chub. Fresh water; rare to occasional; coastal plain from York R. south; most abundant above fall line; clean, sandy streams. (Lachner & Jenkins, 1971; Raney & Massmann, 1953).
- Notropis amoenus (Abbott). Comely shiner. Fresh water; occasional to common; all tributaries; schooling, midwater, moderate & longer streams. (Snelson, 1968; Tsai, 1968).
- Notropis analostanus (Girard). Satinfish shiner. Fresh water-2.0 ppt.; common, most larger tributaries in low gradient areas. (Gibbs, 1963; Mansueti & Hardy, 1967; Schwartz, 1963a; VIMS records).
- Notropis bifrenatus (Cope). Bridle shiner. Fresh water-11.8 ppt.; rare to occasional, most tributaries; sluggish streams. (Jenkins & Zorach, 1970; Mansueti & Hardy, 1967).
- Notropis chalybaeus (Cope). Ironcolor shiner. Fresh water; rare to occasional; scattered Md. and Va. coastal plain localities; swamps, weedy streams. (Jenkins, pers. comm.; Mansueti & Hardy, 1967; Schwartz, 1963a).
- Notropis cornutus (Mitchill). Common shiner. Fresh water; rare to occasional on coastal plain; most abundant above fall line, all major tributaries, clear streams. (Mansueti, 1950; Schwartz, 1963a; Tsai, 1968; VIMS records).
- Notropis hudsonius amarus (Girard). Spottail shiner. Fresh water-10.7 ppt; abundant; all major tributaries; mainstream and sluggish, weedy necks, creeks and swamps. (Mansueti & Hardy, 1967; Mansueti & Scheltema, 1953; Schwartz, 1963a; VIMS records).
- Notropis procne procne (Cope). Swallowtail shiner. Fresh water; occasional, scattered localities on Md. & Va. coastal plain; most abundant above fall line, all major tributaries; clear, swift streams. (Mansueti, 1950; Raney, 1950; Schwartz, 1963a; Tsai, 1968; VIMS records).
- Notropis rubellus (Agassiz). Rosyface shiner. Fresh water; occasional, scattered localities Md. & Va. coastal plain; most abundant above fall line, all major tributaries; clear, swift streams. (Jenkins, pers. comm.; Tsai, 1968; Tsai & Zeisel, 1969).
- Notropis spilopterus spilopterus (Cope). Eastern spotfin shiner. Fresh water; occasional; Susquehanna and Potomac drainages; creeks, larger streams. (Gibbs, 1957; Jenkins, pers. comm.).
- Family Catostomidae - Suckers /Minytrema melanops, former record from the Bay by Hildebrand & Schroeder (1928) is apparently based on the misidentification of Moxostoma macrolepidotum (Robins and Raney, 1957; (Schwartz, 1962b)/
- Carpionodes cyprinus cyprinus (Lesueur). Northern quillback carp-sucker. Fresh water-10.7 ppt.; rare on coastal plain; Susquehanna to Potomac & James drainages; rare upper CB. (Raney, 1950; Schwartz, 1964a; Truitt et al, 1929; VIMS records).
- Catostomus commersoni (Lacépède). Common sucker. Fresh water-"brackish water"; locally common, all tributaries; occasional, upper CB; larger streams, ascends small creeks to spawn in spring. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; VIMS records).
- Erimyzon sucetta sucetta (Lacépède). Lake chubsucker. Fresh water; locally common, impoundments and quiet backwaters; all tributaries. (Fowler, 1911; Hildebrand & Schroeder, 1928; VIMS records).

- Erimyzon oblongus oblongus (Mitchill). Creek chubsucker. Fresh water; common; all major tributaries; sluggish streams, swamps. (Mansueti & Hardy, 1967; VIMS records).
- Moxostoma macrolepidotum macrolepidotum (Lesueur). Northern redhorse. Fresh water-5 ppt.; occasional; all major tributaries; mainstream & larger creeks. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; Raney & Massmann, 1953; VIMS records).
- Hypentellium nigricans (Lesueur). Northern hogsucker. Fresh water-brackish (Tangier Sound); rare to occasional, scattered localities on coastal plain; most abundant above fall line, all major tributaries; clear stream riffles. (Fowler, 1917; Massmann et al, 1952; C.B.L. coll. Martin Wiley, pers. comm.).
- Order Siluriformes (Nematognathi; Ostariophysii - in part)
- Family Ictaluridae - freshwater catfishes (Taylor, 1969; Schwartz, 1961)
- Ictalurus catus (Linnaeus). White catfish. Fresh water-14.5 ppt., common to abundant, most tributaries; mainstream; minor commercial and sport importance. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967; Schwartz, 1964c; VIMS records).
- Ictalurus furcatus (Lesueur). Blue catfish. Fresh water-"brackish" water; introduced; rare; Potomac R. (Ameiurus ponderosus (Bean)). (McAtee & Weed, 1915; Mansueti, 1950; Schwartz, 1961b; Truitt et al, 1929).
- Ictalurus natalis (Lesueur). Yellow bullhead. Fresh water; occasional; all major tributaries; swamps, ditches, sluggish streams. (Mansueti, 1950; Mansueti & Hardy, 1967; VIMS records).
- Ictalurus nebulosus (Lesueur). Brown bullhead. Fresh water-8 ppt. abundant; all major tributaries; sluggish oxbows, backwaters, impoundments; minor commercial and sport importance. (Mansueti & Hardy, 1967; VIMS records).
- Ictalurus punctatus (Rafinesque). Channel catfish. Fresh water-15.1 ppt; introduced; all major tributaries; mainstream; minor commercial and sport importance. (Mansueti & Hardy, 1967; VIMS records).
- Noturus gyrinus (Mitchill). Tadpole madtom. Fresh water; common but secretive; all tributaries; muddy streams. (Mansueti & Hardy, 1967; Taylor, 1969; VIMS records).
- Noturus insignis (Richardson). Margined madtom. Fresh water; rare-occasional on coastal plain; most abundant above fall-line; all major tributaries. (Mansueti & Hardy, 1967; Taylor, 1960).
- Family Ariidae - sea catfishes
- The reports of Arius felis (Linnaeus) from Chesapeake Bay (Mansueti & Hardy, 1967; Massmann, 1958) are apparently based on the confusion caused by changes in the scientific nomenclature of A. felis, sea catfish and Bagre marinus, gafftopsail catfish. Records for A. felis from the Bay have not been substantiated.<sup>7</sup>
- Bagre marinus (Mitchill). Gafftopsail catfish. Marine, meso-polyhaline; adults rare to occasional, upper and lower CB; summer. (Hildebrand & Schroeder, 1928; Mansueti & Hardy, 1967).
- Order Myctophiformes (Inioi)
- Family Synodontidae - lizardfishes - (Anderson et al, 1966)
- Synodus foetens (Linnaeus). Inshore lizardfish. Marine, 12 ppt. meso-polyhaline; occasional to common; upper and lower CB; summer, fall. (Anderson et al, 1966; Hildebrand & Schroeder, 1928; Schwartz, 1960c, 1961b).
- Order Percopsiformes
- Family Amblyopsidae - cavefishes
- Chologaster cornuta Agassiz. Swampfish. Fresh water; enter James R. drainage through ditches and canals from Dismal Swamp; headwaters of Elizabeth and Nansemond rivers. (Fowler, 1945; VIMS records).
- Family Aphredoderidae - pirate perches
- Aphredoderus sayanus (Gilliams). Pirate perch. Fresh water; common to abundant, all tributaries; sluggish streams, backwaters, weed beds. (Mansueti, 1950; Truitt et al, 1929; VIMS records).
- Family Percopsidae - trout perches
- Percopsis omiscomaycus (Walbaum). Trout-perch. Fresh water; rare or extinct; Potomac and Susquehanna drainages, Chesapeake & Baltimore canal; endangered. (Mansueti, 1950; Schwartz, 1964a; Smith & Bean, 1899; Truitt et al, 1929; Uhler & Lugger, 1876).

- Order Batrachoidiformes (Haplodoci)  
 Family Batrachoididae - toadfishes  
Opsanus tau (Linnaeus). Oyster toadfish. Estuarine-0.7-30 ppt., meso-polyhaline; abundant, upper and lower CB; oyster rock, mud bottoms, summer; winter, channels. (Hildebrand & Schroeder, 1928; Swartz & Van Engel, 1969; VIMS records).
- Order Gobiesociformes (Xenopterygii)  
 Family Gobiesocidae - clingfishes  
Gobiesox strumosus Cope. Skilletfish. Estuarine; 4-26 ppt., meso-polyhaline; common to abundant, upper and lower CB; oyster reef, eelgrass beds, summer; channels, winter. (Hildebrand & Schroeder, 1928; VIMS records).
- Order Lophiiformes (Pediculati)  
 Family Lophiidae - goosefishes  
Lophius americanus Valenciennes. Goosefish. Marine-14 ppt., polyhaline; occasional, lower CB; late fall, winter, early spring. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Antennariidae - frogfishes  
Histrio histrio (Linnaeus). Sargassumfish. Marine; rare; associated with floating Sargassum weed which may be blown into the bay during the summer. (Hildebrand & Schroeder, 1928; Uhler & Lugger, 1876).
- Family Ogcocephalidae - batfishes  
Ogcocephalus vespertilio (Linnaeus). Longnose batfish. Marine; rare; lower CB; members of this family occur along the edge of the continental shelf off CB. (Hildebrand & Schroeder, 1928; Uhler & Lugger, 1876).
- Order Gadiformes (Anacanthini)  
 Family Gadidae - codfishes  
Gadus morhua Linnaeus. Atlantic cod. Marine; rare-occasional; lower CB; late winter, spring; northern stray. (Hildebrand & Schroeder, 1928).
- Microgadus tomcod (Walbaum). Atlantic tomcod. Anadromous, but does not spawn in Chesapeake system; rare; lower CB; northern stray. (Massmann, 1957).
- Pollachius virens (Linnaeus). Pollock. Marine; rare-occasional, lower CB; late winter, early spring; northern stray. (Hildebrand & Schroeder, 1928; Massmann, 1960; VIMS records).
- Urophycis chuss (Walbaum). Red hake. Marine-7 ppt., polyhaline; occasional-common; lower CB; winter, spring; migrates offshore, summer. (Hildebrand & Schroeder, 1928; VIMS records).
- Urophycis regius (Walbaum). Spotted hake. Marine-2 ppt., meso-polyhaline; common, lower CB; late winter, spring; occasional, upper CB; channels; migrates offshore, summer and south in fall. Barans, 1972; Hildebrand & Schroeder, 1928; VIMS records).
- Urophycis tenuis (Mitchill). White hake. Marine; rare; spring; lower CB. (VIMS records and collection).
- Family Merlucciidae - silver hakes.  
Merluccius bilinearis (Mitchill). Silver hake. Marine-12 ppt., polyhaline; occasional to common; lower CB; fall, winter, spring; migrates offshore & north, summer. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Ophidiidae - cusk-eels and brotulas  
Rissola marginata (DeKay). Striped cusk-eel. Marine-14 ppt., polyhaline; occasional; lower CB; spring, summer, fall; burrows in bottom. (Hildebrand & Schroeder, 1928; VIMS records).
- Order Atheriniformes (Beloniformes; Syntognathi; Cyprinodontiformes; Microcyprini)  
 Family Exocoetidae - flyingfishes (Brunn, 1935; Staiger, 1965)  
Cypselurus heterurus (Rafinesque). Atlantic flyingfish. Rare, lower CB; record may be invalid, pelagic. (Uhler & Lugger, 1876).
- Family Hemiramphidae - halfbeaks (Collette, 1962a, 1965) (All species are pelagic).  
Hemiramphus brasiliensis (Linnaeus). Ballyhoo. Marine; rare; lower CB. (Hildebrand & Schroeder, 1928; VIMS collections).
- Hemiramphus balao Leseuer. Balao. Marine; rare; upper CB; summer, pelagic. (D.J. Hardy, pers. comm.; CBL collection).

Hyporhamphus unifasciatus (Ranzani). Halfbeak. Marine-12 ppt, meso-polyhaline; adults and juveniles abundant; entire CB; summer, fall. (H. unifasciatus as presently recognized is a composite species /B. B. Collett, pers. comm./ Current usage is followed here pending revision) (Hildebrand & Schroeder, 1928; Schwartz, 1962a; VIMS records).

Family Belontiidae - needlefishes (Berry & Rivas, 1962; Collette & Berry, 1965) (All species are pelagic).

Ablennes hians (Valenciennes). Flat needlefish. Marine; rare to occasional; lower CB; late spring, summer, early fall. (Hildebrand & Schroeder, 1928; VIMS records).

Strongylura marina (Walbaum). Atlantic needlefish. Marine-fresh water, oligo-polyhaline; adults and juveniles abundant entire Bay; summer, fall. (Hildebrand & Schroeder, 1928; Schwartz, 1962a; VIMS records).

Tylosurus acus (Lacépède). Agujon. Marine; occasional; lower CB; late spring, summer. (Hildebrand & Schroeder, 1928; VIMS records).

Family Scomberesocidae - sauries

Scomberesox saurus (Walbaum). Atlantic saury. Marine; rare mouth of CB; pelagic. (Uhler & Lugger, 1876).

Family Cyprinodontidae - killifishes (Brown, 1957; Miller, 1955).

Cyprinodon variegatus Lacépède. Sheepshead minnow. Estuarine 0-32.8 ppt., meso-euhaline; abundant; entire CB; summer, shallow flats, marshes, tidal ponds; wintering in channels or in low salinity ponds, buried in silt. (Hildebrand & Schroeder, 1928; VIMS records).

Fundulus confluentus Goode and Bean. Marsh killifish. Estuarine, fresh-polyhaline; rare; scattered localities entire bay; muddy marshes, grass flats. (Powler, 1945; Hildebrand & Schroeder, 1928; Schwartz, 1968; VIMS records).

Fundulus diaphanus (Lesueur). Banded killifish. Fresh water-20 ppt., oligohaline; common-abundant; all tributaries. (Hildebrand & Schroeder, 1928; Schwartz, 1968; VIMS records).

Fundulus heteroclitus (Linnaeus). Mummichog. Estuarine-0-32 ppt., mesohaline; abundant entire bay; muddy marshes, channels, grass flats, in summer; ascends streams to fresh water, or burrows in in silt in winter. (Hildebrand & Schroeder, 1928; Richards & Castagna, 1970; Schwartz, 1968; VIMS records).

Fundulus luciae (Baird). Spotfin killifish. Estuarine-0-27.8 ppt., rare; scattered localities lower bay; tidal creeks. (Hildebrand & Schroeder, 1928; Richards & Castagna, 1970; Schwartz, 1968; Truitt et al, 1929; VIMS records).

Fundulus majalis (Walbaum). Striped killifish. Estuarine-0-32 ppt., meso-polyhaline; abundant; entire CB; tidal creeks, sandy flats, grass beds, summer; winter habitat? (Hildebrand & Schroeder, 1928; Richards & Castagna, 1970; Schwartz, 1968; VIMS records).

Lucania parva (Baird). Rainwater killifish. Estuarine-0-31.2 ppt., mesohaline; weed beds, muddy coves, summer; low salinity tidal ponds, burrowed in silt in winter. (Hildebrand & Schroeder, 1928; Richards & Castagna, 1970; Schwartz, 1968; VIMS records).

Family Poeciliidae - livebearers

Gambusia affinis (Baird and Girard). Mosquitofish. Fresh water-18 ppt., oligo-mesohaline; abundant; most tributaries south of Annapolis; tidal ponds; streams; winters in silt in low salinity or fresh water (Hildebrand & Schroeder, 1928; Schwartz, 1968; VIMS records).

Family Atherinidae - silversides

Membras martinica (Valenciennes). Rough silverside. Estuarine-3-24 ppt., mesohaline; common; grass flats, channel edge, summer; winter habitat? (Hildebrand & Schroeder, 1928; VIMS records).

Menidia beryllina (Cope). Tidewater silverside. Estuarine-0-35.5 ppt., oligo-mesohaline; abundant; entire CB; tidal creeks, grass flats, summer; channels, winter. (Hildebrand & Schroeder, 1968; Richards & Castagna, 1970; VIMS records).

Menidia menidia (Linnaeus). Atlantic silverside. Estuarine-0-31 ppt., meso-polyhaline; abundant; entire CB; tidal creeks, grass flats, summer; channels, winter. (Hildebrand & Schroeder, 1928; VIMS records).

- Order Beryciformes (Berycoidei)  
 Family Holocentridae - squirrelfishes  
Holocentrus ascensionis (Osbeck). Squirrelfish. Marine; rare lower CB; late summer. (VIMS collection).
- Order Gasterosteiformes (Thoracostei; Hemibranchii; Lophobranchii; Solenichthyes)  
 Family Gasterosteidae - sticklebacks  
Apeltes quadracus (Mitchill). Fourspine stickleback. Estuarine- 3-26 ppt., meso-polyhaline; abundant; entire CB; grass flats, summer; channels and channel edge, winter. (Hildebrand & Schroeder, 1928; VIMS records).  
Gasterosteus aculeatus Linnaeus. Threespine stickleback. Anadromous; locally common in small tributaries of James and York drainages where spawning occurs in fresh or slightly brackish water; winter, spring; rare or absent from CB remainder of year. (Hildebrand & Schroeder, 1928; VIMS collection and records).
- Family Fistulariidae - cornetfishes  
Fistularia tabacaria Linnaeus. Bluespotted cornetfish. Marine; rare-occasional, lower CB; late summer, early fall. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Syngnathidae - pipefishes and seahorses  
Hippocampus erectus Perry. Lined seahorse. Marine-15 ppt., polyhaline; occasional-common, lower CB; channels & flats, summer, channels, winter. (Hildebrand & Schroeder, 1928; VIMS records).  
Syngnathus floridae (Jordan and Gilbert). Dusky pipefish. Estuarine-15-30 ppt., polyhaline; lower CB; abundant, deeper grass flats (3-10'), summer; channel, winter. (Hildebrand & Schroeder, 1928; VIMS records).  
Syngnathus fuscus Storer. Northern pipefish. Estuarine-0-30 ppt., meso-polyhaline; abundant, entire Bay; shallow grass flats, summer; channel, winter. (Hildebrand & Schroeder, 1928; VIMS records).  
Syngnathus louisianae Gunther. Chain pipefish. Marine; rare, lower CB; grass beds, summer. (Hildebrand & Schroeder, 1928; Truitt et al. 1929; VIMS records).
- Order Perciformes (Percomphi, Acanthopterygii) /The record of the tilefish, Lopholatilus chamaeleonticeps from CB (Hildebrand & Schroeder, 1928) based on an example in a fish market, is doubtless of a specimen caught at the shelf edge. It is highly unlikely that this species would occur, even as a stray in CB.7
- Family Percichthyidae - temperate basses. /An extensive literature exists on the biology of M. saxatilis and M. americanus in CB. The present format precludes even a cursory review. Hybrid M. saxatilis X Morone chrysops have been introduced into the Rappahannock & James Rivers. Catches of adult hybrids are recorded for the Rappahannock River (Kerby, et al, 1971.7
- Morone americana (Gmelin). White perch. Anadromous; estuarine-0-25 ppt., oligo-mesohaline; abundant; all major tributaries; spring-fall, flats & channels; winter, channels; minor commercial and sport importance. (Hildebrand & Schroeder, 1928; Mansueti, 1961a; VIMS records).  
Morone saxatilis (Walbaum). Striped bass. Anadromous-marine; estuarine, oligo-polyhaline; abundant; all major tributaries; summer, flats and channels; winter, channels; parts of populations leave CB for coastal waters in severe winters; older year classes leave CB in summer; major commercial & sport importance. (Hildebrand & Schroeder, 1928; Mansueti, 1961b; Raney, 1952; VIMS records).
- Family Serranidae - sea basses. (Rivas, 1964b; Robins & Stark, 1961; Smith, 1961)  
Centropristis striata (Linnaeus). Black sea bass. Marine-12 ppt., polyhaline; common; lower CB; spring, summer, early fall; juveniles, deeper grass flats, often near sponges; adults, channels, wrecks, old pilings; migrates offshore during winter; commercial & sport importance. (Hildebrand & Schroeder, 1928; VIMS records).

Epinephelus itajara (Lichtenstein). Jewfish. Marine; rare, lower CB; tropical stray. (Richards, 1963).

Mycteroperca microlepis (Goode and Bean). Gag. Marine, polyhaline; occasional, lower CB; summer, early fall. (Hoesé et al, 1961; VIMS records).

Family Centrarchidae - sunfishes. (Moore, 1968; Eddy, 1969)

Acantharchus pomotis (Baird). Mud sunfish. Fresh water; local, rare to common; scattered Va. and Md. localities; sluggish streams, swamps, acid-water habitats. (Schwartz, 1964a; VIMS records).

Ambloplites rupestris (Rafinesque). Rock bass. Fresh water; introduced; rare on coastal plain; recorded from upper CB, off Worton Pt., Md. (C.B.L. coll., M. Wiley, pers. comm.); most abundant above fall line; all major tributaries. (Mansueti, 1955; VIMS records).

Centrarchus macropterus (Lacepede). Flier. Fresh water-7 ppt., locally common, sluggish streams; York River system south. (VIMS records).

Enneacanthus chaetodon (Baird). Blackbanded sunfish. Fresh water; locally rare to common; eastern shore of Md.; acid-water, impoundments, weed beds, cypress lowlands. No records for elsewhere in CB. (Mansueti, 1950; Schwartz, 1961d, 1964a).

Enneacanthus gloriosus (Holbrook). Bluespotted sunfish. Fresh water 12.9 ppt; locally occasional to common, Md. & Va.; sluggish streams, acid ponds. (Hildebrand & Schroeder, 1928; Mansueti, 1950; VIMS records).

Enneacanthus obesus (Girard). Banded sunfish. Fresh water; occasional; sluggish streams, acid-water swamps, ditches, in muddy bottoms; Md. & Va. (Mansueti, 1950; VIMS collection).

Lepomis auritus (Linnaeus). Redbreast sunfish. Fresh water; occasional to common; all tributaries; minor sport importance. (Mansueti, 1950; VIMS records).

Lepomis cyaneus Rafinesque. Green sunfish. Fresh water; introduced; locally rare to occasional from Potomac R. north and east; rare or absent on Va. coastal plain. (Mansueti, 1950; Tsai, 1968).

Lepomis gulosus (Cuvier). Warmouth. Fresh water; rare to occasional; scattered localities; sluggish weedy streams; Md. & Va. (Fowler, 1945; Mansueti, 1950; VIMS records).

Lepomis macrochirus Rafinesque. Bluegill. Fresh water-18.0 ppt; introduced; common to abundant; all tributaries; impoundments; major sport importance. (Fowler, 1945; Mansueti, 1950; VIMS records).

Lepomis gibbosus (Linnaeus). Pumpkinseed. Fresh water-18.2 ppt; common to abundant; all tributaries; major sport importance. (Fowler, 1945; Hildebrand & Schroeder, 1928; Mansueti, 1950; VIMS records).

Micropterus dolomieu Lacepede. Smallmouth bass. Fresh water-7.4 ppt; introduced; occasional to common, Rappahannock R. north on coastal plain; absent E. Shore; rare to occasional south of Rappahannock on coastal plain; most abundant, all major tributaries above fall-line; clear gravelly streams; major sport importance. (Fowler, 1945; Hildebrand & Schroeder, 1928; Mansueti, 1950; Massmann et al, 1952; VIMS records).

Micropterus salmoides (Lacepede). Largemouth bass. Fresh water-12.9 ppt; introduced; common to abundant; all tributaries; sluggish streams, weed beds; major sport importance. (Fowler, 1945; Hildebrand & Schroeder, 1928; Mansueti, 1950; VIMS records).

Pomoxis annularis Rafinesque. White crappie. Fresh water-1.5 ppt; introduced; rare, Va. drainages; rare to locally common, Md. drainages & impoundments. (Hildebrand & Schroeder, 1928; Schwartz, 1959b).

Pomoxis nigromaculatus (Lesueur). Black crappie. Fresh water-1 ppt; introduced; occasional to abundant all major tributaries, impoundments; major sport importance. (Fowler, 1945; Mansueti, 1950; Schwartz, 1959b; VIMS records).

## Family Percidae - perches

- Etheostoma f. fusiforme (Girard). Swamp darter. Fresh water-1.3 ppt; locally rare to common, most tributaries; back waters of sluggish streams, mill ponds, acid-water; vegetation, dark boggy habitats. (Collette, 1962b; Mansueti, 1951; VIMS records).
- Etheostoma olmstedi Storer. Tessellated darter. Fresh water-13 ppt, oligohaline; common to abundant, most tributaries; streams, swamp runs. (Cole, 1967; VIMS records; Zorach, 1971).
- Etheostoma sellare (Radcliffe & Welsh). Maryland darter. Fresh water; rare, endemic to Swan Creek near Havre de Grace, Md., and adjacent drainages; clear, rapid, gravelly streams; endangered. (B. B. Collette, pers. comm.; Schwartz, 1964b).
- Etheostoma serriferum (Hubbs & Cannon). Sawcheek darter. Fresh water; occasional, enters CB area from the south in Dismal Swamp, head waters of Elizabeth and Nansemond rivers, James drainage; sluggish streams (midstream), weed beds. (Collette, 1962b).
- Etheostoma vitreum (Cope). Glassy darter. Fresh water; scattered coastal plain localities from Patuxent R. Md. south; most abundant above fall line; clear, sandy streams. (Fowler, 1945; Jenkins, 1971; Tsai, 1968).
- Perca flavescens (Mitchill). Yellow perch. Fresh water-13 ppt; common to abundant, most tributaries; large streams, some impoundments, swamps; minor sport importance. (Hildebrand & Schroeder, 1928; Mansueti, 1950; VIMS records).
- Percina caprodes (Rafinesque). Logperch. Fresh water; rare or extinct, Potomac drainage; endangered. (Mansueti, 1950; 1955; Smith and Bean, 1899).
- Percina notogramma (Raney and Hubbs). Stripeback darter. Fresh water; rare; few scattered localities on coastal plain; most abundant above fall-line, all major tributaries. (Mansueti, 1950; Tsai, 1968; VIMS records).
- Percina peltata (Stauffer). Shield darter. Fresh water; rare, a few scattered localities on coastal plain, most abundant above fall line, all major tributaries (Mansueti, 1950; Tsai, 1968; VIMS York piedmont drainage records).
- Stizostedion v. vitreum (Mitchill). Walleye. Fresh water; introduced; rare, Susquehanna, upper CB; most abundant above fall line, all major tributaries (C.B.L. records, Martin Wiley, pers. comm.).

## Family Priacanthidae - bigeyes (Caldwell, 1962a,b)

- Priacanthus arenatus Cuvier. Bigeye. Marine; rare to occasional, lower CB; summer, fall; tropical straggler. (Hildebrand & Schroeder, 1928; VIMS records).
- Pristigenys alta (Gill). Short bigeye. Marine; rare to occasional, lower CB; summer, fall; tropical straggler. (Hildebrand & Schroeder, 1928; VIMS records).

## Family Pomatomidae - bluefishes

- Pomatomus saltatrix (Linnaeus). Bluefish. Marine-1 ppt, meso-polyhaline; large older fish pass through in spring, followed by younger (2-4 lb.) fish which summer in Bay; young of year (snappers) enter lower CB and tributaries in late summer and fall; large fish return late fall; in winter, absent from CB, all sizes migrating offshore and south. Abundant, lower CB; occasional, upper CB; pelagic, major commercial and sport importance. (Hildebrand & Schroeder, 1928; Norcross et al., 1972; VIMS records).

## Family Rachycentridae - cobias

- Rachycentron canadum (Linnaeus). Cobia. Marine, polyhaline; occasional to common, summer, lower CB; mouth of tidal creeks, vicinity of spits, reefs, bars; migrates south, fall; minor sport and commercial importance. (Hildebrand & Schroeder, 1928; Joseph, et al, 1964; Richards, 1967).

## Family Echeneidae - remoras

- Remora osteochir (Cuvier). Marlinsucker. Marine; rare, CB, oceanic stray (if record valid). (Truitt et al, 1929). (Remoras are often found attached by the head to sharks, rays, billfishes or other large fishes. (Cressey & Lachner, 1970).

- Echeneis naucrates Linnaeus. Sharksucker. Marine-9.2 ppt, polyhaline; occasional, summer, upper and lower CB. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).
- Remora australis (Bennett). Whalesucker. Marine; rare, summer; lower CB; summer. (Massmann, 1957).
- Family Carangidae - jacks and pompanos. (Berry, 1959, 1968; Fields, 1962; Ginsburg, 1952a; Mather, 1958).
- Alectis crinitus (Mitchill). African pompano. Marine, polyhaline; rare, upper CB, fall; occasional, lower CB, summer, pelagic. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).
- Caranx bartholomaei Cuvier. Yellow jack. Marine; rare; lower CB; summer; pelagic. (Richards, 1963).
- Caranx fuscus Geoffroy Saint-Hilaire. Blue-runner. Marine-21 ppt, polyhaline; occasional, summer, fall, upper CB; occasional to common, summer, fall, lower CB; pelagic; minor commercial importance. (Bohlke & Chaplin, 1968; Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).
- Caranx hippos (Linnaeus). Crevalle jack. Marine-1 ppt, meso-polyhaline; occasional to common; lower CB; summer, fall; pelagic; minor commercial importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Caranx latus Agassiz. Horse-eye jack. Marine-30 ppt, polyhaline; rare; lower CB; summer; fall; pelagic. (Hildebrand & Schroeder, 1928; VIMS records).
- Chloroscombrus chrysurus (Linnaeus). Atlantic bumper. Marine; rare; lower CB; fall; pelagic. (Bean, 1891; VIMS collection).
- Oligoplites saurus (Bloch & Schneider). Leatherjacket. Marine; rare; lower CB; spring, fall; pelagic. (Hildebrand & Schroeder, 1928).
- Selar crumenophthalmus (Bloch). Bigeye scad. Marine-15 ppt, meso-polyhaline; rare, upper CB; occasional to common, lower CB; summer, fall; pelagic. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).
- Selene vomer (Linnaeus). Lookdown. Marine-1 ppt, polyhaline; occasional, upper CB; occasional to common, lower CB; summer, fall; pelagic. (Hildebrand & Schroeder, 1928; Schwartz, 1960; VIMS records).
- Seriola dumerilli (Risso). Greater amberjack. Marine; occasional, lower CB; summer; pelagic. (Richards, 1963; VIMS records).
- Seriola fasciata (Bloch). Lesser amberjack. Marine; rare, lower CB; pelagic. (Ginsburg, 1952a; Massmann, 1957).
- Seriola rivoliana Valenciennes. Almaco jack. Marine; rare to occasional; lower CB; summer, fall; pelagic. (Ginsburg, 1952a; Massmann, 1957; VIMS records).
- Seriola zonata (Mitchill). Banded rudderfish. Marine; occasional, lower CB; summer; pelagic. (Ginsburg, 1952a; Massmann, 1957; VIMS records).
- Trachinotus carolinus (Linnaeus). Florida pompano. Marine, polyhaline; common; lower CB; summer, fall; pelagic; shallow sandy beaches; minor commercial importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Trachinotus falcatus (Linnaeus). Permit. Marine; rare, upper CB; rare to occasional, lower CB; summer, fall; pelagic. (Hildebrand & Schroeder, 1928; VIMS records).
- Trachinotus goodei Jordon & Evermann. Palometa. Marine; rare; lower CB; pelagic. (Hildebrand & Schroeder, 1928; VIMS records).
- Trachurus lathamii Nichols. Rough scad. Marine-14 ppt, polyhaline; rare to occasional, upper CB; occasional, lower CB; summer; pelagic. (Massmann, 1960; Mansueti, 1960b; VIMS records).
- Vomer setapinnis (Mitchill). Atlantic moonfish. Marine, polyhaline; rare, upper CB; occasional to common, lower CB; summer, fall; pelagic. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).



- Family Coryphaenidae - dolphins (Collette & Gibbs, 1969)  
Coryphaena hippurus Linnaeus. Dolphin. Marine; rare; lower CB; summer; pelagic; an oceanic stray. (Massmann, 1957).
- Family Lutjanidae - snappers (Anderson, 1967)  
Lutjanus cyanopterus (Cuvier). Cubera snapper. Marine; rare, lower CB; fall; tropical stray. (VIMS collection).  
Lutjanus griseus (Linnaeus). Gray snapper. Marine, polyhaline; occasional; lower CB; summer, fall. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Lobotidae - tripletails  
Lobotes surinamensis (Bloch). Tripletail. Marine, polyhaline; occasional; lower CB; summer, fall. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Gerreidae - mojarras (Curran, 1942; Bohlke & Chaplin, 1968; Cervigon, 1966)  
Eucinostomus argenteus Baird & Girard. Spotfin mojarra. Marine; rare; lower CB; summer; tropical stray. (Bean, 1891; Hildebrand & Schroeder, 1928; VIMS collection).  
Eucinostomus gula (Quoy and Gaimard). Silver jenny. Marine; rare; lower CB; summer; tropical stray. (Hildebrand & Schroeder, 1928; VIMS collection).  
Diapterus olisthostomus (Goode & Bean). Irish pompano. Marine; rare; upper and lower CB; summer; tropical stray. (M. Wiley, pers. comm.; VIMS collection).
- Family Pomadasysidae - grunts (Courtney, 1961; Bohlke & Chaplin, 1968)  
Haemulon aurolineatum Cuvier. Tomtate. Marine; rare, lower CB. (Uhler & Lugger, 1876).  
Haemulon plumieri (Lacépède). White grunt. Marine; rare, CB. (Uhler & Lugger, 1876).  
Orthopristis chrysoptera (Linnaeus). Pigfish. Marine-13.9 ppt, polyhaline; common-abundant, lower CB; rare to occasional, upper CB; spring, summer, fall; minor commercial & sport importance. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).
- Family Sparidae - porgies (Bohlke & Chaplin, 1968; Caldwell, 1965; Randall & Caldwell, 1966).  
Stenotomus chrysops (Linnaeus). Scup. Marine-17 ppt., polyhaline; common-abundant, lower CB; /large adults, early spring; immatures, summer, fall; migrates offshore in winter./ minor commercial and sport importance. (Important offshore landings). (Hildebrand & Schroeder, 1928; VIMS records).  
Lagodon rhomboides (Linnaeus). Pinfish. Marine-15 ppt, polyhaline; occasional; lower CB; spring, summer, fall. (Hildebrand & Schroeder, 1928; VIMS records).  
Archosargus probatocephalus (Walbaum). Sheepshead. Marine-25 ppt, polyhaline; rare to occasional; lower CB; summer; frequents wrecks, pilings, reefs. (Hildebrand & Schroeder, 1928; VIMS records).  
Diplodus holbrooki (Bean). Spottail pinfish. Marine; rare; lower CB. (Bean, 1891).
- Family Sciaenidae - drums (Gilbert, 1966; Ginsburg, 1929; Hildebrand & Cable, 1934; Welsh & Breder, 1923)  
Bairdiella chrysura (Lacépède). Silver perch. Marine-fresh water; abundant. lower CB; rare to occasional, upper CB; spring, summer, fall, deeper flats, channels; winter, deeper channels, may migrate out of Bay southward, Feb., March in cold winters; minor commercial and sport importance. (Hildebrand & Schroeder, 1928; VIMS records).  
Cynoscion nebulosus (Cuvier). Spotted seatrout. Marine-5 ppt., meso-polyhaline; occasional to common, spring, summer, fall, lower CB; rare to occasional, upper CB; minor to major commercial importance. May remain in CB in deep water in mild winters but usually migrates south out of CB. (Hildebrand & Schroeder, 1928; VIMS records).  
Cynoscion nothus (Holbrook). Silver seatrout. Marine, polyhaline; occasional; summer; lower CB. (Hildebrand & Schroeder, 1928; VIMS records).  
Cynoscion regalis (Bloch and Schneider). Weakfish. Marine-fresh water; juveniles mesohaline, summer, fall; adults meso-polyhaline,

- spring, summer, fall; abundant lower CB; rare-occasional, upper CB; may remain in deeper water of CB in mild winters but usually migrates south; major commercial & sport importance. (Hildebrand & Schroeder, 1928; Pearson, 1941; VIMS records).
- Leiostomus xanthurus Lacépède. Spot. Marine-freshwater; adults meso-polyhaline; juveniles mesohaline; abundant; spring, summer, fall; upper & lower CB; migrates out of CB and south in winter; major commercial & sport importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Larimus fasciatus Holbrook. Banded drum. Marine-15 ppt, polyhaline; occasional; summer; lower CB. (Hildebrand & Schroeder, 1928; VIMS records).
- Menticirrhus americanus (Linnaeus). Southern kingfish. Marine-14 ppt., polyhaline; occasional to common; lower CB; summer, fall; migrates south, winter; minor commercial & sport importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Menticirrhus littoralis (Holbrook). Gulf kingfish. Marine, polyhaline; rare; lower CB; summer, fall. (Hildebrand & Schroeder, 1928; VIMS records).
- Menticirrhus saxatilis (Bloch & Schneider). Northern kingfish. Marine-4 ppt, meso-polyhaline; common; lower CB; summer, fall; migrates south in winter; minor commercial and sport importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Micropogon undulatus (Linnaeus). Atlantic croaker. Marine-freshwater, meso-polyhaline; adults rare to abundant; summer, fall; migrates south in winter; juveniles may remain in CB in channels, mild winters; high mortality, severe winter; minor to major commercial & sport importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Pogonias cromis (Linnaeus). Black drum. Marine-freshwater; adults, polyhaline; common; spring, summer, fall; lower CB; migrate south in winter; juveniles, meso-polyhaline, may remain in CB in mild winters; minor commercial & sport importance. (Frisbie, 1961; Hildebrand & Schroeder, 1928; VIMS records).
- Sciaenops ocellata (Linnaeus). Red drum. Marine-16 ppt; adults polyhaline; rare to occasional, spring, summer; occasional to common, fall; juveniles, meso-polyhaline; occasional to common, fall; may remain in CB in mild winters; migrates south in winter; minor commercial and sport importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Stellifer lanceolatus (Holbrook). Star drum. Marine-27 ppt, polyhaline; rare to occasional; summer; lower CB. (Hildebrand & Schroeder, 1928; VIMS records).
- Umbrina coroides Cuvier. Sand drum. Marine; rare; fall; lower CB. (Hildebrand & Schroeder, 1928).
- Family Kyphosidae - sea chubs (Moore, 1962)
- Kyphosus incisor (Cuvier). Yellow chub. Marine; spring; lower CB. (Richards, 1970).
- Kyphosus sectatrix (Linnaeus). Bermuda chub. Marine; rare; summer; lower CB. (Hildebrand & Schroeder, 1928).
- Family Ehippidae - spadefishes
- Chaetodipterus faber (Broussonet). Atlantic spadefish. Marine-12 ppt, meso-polyhaline; occasional to common; lower CB; summer, fall; rock piles, wrecks; minor sport importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Chaetodontidae - butterflyfishes. (Bohlke & Chaplin, 1968)
- Chaetodon ocellatus Bloch. Spotfin butterflyfish. Marine; rare to occasional; summer, fall; lower CB; tropical stray; usually juveniles. (Hildebrand & Schroeder, 1928; Richards, 1963; VIMS records).
- Family Labridae - wrasses (Bigelow & Schroeder, 1953b; Bohlke & Chaplin, 1968).
- Tautoga onitis (Linnaeus). Tautog. Marine-16 ppt., polyhaline; common; lower CB; fall, winter, spring; moves to mouth of Bay or further offshore, summer; rockpiles, wharfs, wrecks; minor sport importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Tautoglabrus adspersus (Walbaum). Cunner. Marine-11 ppt., polyhaline; rare to occasional; lower CB; summer, fall, winter; northern stray. (Hildebrand & Schroeder, 1928; VIMS records).

- Family Scaridae - parrotfishes (Schultz, 1958, 1969; Randall, 1963).  
Scarus coeruleus (Bloch). Blue parrotfish. Marine; rare; lower CB; tropical stray. (Hildebrand & Schroeder, 1928; Smith & Kendall, 1898).
- Family Mugilidae - mullets  
Mugil cephalus Linnaeus. Striped mullet. Marine-17 ppt, polyhaline; summer, fall; occasional; upper and lower CB; tidal creeks & flats; winter, rare in CB; most migrate out of CB to south; minor commercial importance. (Hildebrand & Schroeder, 1928; Mansueti, 1962b; VIMS records).  
Mugil curema Valenciennes. White mullet. Marine-1 ppt; juveniles mesohaline, summer, fall; adults polyhaline, summer, fall; occasional, upper CB; occasional to common, lower CB; tidal creeks & flats; winter, migrate from CB to the south; minor commercial importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Sphyraenidae - barracudas (DeSilva, 1963)  
Sphyraena borealis DeKay. Northern sennet. Marine; rare to occasional; lower CB; summer. (Everman & Hildebrand, 1910; VIMS records).  
Sphyraena guachancho Cuvier. Guaguanche. Marine; rare; lower CB; summer. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Polynemidae - threadfins. (Randall, 1966).  
Polydactylus octonemus (Girard). Atlantic threadfin. Marine; rare; summer; lower CB. (Hildebrand & Schroeder, 1928).  
Polydactylus virginicus (Linnaeus). Barbu. Marine; rare; summer; lower CB. (Richards, 1963).
- Family Uranoscopidae - stargazers. (Berry & Anderson, 1961).  
Astroscopus guttatus Abbott. Northern stargazer. Marine-11 ppt., meso-polyhaline; occasional, entire year, lower CB; rare, fall, upper CB; burrows into sand bottoms; electrogenic. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).
- Family Blenniidae - combtooth blennies. (Springer, 1959, 1968)  
Blennius marmoratus Poey. Seaweed blenny. Marine; rare; lower CB; this record may be in error. (Hildebrand & Schroeder, 1928; Uhler & Lugger, 1876).  
Hypsoblennius hentzi (Lesueur). Feather blenny. Estuarine-12-30 ppt, meso-polyhaline; common; entire CB; frequents deeper flats and oyster reefs, summer; shallow flats, fall; channels at higher salinities, winter. (Hildebrand & Schroeder, 1928; VIMS records).  
Chasmodes bosquianus (Lacépède). Striped blenny. Estuarine-12-25 ppt., meso-polyhaline; common to abundant; entire CB; shallow flats, oyster reefs, spring, summer; deeper flats, reefs, fall; channels at higher salinities, winter. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Gobiidae - gobies (Bohlke & Robins, 1968; Dawson, 1969; Ginsburg, 1933).  
Evorthodus lyricus (Girard). Lyre Goby. Marine; rare; lower CB; fall. (Ginsburg, 1931; Hildebrand & Schroeder, 1928; Massmann, 1957).  
Gobionellus boleosoma (Jordan & Gilbert). Darter goby. Marine; rare; lower CB; fall. (Massmann, 1957).  
Gobiosoma bosci (Lacépède). Naked goby. Estuarine-0-27 ppt, meso-polyhaline; common to abundant; entire CB; shallow flats, weed beds, oyster reefs, spring, summer, fall; deeper channel edges & channels in higher salinity, winter. (Hildebrand & Schroeder, 1928; Schwartz, 1971; VIMS records).  
Gobiosoma ginsburgi Hildebrand & Schroeder. Seaboard goby. Estuarine-15-31 ppt, polyhaline; occasional to common, upper CB; common-abundant, lower CB; deeper flats, oyster reefs, spring, summer, fall; channels in higher salinity, winter. (Hildebrand & Schroeder, 1928; Schwartz, 1971; VIMS records).  
Gobiosoma robustum Ginsburg. Code goby. Marine-15.8 ppt, meso-polyhaline; rare; winter; upper CB; channel edge; tropical stray? Schwartz, 1971).  
Microgobius gulosus (Girard). Clown goby. Marine-15.8 ppt, meso-polyhaline; rare; winter; upper CB; channel edge; tropical stray? (Dawson, 1969; Schwartz, 1971).

- Microgobius thalassinus (Jordan & Gilbert). Green goby. Estuarine-11-13 ppt., meso-polyhaline; occasional to common, entire CB; deeper oyster reefs (10-20 ft.), spring, summer, fall; channel edges, channels, winter; inhabits living sponges. (Ginsburg, 1934; Hildebrand & Schroeder, 1928; Schwartz, 1971; VIMS records).
- Family Ammodytidae - Sand lances. (Richards et al, 1963; /A. americanus is considered a synonym of A. hexapterus (Winters, 1970). /  
Ammodytes hexapterus Pallas. Inshore sandlance. Marine; rare; fall, winter; lower CB; sandy bottoms. (Massmann, 1960; Richards et al, 1963; VIMS records).
- Family Trichiuridae - cutlassfishes  
Trichiurus lepturus Linnaeus. Atlantic cutlassfish. Marine-16 ppt, meso-polyhaline; occasional to common; entire CB; spring, summer, fall; pelagic; occasional sport catch. (CBL records, M. Wiley, pers. comm.; Hildebrand & Schroeder, 1928; VIMS records).
- Family Scombridae - mackerels and tunas (Collette & Gibbs, 1963a; Fitch & Roedel, 1962; Gibbs & Collette, 1966; Matsui, 1967; Rivas, 1951).  
Euthynnus alletteratus (Rafinesque). Little tunny. Marine, polyhaline; occasional; upper & lower CB; late spring, summer, fall; pelagic; minor commercial & sport importance. (Mansueti & Mansueti, 1962; Massmann, 1957; Schwartz, 1960d).  
Sarda sarda (Bloch). Atlantic bonito. Marine-10 ppt, polyhaline; occasional; upper & lower CB; spring, summer, fall; minor commercial and sport value; pelagic. (Hildebrand & Schroeder, 1928; Mansueti, 1962a).  
Scomber japonicus Houttuyn. Chub mackerel. Marine, polyhaline; rare to occasional; lower CB; spring; pelagic. (Uhler & Lugger, 1876; VIMS records).  
Scomber scombrus Linnaeus. Atlantic mackerel. Marine, polyhaline; occasional; lower CB; late fall, winter, early spring; minor commercial importance. (Hildebrand & Schroeder, 1928; VIMS records).  
Scomberomorus cavalla (Cuvier). King mackerel. Marine-14 ppt, polyhaline; rare to occasional, upper CB; occasional, lower CB; pelagic; minor commercial and sport importance. (Butz & Mansueti, 1962; Massmann, 1960).  
Scomberomorus maculatus (Mitchill). Spanish mackerel. Marine, polyhaline; occasional to common; lower CB; spring, summer, fall; pelagic; minor commercial & sport importance. (Hildebrand & Schroeder, 1928; VIMS records).  
Scomberomorus regalis (Bloch). Cero. Marine; rare; lower CB; tropical stray. (Uhler & Lugger, 1876).  
Thunnus thynnus (Linnaeus). Bluefin tuna. Marine; rare; lower CB; summer; oceanic stray. (Hildebrand & Schroeder, 1928).
- Family Xiphiidae - swordfishes  
Xiphias gladius Linnaeus. Swordfish. Marine; rare; lower CB; record questionable. (Uhler & Lugger, 1876).
- Family Centrolophidae - ruffs, cigarfishes and barrelfishes (Haedrich, 1967; Haedrich & Horn, 1969). /Because all stromateoid fishes were placed in one family in the A.F.S. list with no justification, I prefer to follow the recent, thorough revision by Haedrich (1967)/  
Hyperoglyphe perciformis (Mitchill). Barrelfish. Marine; rare; upper and lower CB; summer, fall. (Merrimen, 1945; Schwartz, 1963b; VIMS records).
- Family Stromateidae - butterflyfishes (Haedrich, 1967; Haedrich & Horn, 1969; Horn, 1970)  
Peprilus paru (Linnaeus). Harvestfish. Marine-4 ppt, meso-polyhaline; summer, fall; common, lower CB; occasional, upper CB; pelagic; minor commercial importance; migrates south in winter. (I follow Horn (1970) in placing P. alepidotus (Linnaeus) within the synonymy of P. paru) (Hildebrand & Schroeder, 1928; Horn, 1970; Mansueti, 1963; VIMS records).  
Peprilus triacanthus (Peck). Butterfish. Marine-5 ppt, meso-polyhaline; spring, summer, fall; common-abundant, lower CB; occasional, upper CB; pelagic; minor-major commercial importance; migrates offshore, south in winter. (Hildebrand & Schroeder, 1928; Horn, 1970; Mansueti, 1963; VIMS records).

- Family Triglidae - searobins (Miller (in press); Ginsburg, 1950; Teague, 1951).
- Prionotus carolinus (Linnaeus). Northern searobin. Marine-5 ppt, meso-polyhaline; common, upper CB; abundant, lower CB; spring, summer, fall; deeper flats, channel edges; migrates offshore & south in winter. (Hildebrand & Schroeder, 1928; VIMS records).
- Prionotus evolans (Linnaeus). Striped searobin. Marine-16 ppt, meso-polyhaline; occasional-common, lower CB; rare to occasional, upper CB; spring, summer, fall; deeper flats, channel edges; migrates offshore & south in winter. (Hildebrand & Schroeder, 1928; VIMS records).
- Prionotus scitulus Jordan and Gilbert. Leopard searobin. Marine; rare; lower CB; southern stray. (Ginsburg, 1950).
- Prionotus tribulus Cuvier. Bighead searobin. Marine; rare; lower CB; southern stray. (Ginsburg, 1950).
- Family Cottidae - sculpins (Bigelow & Schroeder, 1953b).
- Hemitripterus americanus (Gmelin). Sea raven. Marine; rare; lower CB; winter, early spring. (Uhler & Lugger, 1876).
- Myoxocephalus octodecemspinosus (Mitchill). Longhorn sculpin. Marine-27 ppt, polyhaline; rare to occasional; lower CB; winter. VIMS collection & records).
- Family Cyclopteridae - lumpfishes and snailfishes
- Cyclopterus lumpus Linnaeus. Lumpfish. Marine, polyhaline; occasional; lower CB; winter, early spring. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Dactylopteridae - flying gurnards
- Dactylopterus volitans (Linnaeus). Flying gurnard. Marine; rare; fall; lower CB. (Hildebrand & Schroeder, 1928).
- Order Pleuronectiformes (Heterosomata)
- Family Bothidae - lefteye flounders (Gutherz, 1967; Ginsburg, 1952b; Norman, 1934; Parr, 1931). Neoetropus macrops described by Hildebrand and Schroeder (1928) from CB is apparently a reversed (teratological) specimen of E. microstomus. Reported differences in morphometrics between these two forms may be attributed to the small size of N. macrops, which exhibits juvenile proportions, i.e., shallower body and longer head and eyes typical also of E. microstomus. Massmann (1958 *et seq*) listing of Citherichthys macrops from Chesapeake Bay was apparently in reference to Neoetropus. Citherichthys macrops Dresel is a distinct taxon and to my knowledge has not been recorded from CB or the mid-Atlantic Bight.
- Etropus crossotus Jordan & Gilbert. Fringed flounder. Marine-18 ppt., polyhaline; rare to occasional; lower CB; spring, summer, fall. (Hildebrand & Schroeder, 1928; VIMS coll.).
- Etropus microstomus (Gill). Smallmouth flounder. Marine-7 ppt, meso-polyhaline; common; lower CB; all year; channels, mud bottom. (Hildebrand and Schroeder, 1928; VIMS records).
- Paralichthys dentatus (Linnaeus). Summer flounder. Marine-6 ppt, meso-polyhaline; occasional to common, upper CB; common to abundant, lower CB; spring, summer, fall; flats to channel edges; migrates offshore in winter; major commercial & sport importance. (Hildebrand & Schroeder, 1928; VIMS records).
- Scophthalmus aquosus (Mitchill). Windowpane. Marine-13 ppt, meso-polyhaline; occasional to common, upper CB; common to abundant, lower CB; extends to lower part of salinity range; winter, spring; present entire year. (Hildebrand & Schroeder, 1928; VIMS records).
- Family Pleuronectidae - righteye flounders (Bigelow & Schroeder, 1953; Norman, 1934).
- Hippoglossus hippoglossus (Linnaeus). Atlantic halibut. Marine; rare; lower CB; winter; northern stray. (Walford, 1946).
- Limanda ferruginea (Storer). Yellowtail flounder. Marine; rare; lower CB; winter; northern stray. (Uhler & Lugger, 1876).
- Pseudopleuronectes americanus (Walbaum). Winter flounder. Estuarine-5-30 ppt, meso-polyhaline; common to abundant, upper CB; occasional to common, lower CB; flats, channel edges, late fall, winter, spring; deeper channels or migrates offshore, summer; minor commercial importance. (Hildebrand & Schroeder, 1928; VIMS records).

## Family Soleidae - soles

Trinectes maculatus (Bloch & Schneider). Hogchoker. Estuarine-0-32 ppt, oligo-polyhaline; abundant, entire year; entire CB; channels, channel edges, mud bottoms; young on shallow mud flats, summer. (Dovel et al, 1969; Hildebrand & Schroeder, 1928; VIMS records).

## Family Cynoglossidae - tonguefishes (Ginsburg, 1951).

Symphurus plagiusa (Linnaeus). Blackcheek tonguefish. Marine-7 ppt, meso-polyhaline; all year; channels, mud bottom; common, lower CB; occasional, upper CB. (Hildebrand & Schroeder, 1928; VIMS records).

## Order Tetraodontiformes (Plectognathi)

Family Balistidae - triggerfishes and filefishes (Berry & Vogele, 1961; Moore, 1967; Randall, 1964).

Aluterus schoepfi (Walbaum). Orange filefish. Marine-16.4 ppt, polyhaline; occasional, upper CB; common, lower CB; summer; deeper bars, spits, often seen drifting beneath jellyfish, nipping at tentacles. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).

Balistes capriscus Gmelin. Gray triggerfish. Marine-25 ppt, polyhaline; occasional, lower CB; summer. (Hildebrand & Schroeder, 1928; VIMS records).

Stephanolepis hispidus (Linnaeus). Planehead filefish. Marine-19 ppt, polyhaline; occasional, lower CB; summer, fall. (Stephanolepis = Monacanthus, after Berry & Vogele (1961), and Bohlke & Chaplin (1968). (Hildebrand & Schroeder, 1928; VIMS records).

## Family Ostraciidae - boxfishes (Bohlke &amp; Chaplin, 1968; Tyler, 1965).

Lactophrys quadricornis (Linnaeus). Scrawled cowfish. Marine; rare; lower CB; tropical stray. (Goode, 1880; Bohlke & Chaplin, 1968).

Lactophrys trigonus (Linnaeus). Trunkfish. Marine; rare, summer, lower CB; tropical stray. (Hildebrand & Schroeder, 1928; VIMS records).

## Family Tetraodontidae - puffers (Shipp &amp; Yerger, 1969a, b).

Lagocephalus laevigatus (Linnaeus). Smooth puffer. Marine; summer, fall; rare, upper CB; occasional, lower CB. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).

Sphoeroides maculatus (Bloch and Schneider). Northern puffer. Marine-9 ppt, meso-polyhaline; spring, summer, fall; channel edges, flats; abundant, lower CB; occasional, upper CB; migrates north in winter; major commercial and minor sport importance. (Hildebrand & Schroeder, 1928; VIMS records).

Sphoeroides testudineus (Linnaeus). Checkered puffer. Marine; rare; lower CB; questionable record: (Lugger, 1877).

## Family Diodontidae - porcupinefishes (Bohlke &amp; Chaplin, 1968).

Chilomycterus schoepfi (Walbaum). Striped burrfish. Marine-2 ppt, polyhaline; common; summer, fall; upper and lower CB; deep flats, channel edges; migrates south, winter. (Hildebrand & Schroeder, 1928; Schwartz, 1960d; VIMS records).

Diodon hystrix Linnaeus. Porcupinefish. Marine; rare; lower CB; summer. (Uhler & Lugger, 1876; Truitt et al, 1929).

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## CHAPTER VII:

## Herptiles of the Maryland and Virginia Coastal Plain

J. A. Musick

This list includes 43 species of amphibians and 59 species of reptiles reported from the coastal plain of Virginia and Maryland. Included among the Amphibia are 1 species of siren; 17 species, 10 genera and 6 families of salamanders; and 25 species, 8 genera and 5 families of frogs. The reptiles include 24 species, 15 genera and 6 families of turtles; 7 species, 5 genera and 4 families of lizards; and 28 species, 17 genera and 2 families of snakes.

Distribution: The most notable feature of the distribution of herptiles in our region is the rapid depauperization of the fauna from southern Virginia northward. Siren lacertina, Amphiuma means, Necturus punctatus, Desmognathus auriculatus, Stereochilus marginatus, Eurycea longicauda guttolineata, Gastrophryne carolinensis, Bufo terrestris, B. quercicus, Hyla femoralis; H. gratiosa, H. squirella, Limnaeodes ocularis, Acris g. gryllus, Pseudacris brimleyi, Chrysemys c. concinna, C. f. floridana, C. s. scripta, Deirochelys reticularia, Eumeces inexpectatus, Cnemidophorus sexlineatus, Ophisaurus attenuatus longicaudus, Natrix e. erythrogaster, N. taxispilota, Regina rigida, Virginia striatula, Farancia a. abacura, F. e. erythrogramma, Lampropeltis calligaster rhombomaculata, Agkistrodon p. piscivorus and Crotalus horridus atricaudatus all reach their normal northern limit of distribution in the Chesapeake Bay region. Most of these species are derived from the diverse austroriparian fauna to the south. Conversely several northern forms reach their southern limit of distribution on the coastal plain in the region. Most of these species become more montane in distribution from north to south. Included within the northern group are Desmognathus fuscus, Hemidactylus scutatum, Rana sylvatica, Bufo americanus, Hyla versicolor, Acris c. crepitans, Pseudacris triseriata kalmi, Regina septemvittata and Diadophis punctatus edwardsi.

The physiography of the study area is such that the coastal plain may be conveniently divided into 7 geographic regions for faunal analysis. "Southside" Virginia is the area south of the James River. The "Lower Peninsula" is bounded by the James and York rivers; the "Middle Peninsula" by the York and Rappahannock rivers and the "Northern Neck" by the Rappahannock and Potomac rivers. The coastal plain on the "Western Shore, Maryland" becomes narrower toward the head of Chesapeake Bay where the coastal plain fauna encroaches by way of river flood plains into the piedmont. This encroachment is greatest along the largest river, the Susquehanna, which with the adjacent Eastern Shore peninsula, Elk Neck, will be treated herein as a discrete area called "Bay Head." Elk Neck, although coastal plain in physiography, is more closely allied to the piedmont in ecology (Conant, 1945). The remaining geographic area is the Eastern Shore of Maryland and Virginia, which comprises the southwestern portion of the Delmarva peninsula.

Discounting sea turtles and introductions, the ranges of 82 species of herptiles include "Southside" Virginia (table 1); whereas the adjacent peninsula to the north, the Lower Peninsula, is included within the ranges of only 68 species. From there the number of species decreases from 61 on the Middle Peninsula to 60 on Northern Neck, 58 on W. Shore, Maryland and 54 in the Bay Head area. The E. Shore has 55 species. Four species are found only in the Bay Head area. Of these, Cryptobranchus allegheniensis and Malaclemys geographica are Susquehanna relicts of the Mississippi fauna and are absent from all other Atlantic slope drainages, whereas Clemmys insculpta and C. mühlenbergi are piedmont and montane forms in Maryland and Virginia but occur in the Bay Head area undoubtedly because of the piedmont influences on the ecology there.

Format: Taxa above the generic level are arranged phylogenetically. Within each species account are given details of the geographical distribution within the Maryland and Virginia coastal plain, comments on ecology and maximum size attained. The last is from Conant (1958) and method of mensuration depends on the taxon and is stated after each order or infraorder. Literature citations follow each species account and may include reference to the Virginia Herpetological Society (VHS) records of specimens housed in various museums. The



following abbreviations will be used to designate respective institutions: American Museum of Natural History, AMNH; Carnegie Museum, CM; Cornell University, CU; Ohio State University, OSU; National Museum of Natural History, USNM; University of Michigan, UM; Museum of Comparative Zoology, MCZ.

Previous works: The literature on the herpetology of Maryland and Virginia is voluminous, scattered and varied in competence from undocumented heresay (Carroll, 1950) to the excellent monograph of McCauley (1945). Local faunal lists (Hay, 1902; Dunn, 1920) have contributed much to the accumulated knowledge published in recent more inclusive lists (Harris, 1969).

I have attempted to review most of the Virginia and Maryland literature on coastal plain herptiles and have also included new distributional information based on VIMS collections. Certain Maryland publications (Harris, 1966a, b, 1968a, b; Fowler, 1945; Prince et al, 1955; Nemuras et al, 1966; Wells, 1968) have been unavailable to me to date but information therein has been summarized by Harris (1969). For those interested in identifying herptiles, Conant's (1958) Field Guide is unsurpassed for lay use and quite valuable to scientists. In addition, references cited herein after the order or infraorder will be helpful to herptile identification.

Acknowledgements: I wish to thank J. D. Hardy for his cooperation in obtaining literature and specimens and in sharing information on ecology and distribution of herptiles. Dr. G. R. Brooks of the College of William and Mary has likewise provided literature, range record information and specimens and has also made available to me distributional maps prepared by the Virginia Herpetological Society over a period of years under the direction of W. L. Witt and F. J. Tobey. In addition Mr. Tobey provided information on middle peninsula distribution records (in litt) and on the location of voucher specimens for various counties. Much of the information herein derives directly from the devoted work done by many members of VHS and the Maryland Herpetological Society over several years. Their contributions are and will be valuable additions to knowledge so long as the societies continue to insist that members place voucher specimens in established, cataloged collections to document new distributional records. Lastly I wish to thank Dr. Marvin Wass for his editorial assistance, Pam Townsend for typing the manuscript and Linda Pushee for preliminary editing.

## Zoogeography of Chesapeake Bay Herptiles

| SPECIES                                | SS  | LP | MP | NN | WM | BH | ES  |
|--|-----|----|----|----|----|----|-----|
| <u>Siren lacertina</u>                 |     |    |    |    | →  |    |     |
| <u>Cryptobranchus a. alleganiensis</u> |     |    |    |    |    | X  |     |
| <u>Ambystoma maculatum</u>             | ←   |    |    |    |    |    | →   |
| <u>Ambystoma opacum</u>                | ←   |    |    |    |    |    | →   |
| <u>Ambystoma t. tigrinum</u>           | ←-? | -? |    | -? | X  |    | X-→ |
| <u>Amphiuma m. means</u>               |     | →  |    |    |    |    |     |
| <u>Notophthalmus v. viridescens</u>    | ←   |    |    |    |    |    | →   |
| <u>Necturus p. punctatus</u>           | →   |    |    |    |    |    |     |
| <u>Desmognathus f. fuscus</u>          |     | ←  |    |    |    |    |     |
| <u>Desmognathus auriculatus</u>        | →   |    |    |    |    |    |     |
| <u>Stereochilus marginatus</u>         | →   |    |    |    |    |    |     |
| <u>Plethodon c. cinereus</u>           | ←   |    |    |    |    |    | →   |
| <u>Plethodon g. glutinosus</u>         | ←   |    |    |    | →  |    |     |
| <u>Hemidactylium scutatum</u>          |     | ←  |    |    |    |    | →   |
| <u>Pseudotriton r. ruber</u>           | ←   |    |    |    |    |    | →   |
| <u>Pseudotriton m. montanus</u>        | ←   |    |    |    |    |    | →   |
| <u>Eurycea b. bislineata</u>           | ←   |    |    |    |    |    | →   |
| <u>Eurycea longicauda guttolineata</u> |     |    |    |    | →  |    |     |
| <u>Scaphiopus h. holbrooki</u>         | ←   |    |    |    |    |    | →   |
| <u>Rana catesbeiana</u>                | ←   |    |    |    |    |    | →   |
| <u>Rana clamitans melanota</u>         | ←   |    |    |    |    |    | →   |
| <u>Rana palustris</u>                  | ←   |    |    |    |    |    | →   |
| <u>Rana sphenoccephala</u>             | ←   |    |    |    |    |    | →   |
| <u>Rana sylvatica</u>                  |     |    |    |    | ←  |    |     |
| <u>Rana virgatipes</u>                 | ←   | →  |    |    |    |    | ←   |
| <u>Gastrophryne carolinensis</u>       | ←   |    |    |    | →  |    | X   |
| <u>Bufo a. americanus</u>              |     | ←  |    |    |    |    | →   |
| <u>Bufo fowleri</u>                    | ←   |    |    |    |    |    |     |
| <u>Bufo terrestris</u>                 | →   |    |    |    |    |    |     |
| <u>Bufo quercicus</u>                  | →   |    |    |    |    |    |     |

SS= Southside, LP= Lower Peninsula, MP= Middle Peninsula, NN= Northern Neck, WM= Western Shore, Md., BH= Bay Head, ES= Eastern Shore.

|  | SS | LP    | MP | NN | WM | BH | ES |
|--|----|-------|----|----|----|----|----|
| <u>Hyla chrysoscelis</u>                 |    |       |    |    | →  |    | ←  |
| <u>Hyla versicolor</u>                   |    |       |    |    | ←  |    | ?  |
| <u>Hyla c. cinerea</u>                   | ←  |       |    |    |    |    | →  |
| <u>Hyla c. crucifer</u>                  | ←  |       |    |    |    |    | →  |
| <u>Hyla femoralis</u>                    |    |       | →  |    |    |    |    |
| <u>Hyla gratiosa</u>                     | →  |       |    |    |    |    |    |
| <u>Hyla squirella</u>                    | →  |       |    |    |    |    |    |
| <u>Limnaeodes ocularis</u>               | →  |       |    |    |    |    |    |
| <u>Acris c. crepitans</u>                |    | ←     |    |    |    |    | →  |
| <u>Acris g. gryllus</u>                  | →  |       |    |    |    |    |    |
| <u>Pseudacris brimleyi</u>               |    |       | →  |    |    |    |    |
| <u>Pseudacris t. feriarum</u>            |    |       |    |    |    | ?  |    |
| <u>Pseudacris triseriata kalmi</u>       |    |       |    |    |    | ?  | ←  |
| <u>Chelydra s. serpentina</u>            | ←  |       |    |    |    |    | →  |
| <u>Sternotherus odoratus</u>             | ←  |       |    |    |    |    | →  |
| <u>Kinosternon s. subrubrum</u>          | ←  |       |    |    |    |    | →  |
| <u>Clemmys guttata</u>                   | ←  |       |    |    |    |    | →  |
| <u>Clemmys insculpta</u>                 |    |       |    |    |    | X  |    |
| <u>Clemmys muhlenbergi</u>               |    |       |    |    |    | X  |    |
| <u>Terrapene c. carolina</u>             | ←  |       |    |    |    |    | →  |
| <u>Malaclemys t. terrapin</u>            | ←  |       |    |    |    |    | →  |
| <u>Malaclemys geographica</u>            |    |       |    |    |    | X  |    |
| <u>Chrysemys p. picta</u>                | ←  |       |    |    |    |    | →  |
| <u>Chrysemys c. concinna</u>             |    | ----- |    |    | →  |    |    |
| <u>Chrysemys f. floridana</u>            | →  |       |    |    |    |    |    |
| <u>Chrysemys rubriventris</u>            | ←  |       |    |    |    |    | →  |
| <u>Chrysemys scripta troosti</u>         | →  |       |    |    |    |    |    |
| <u>Deirochelys r. reticularia</u>        | →  |       |    |    |    |    |    |
| <u>Sceloporus undulatus hyacinthinus</u> | ←  |       |    |    |    |    | →  |
| <u>Eumeces fasciatus</u>                 | ←  |       |    |    |    |    | →  |
| <u>Eumeces inexpectatus</u>              |    |       |    | →  |    |    |    |
| <u>Eumeces laticeps</u>                  | ←  |       |    |    |    |    | →  |
| <u>Lygosoma laterale</u>                 | ←  |       |    |    | →  | ?  | ←  |

|  | SS | LP | MP | NN | WM | BH | ES |
|--|----|----|----|----|----|----|----|
| <u>Cnemidophorus sexlineatus</u>               |    |    |    |    |    |    |    |
| <u>Ophisaurus attenuatus longicaudus</u>       |    |    |    |    |    |    |    |
| <u>Natrix e. erythrogaster</u>                 |    |    |    |    |    |    |    |
| <u>Natrix s. sipedon</u>                       |    |    |    |    |    |    |    |
| <u>Natrix taxispilota</u>                      |    |    |    |    |    |    |    |
| <u>Regina r. rigida</u>                        |    |    |    |    |    |    |    |
| <u>Regina s. septemvittata</u>                 |    |    |    |    |    |    |    |
| <u>Thamnophis s. sauritus</u>                  |    |    |    |    |    |    |    |
| <u>Thamnophis s. sirtalis</u>                  |    |    |    |    |    |    |    |
| <u>Storeria d. dekayi</u>                      |    |    |    |    |    |    |    |
| <u>Storeria o. occipitomaculata</u>            |    |    |    |    |    |    |    |
| <u>Virginia striatula</u>                      |    |    |    |    |    |    |    |
| <u>Virginia v. valeriae</u>                    |    |    |    |    |    |    |    |
| <u>Heterodon platyrhinos</u>                   |    |    |    |    |    |    |    |
| <u>Diadophis p. punctatus</u>                  |    |    |    |    |    |    |    |
| <u>Carphophis a. amoenus</u>                   |    |    |    |    |    |    |    |
| <u>Farancia a. abacura</u>                     |    |    |    |    |    |    |    |
| <u>Farancia e. erythrogrammus</u>              |    |    |    |    |    |    |    |
| <u>Coluber c. constrictor</u>                  |    |    |    |    |    |    |    |
| <u>Opheodrys aestivus</u>                      |    |    |    |    |    |    |    |
| <u>Elaphe g. guttata</u>                       |    |    |    |    |    |    |    |
| <u>Elaphe o. obsoleta</u>                      |    |    |    |    |    |    |    |
| <u>Lampropeltis calligaster rhombomaculata</u> |    |    |    |    |    |    |    |
| <u>Lampropeltis g. getulus</u>                 |    |    |    |    |    |    |    |
| <u>Lampropeltis triangulum temporalis</u>      |    |    |    |    |    |    |    |
| <u>Cemophora coccinea copei</u>                |    |    |    |    |    |    |    |
| <u>Agkistrodon contortrix mokasen</u>          |    |    |    |    |    |    |    |
| <u>Agkistrodon p. piscivorus</u>               |    |    |    |    |    |    |    |
| <u>Crotalus horridus atricaudatus</u>          |    |    |    |    |    |    |    |

## Class Amphibia

Order Trachystomata, one family in our area. (Bishop, 1943). Maximum size of sirens given herein is total length from tip of snout to tip of tail.

Family Sirenidae - Sirens, one species in our area.

Siren lacertina Linnaeus. Greater siren. Rare to occasional; scattered localities on western shore of CB as far north as Washington, D.C.; restricted to coastal plain; aquatic; has been taken in brackish water (Neill, 1958); shallow ponds, ditches, sluggish streams; max. size, 36 in. /Dunn, 1918; Hay, 1902; Werler & McCallion, 1951; (VHS; USNM)/.

Order Caudata - Salamanders, six families in our area. (Bishop, 1947; Keller, 1954; Worthington, 1968). Maximum size of salamanders given herein is total length from tip of snout to tip of tail.

Family Cryptobranchidae - hellbenders, one species in our area.

Cryptobranchus a. allegheniensis (Daudin). Hellbender. Rare; Susquehanna drainage only; Cecil Co., Md.; more abundant above fall line; aquatic; clear, cool, rapid streams with boulders; habitat endangered by industrialization, stream channelization, and mining; max. size, male, 22 in., female, 29 1/8 in. (Conant, 1945; Dundee, 1971; Fowler, 1915, 1947a; Harris, 1969).

Family Ambystomatidae - Mole salamanders, three species in our area.

Ambystoma maculatum (Shaw). Spotted salamander. Locally rare to abundant, entire area; no records on E. Shore of CB south of Talbot Co., Md. or W. Shore south of James R. on coastal plain, although present on N.C. coastal plain; breeds in temporary ponds; early spring; fossorial remainder of year; mixed deciduous forest, taken from beneath driftwood on sand beach 20 ft. from CB, Calvert Co., Md.; max. size, 9 in. /Anderson, 1967b; Anon., 1971; Brittle, 1969; Cargo, 1960; Conant, 1945; Dunn, 1918; Hardy, 1952; Hardy & Mansueti, 1962; Harris, 1969; Klimkiewicz, 1972b; Wood & Wilkinson, 1952; (VHS; USNM, AMNH, UM)/.

Ambystoma opacum. (Gravenhorst). Marbled salamander. Locally common to abundant, entire area; no records E. Shore, Va., but probably occurs; nests in fall in dry pond beds; eggs hatch in spring rains; pine woods, sandy soils; adults terrestrial, fossorial; reported from under debris on Potomac R. tidal flats; max. size, 5 in. /Anderson, 1967a; Anon., 1971; Buxbaum & Mansueti, 1942; Conant, 1945; Dunn, 1917, 1918; Hardy & Mansueti, 1962; Harris, 1969; Hoffman, 1947; Klimkiewicz, 1972b; Mansueti, 1943; Noble & Brady, 1933; Stine, 1953; Werler & McCallion, 1951; (VHS; USNM, AMNH, CM)/.

Ambystoma t. tigrinum (Green). Eastern tiger salamander. Rare or absent, Va.; rare or extinct, W. Shore, Md.; locally common, E. Shore, Md.; south to include Dorchester and N. Worcester Co.'s.; breeds in temporary ponds in cornfields, etc.; late winter, adults fossorial rest of year; max. size, 13 in. /Anon., 1971; Conant, 1945; Dunn, 1918; Gelbach, 1967; Harris, 1969; Stine, 1953; Stine et al, 1954; (VHS; USNM)/.

Family Amphiumidae - Amphiumas, one species in our area.

Amphiuma m. means Garden. Two-toed amphiuma. Locally rare to common, Va., north to Pamunkey R., Indian Reservation, King William Co. and New Kent Co., Va.; York River drainage; aquatic; ditches, pools, swamps, streams, and in crayfish burrows; max. size, 40 in. /Dunn, 1918; Engeling, 1969a; Richmond, 1945; Smith, 1899; Werler & McCallion, 1951; VIMS records; Wm. & Mary Coll.; (VHS; USNM, AMNH, CM, UM)/.

Family Salamandridae - Newts, one species in our area.

Notophthalmus v. viridescens (Rafinesque). Red-spotted newt. Locally common, entire area except records lacking for E. Shore from Caroline Co., Md., to Accomac Co., Va.; adults aquatic; ponds; juveniles terrestrial, "red-eft" terrestrial stage often omitted in coastal plain populations; max. size, 15 in. /Brittle, 1969; Cooper, 1953; Dunn, 1918; Engeling, 1969a; Hardy & Mansueti, 1962; Harris, 1969; Klimkiewicz, 1972a; Meham, 1967; Richmond & Goin, 1938; Reinke & Chadwick, 1940; Werler & McCallion, 1951; Wood & Goodwin, 1954; (VHS; USNM, CM)/.

Family Proteidae - mud puppies and waterdogs

Necturus p. punctatus (Gibbes). Dwarf waterdog. Rare, recorded in area only in SE Va. north to Dinwiddie Co. in Chowan R. drainage; aquatic; sluggish streams, backwaters, sandy-muddy bottoms, under leaves and debris; max. size, 7 1/4 in. /Bishop, 1943; Conant, 1958; (VHS; CU)/.

Family Plethodontidae - Lungless salamanders, ten species and six genera in our area.

Desmognathus f. fuscus (Green). Northern dusky salamander. Common to abundant, entire area above James R. on W. Shore of CB and Wicomico Co., Md. on E. Shore; terrestrial but usually in very moist places; woodland streams, springs, ravines, under wet leaf litter; nests beneath rocks and logs adjacent to water in summer; max. size, 5 ¼ in. /Brittle, 1969; Conant, 1945; Dunn, 1918; Engeling, 1969a; Fowler, 1915; Hardy & Mansueti, 1962; Harris, 1969; Reed, 1957a; VIMS records; (VHS; USNM, CM)7.

Desmognathus auriculatus (Holbrook). Southern dusky salamander. Locally common, Dismal Swamp south; stagnant pools, cypress ponds, acid soil, beneath logs and bark, sandy streams; max. size, 4 ¾ in. /Werler & McCallion, 1951 (apparently as D. f. fuscus); Valentine, 1963; (VHS; USNM)7.

Stereochilus marginatus (Hallowell). Many-lined salamander. Common south of James R., Va.; aquatic, under logs and debris; swampy pools, backwaters, sluggish streams, gum-cypress forests; nests beneath logs or moss, Fontinalis in or at edge of water in spring; max. size, 4 ½ in. /Brady, 1927; Werler & McCallion, 1951; Wood & Rageot, 1918; (VHS; USNM, UM, CM)7.

Plethodon c. cinereus (Green). Red-backed salamander. Locally rare to abundant, entire area; terrestrial; under and in rotting logs; deciduous and coniferous woodlands; nests in rotting logs in summer; breeds in fall; max. size, 5 in. /Anon., 1970; Brittle, 1969; Conant, 1945; Cooper, 1959b; Dunn, 1918; Engeling, 1969a; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Harris, 1969; Reed, 1957a; Smith, 1963; Werler & McCallion, 1951; VIMS records; (VHS; USNM, UM, MCZ)7.

Plethodon g. glutinosus (Green). Slimy salamander. Locally rare to abundant, entire W. Shore, Va.; absent coastal plain Md. and entire E. Shore, CB; terrestrial; moist woodland, ravines; beneath litter and humus; nests beneath stumps, rocks and in crevices in summer; probably breeds in fall; max. size, 7 ¾ in. /Conant, 1945; Dunn, 1918; Harris, 1969; Hoffman, 1953; Marsiglia, 1950; Richmond & Goin, 1935; Werler & McCallion, 1951; (VHS; USNM, UM, CM)7.

Hemidactylium scutatum (Schlegel). Four-toed salamander. Locally common, entire W. Shore south to James R. and all E. Shore, Md.; no E. Shore, Va. records. Nests in sphagnum bogs in spring; adults terrestrial; hardwood or, occasionally, coniferous forests; max. size, 3 ½ in. /Conant, 1945; Dunn, 1918; Hardy & Mansueti, 1962; Harris, 1969; Mansueti & Simmons, 1943; Neill, 1963; Richmond & Goin, 1938; Wood, 1955; (VHS; USNM, UM)7.

Pseudotriton r. ruber (Sonnini). Northern red salamander. Occasional to locally common, W. Shore, Md. and Va., except no records below James R. on coastal plain; E. Shore south to Talbot Co., Md. Clear springs and rivulets under moss or debris; sandy-rocky substrates; nests submerged beneath rocks and logs in fall; max. size, 7 1/8 in. /Brittle, 1969; Conant, 1945; Dunn, 1918; Fowler, 1915; Hardy & Mansueti, 1962; Harris, 1969; Hoffman, 1953; VIMS records; (VHS; US, NM)7.

Pseudotriton m. montanus Baird. Eastern mud salamander. Occasional, all W. Shore, Md. and Va., south of Baltimore Co.; E. Shore, Md., Queen Annes Co. to Worcester Co.; small streams, muddy springs; nests on submerged leaves, debris in fall; max. size, 7 in. /Brady, 1924a; Conant, 1945; Dunn, 1918; Fowler, 1941, 1946a; Hardy & Mansueti, 1962; Hoffman, 1947; VIMS records; (VHS; USNM, CM, UM)7.

Eurycea b. bislineata (Green). Northern two-lined salamander. Occasional to common entire area; intergrades with E. b. cirrigera in southern Va.; brooks, springs, wet hillsides, under litter; breeds late winter, early spring; nests in running water beneath rocks, twigs in spring, summer; max. size, 4 ½ in. /Conant, 1945; Dunn, 1918; Engeling, 1969a; Fisher, 1887; Fowler, 1915; Hardy & Mansueti, 1962; Harris, 1969; Mittleman, 1966; Reed, 1957a, 1957b; Richmond, 1945b; Werler & McCallion, 1951; Wood, 1949, 1953; Wood & McCutcheon, 1954; Valentine, 1962; VIMS records; (VHS; USNM, UM)7.

Eurycea longicauda guttolineata (Holbrook). Three-lined salamander. Occasional, W. Shore of Va., only; swamps, ditches, springs, wet hillsides near streams; max. size, 7 1/8 in. /Brittle, 1969; Dunn, 1918; Engeling, 1969a; (VHS; USNM, UM)7.

- Order Salientia - Frogs & toads, five families in our area. (Altig, 1970; Livezey & Wright, 1947; Wright & Wright, 1949). Maximum size of frogs and toads given herein is "head-body" or "standard" length, the distance from the tip of the snout to the rear of the anus.
- Family Pelobatidae - Spadefoot toads, one species in our area.
- Scaphiopus h. holbrookii (Harlan). Eastern spadefoot toad. Locally abundant, entire region; fossorial and secretive, except at night during heavy rain when it forages on surface and breeds during summer; max. size, 2 7/8 in., sandy soils. (Burger, 1957; Conant, 1945; Hardy & Mansueti, 1962; Harris, 1969; Klimkiewicz, 1972a; Rageot, 1969; Reed, 1956b; 1957a; Richmond & Goin, 1938; Stine et al., 1956; VIMS records; Wasserman, 1968:70.1; (VHS; USNM, CM, AMNH)7.
- Family Ranidae - True frogs, seven species in our area.
- Rana catesbeiana (Shaw). Bullfrog. Locally common, entire region, ponds, marshes, backwaters, lake shores; breeds in mid-summer; minor commercial and sport value (frog legs); max. size, 8 in., our largest frog. (Anon., 1970; Conant, 1945; Dunn, 1918; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Harris, 1969; Reed, 1957a; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, UM)7.
- Rana clamitans melanota (Rafinesque). Green frog. Common, entire region, ditches, streams, ponds, swamps; breeds in spring, summer; max. size, 4 in. (Anon., 1970; Brady, 1927; Collins, 1966; Conant, 1945; Dunn, 1918; Engeling, 1969a; Fowler, 1915, 1925; Gronberger, 1915; Hardy & Mansueti, 1962; Klimkiewicz, 1972a; Reed, 1957a; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, AMNH, UM)7.
- Rana palustris Le Conte. Pickerel frog. Occasional, entire region, sphagnum bogs, cool streams, flooded meadows; breeds in early spring; max. size, 3 1/8 in. (Subspecies R. p. mansuetii, described from coastal sphagnum habitat, is not currently recognized but may prove to be valid when systematics have been thoroughly studied.) (Conant, 1945; Dunn, 1918; Gronberger, 1915; Hardy, 1964; Hardy & Mansueti, 1962; Harris, 1969; Reed, 1957a; Richmond & Goin, 1938; Schaaf & Smith, 1971:107.1; (VHS; USNM, CM)7.
- Rana sphenoccephala Cope. Southern leopard frog. Locally abundant, entire region, streams, ponds, marshes, lake shores; slightly brackish habitats; Rana sphenoccephalus has long been considered a subspecies of R. pipiens. I follow Cochran & Goin, 1970, because mounting evidence suggests the two forms are reproductively isolated (Littlejohn & Oldham, 1968)7; max. size, 5 in. (Brady, 1927; Engeling, 1969a; Hardy, 1952; Hardy & Mansueti, 1962; Klimkiewicz, 1972a; Neill, 1958; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, UM)7.
- Rana p. pipiens Schreber, Northern leopard frog. Common, above fall-line, may enter region along fall-line and at the head of CB in Md.; basically a Piedmont form; max. size, 4 1/8 in. (Harris, 1969; Klimkiewicz, 1972a).
- Rana sylvatica Le Conte. Wood frog. Occasional, entire Md. coastal plain; no records Va. E. Shore (but probably present); W. Shore Va., above fall-line except one Fairfax Co. locality along Potomac estuary; (Engeling's (1969a) record of this species from the lower peninsula is in error (Tobey pers. comm.)7; max. size, 3 3/4 in. (Conant, 1945; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Harris, 1969; Klimkiewicz, 1972a; Mansueti, 1955; Martof, 1970:86.1).
- Rana virgatipes Cope. Carpenter frog. Locally common, E. Shore Md.; Dorchester & Wicomico Co.'s. southward; unrecorded from E. Shore, Va., although probably present; on W. Shore only in Dismal Swamp, Va.; sphagnum bogs; breeds spring & summer; max. size, 2 5/8 in. (Reed's (1957a) record from Charles Co., Md., was based on a misidentification (Hardy, 1972a)7. (Brady, 1927; Conant, 1945, 1947; Dunn, 1918; Gosner & Black, 1968:67.1; Harris, 1969; Meanley, 1951; Reed, 1957b; Werler & McCallion, 1951; (VHS; USNM)7.

Family Microhylidae (Brevicipitidae) - Narrow-mouthed toads, one species in our area. (Wright & Wright, 1949).

Gastrophryne carolinensis (Holbrook). Eastern narrow-mouthed toad. Locally abundant, W. Shore, Va., north to Calvert & St. Mary's Co's. Md.; woodlands, swamp borders; secretive, under debris, in rotting logs, enters brackish habitats; breeds spring, summer; in flooded fields, marshy ponds; max. size, 1 7/16 in. /Collins, 1966; Conant, 1958b; Dunn, 1918; Fowler & Stine, 1953; Hardy, 1953; Hardy & Mansueti, 1962; Harris, 1969; Mansueti, 1942; Neill, 1958; Nelson, 1972a:120, 1972b; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM)7.

Family Bufonidae - Toads, four species in our area.

Bufo a. americanus Holbrook. American toad. Locally common, on E. Shore from Wicomico Co., Md. to Northampton Co., Va. and from head of CB (Cecil Co., Md.) to lower peninsula of Va. (New Kent Co.); upland areas, woods, fields; breeds in temporary ponds, backwaters, early spring; may interbreed with B. w. fowleri in scattered localities, usually where man has disturbed the environment; max. size, 4 1/4 in. /Conant, 1945; Dunn, 1918; Fowler, 1915; Hardy & Mansueti, 1962; Harris, 1969; Klimkiewicz, 1972a; Reed, 1957a; VIMS records; (VHS; USNM, CM, AMNH)7.

Bufo fowleri Hinckley. Fowler's toad. Abundant through entire region; ubiquitous; in fields, forests, swamps, sandy soils; often occurs on coastal islands; at edges of salt marsh; probably our most salt tolerant amphibian; breeds spring, summer, marshes, ponds, swamps, backwaters; max. size, 3 1/4 in.; (Brady's (1924b) record of Bufo americanus from Hog Island, Va. is probably attributable to B. fowleri). /Brady, 1927; Conant, 1945; Dunn, 1918; Engeling, 1969a; Fowler, 1925; Gronberger, 1915; Hardy & Mansueti, 1962; Harris, 1969; Neill, 1958; Reed, 1957a; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1969; (VHS; USNM, CM, AMNH)7.

Bufo terrestris Bonnaterre. Southern toad. Locally abundant, south of James R., Va. only; fields, swamps; pine woods; breeds early spring to late summer, temporary pools; has been taken close to brackish water; max. size, 3 7/8 in. /Brady, 1927; Neill, 1958; Werler & McCallion, 1951; (VHS; USNM)7.

Bufo quercicus Holbrook. Oak toad. Rare, in area south of James R., Va. only, pine woods; breeds spring to fall, pools, ditches, during heavy rains; has been taken on beaches close to brackish water; max. size, 1 1/4 in. /Cooper, 1950a; Hoffman, 1955; Neill, 1958; Rageot, 1969; (VHS; USNM)7.

Family Hylidae - Tree frogs, twelve species and four genera in our area.

Hyla chrysoscelis Cope. Southern gray tree frog. Locally common, W. Shore, Va. & Md., north to Anne Arundel Co., where range overlaps H. versicolor, a sibling species; distribution on E. Shore unclear but Delaware collections are 4:1 H. chrysoscelis : H. versicolor; brushy swamps; woodlands; breeds in summer; max. size, 2 3/8 in. (Hardy & Mansueti, 1962; (as H. versicolor); Hoffman, 1946; Noble & Hassler, 1936; Ralin, 1968; VIMS records; Zweifel, 1970).

Hyla versicolor Le Conte. Northern gray tree frog. Locally common, W. Shore above Anne Arundel Co., Md.; distribution on E. Shore unknown because of confusion in identification of H. versicolor & H. chrysoscelis; swamps, woodlands; breeds in summer; max. size, 2 3/8 in.; taken close to brackish environment. (Hoffman, 1946; Neill, 1958; Nobel & Hassler, 1936; Ralin, 1968; Zweifel, 1970).

Hyla c. cinerea (Schneider). Green tree frog. Locally abundant, entire region, marshes, ponds, often adjacent to CB, slightly brackish habitats; breeds in summer, pond edges, marshes; max. size, 2 1/2 in. (The race H. c. evittata described for the Potomac drainage is not sufficiently distinguishable from other CB populations to be considered a subspecies.) /Bartsch, 1944; Conant, 1945; Dunn, 1918, 1937; Fowler, 1915; Hardy, 1952; Hardy & Mansueti, 1962; Harris, 1969; Hoffman, 1955; Miller, 1899; Neill, 1958; Rageot, 1969; Reed, 1956c, 1957a, 1960; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, AMNH)7.



- Hyla c. crucifer Wied. Northern spring peeper. Locally common, entire region, wooded edges of ponds, marshes, swamps; breeds early spring; max. size, 1 3/8 in. /Collins, 1966; Conant, 1945; Dunn, 1918; Engeling, 1969a; Fowler, 1915; Hardy & Mansueti, 1962; Klimkiewicz, 1972a; Reed, 1957a, 1957b; VIMS records; (VHS; USNM, CM, AMNH)✓.
- Hyla femoralis Sonnini and Latreille. Pine woods tree frog. Locally common, only on W. Shore in Va. north to New Kent Co. and on middle peninsula (Gloucester Co.); pine woods, swamps, brackish marshes; max. size, 1 5/8 in. /A record of the species from Md. (Fowler & Orton, 1947) is considered to be invalid/. /Brady, 1927; Cooper, 1970; Fowler, 1969; Hardy & Mansueti, 1962; Neill, 1958; Rageot, 1969; VIMS records; (VHS; USNM, CM, OSU)✓.
- Hyla gratiosa Le Conte. Barking tree frog. Rare, W. Shore, Va., only, south of James R.; partially arboreal, pine woods, cypress swamp hammocks, occasional in brackish habitats; breeds spring, summer; max. size, 3 3/4 in. (Burger, 1961; Neill, 1958; Rageot, 1969).
- Hyla squirella Sonnini and Latreille. Squirrel tree frog. Locally common south of James R., Va.; ubiquitous, swamps, marshes, woodlands, gardens, close to brackish habitats; breeds, summer; max. size, 1/2 in. /Dunn, 1918; Hoffman, 1955; Rageot, 1969; (VHS; USNM)✓.
- Limnaeodius ocularis (Bosc & Daudin). Little grass frog. Rare, south of James R., Va.; roadside ditches, grassy edges of ponds; breeds in summer; max. size, 1 1/16 in.; our smallest frog; has been taken in salt marsh. /Burger, 1961; Neill, 1958; Rageot, 1969; (VHS; CM)✓.
- Acris c. crepitans Baird. Northern cricket frog. Common entire region north of James R. on coastal plain, entire E. Shore; meadow creeks, pond edges, marshes, swamps, fresh ponds adjacent to CB, subjected to seasonal inundation; breeds spring, summer; max. size, 1 3/8 in. /Collins, 1966; Conant, 1945; Engeling, 1969a; Fowler, 1915; Hardy & Mansueti, 1962; Klimkiewicz, 1972a; Mansueti, 1942; Reed, 1957a; VIMS records; (VHS; USNM, CM, UM, AMNH)✓.
- Acris g. gryllus (Le Conte). Southern cricket frog. Common, south of James R., Va.; pond edges, swamps, has been taken near brackish water; breeds spring to fall in rain; max. size, 1 1/4 in. /Engeling's (1969a) report of this species from the lower peninsula remains to be verified/. /Brady, 1927; Neill, 1958; Rageot, 1969; Werler & McCallion, 1951; (VHS; USNM, UM)✓.
- Pseudacris brimleyi Brandt & Walker. Brimley's chorus frog. Common to abundant W. Shore, Va. as far north as New Kent Co., and on middle peninsula (Gloucester Co.); flooded fields, marshes, abundant Back Bay; breeds late winter, spring; max. size, 1 1/4 in. /Gosner & Black, 1958; Richmond, 1952; VIMS records; Werler & McCallion, 1951; Witt, 1962; (VHS; USNM, CM)✓.
- Pseudacris triseriata feriarum. (Baird). Upland chorus frog. Abundant, entire W. Shore Md. & Va.; roadside ditches, swamps; breeds in winter, early spring; max. size, 1 3/8 in. /Dunn, 1918; Fowler, 1947b; Hardy & Mansueti, 1962; Harris, 1969; Klimkiewicz, 1972b; VIMS records; (VHS; USNM, CM, AMNH)✓.
- Pseudacris t. kalmi Harper. New Jersey chorus frog. Common, entire E. Shore Md. & Va.; roadside ditches, swamps; breeds late winter, spring; max. size, 1 3/8 in. /Gosner & Black, 1958; Harris, 1969; Mansueti, 1953; (VHS; USNM)✓.

#### Class Reptilia

Order Testudinata - Turtles, six families in our area. (Anon., 1968; Bierly, 1954; Carr, 1952; Harris, 1969; McCauley, 1945; Pope, 1939; Pritchard, 1967; Schwartz, 1967). Maximum size given herein is total weight in pounds or straight line length of upper shell (carapace) in inches. Sea turtle shell lengths, however, are measured along the curve.

Family Chelydridae - Snapping turtles, one species in our area.

Chelydra s. serpentina (Linnaeus). Common snapping turtle. Locally common, entire area; aquatic; tidal rivers, ponds, swamps, marshes; resident in brackish waters to at least 12 ppt.; minor commercial importance; max. size, 18 1/2 in. (86 lbs.). /Anon., 1968; Brittle, 1970; Conant, 1945; Dunn, 1918; Engeling, 1969a; Hardy & Mansueti, 1962; Harris, 1969; Mansueti, 1953a; Neill, 1958; Reed, 1957a; Werler & McCallion, 1951; VIMS records; (VHS; USNM, CM, MCZ)✓.

Family Kinosternidae - Musk and mud turtles, two species and two genera in our area.

Sternothaerus odoratus (Latreille). Stinkpot. Common, entire area; aquatic; sluggish streams, swamps, impoundments; rarely basks; unlike its relative Kinosternon, it rarely if ever enters brackish areas in CB, although reported to do so elsewhere by Neill, (1958); max. size, 5 3/8 in. /Anon., 1968; Collins, 1966; Conant, 1945; Dunn, 1918; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Harris, 1964; Reed, 1957a; Richmond & Goin, 1938; Schwartz, 1967; Werler & McCallion, 1951; (VHS; USNM, CM)7.

Kinosternon s. subrubrum (Lacepede). Eastern mud turtle. Common to abundant, entire region; aquatic, tidal marshes, sloughs, ditches; resident in brackish habitats to at least 12 ppt.; max. size, 4 7/8 in. /Conant, 1945; Dunn, 1918; Engeling, 1969a; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Harris, 1969; McCauley, 1945; Neill, 1958; Reed, 1957a; Richmond & Goin, 1938; Schwartz, 1967; Wetmore & Harper, 1917; VIMS records; (VHS; USNM, CM, AMNH)7.

Family Emydidae - Freshwater, marsh and box turtles, seventeen species and six genera in our area. (McDowell, 1964).

Clemmys guttata (Schneider). Spotted turtle. Locally rare to common, entire region; ponds, bogs, meadowbrooks, including heads of brackish marshes; max. size, 5 in. /Anon., 1968; Conant, 1945; Dunn, 1918; Engeling, 1969a; Ernst, 1972a:124.1; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Harris, 1969; McCauley, 1945; Neill, 1938; Reed, 1957a; Richmond & Goin, 1938; Schwartz, 1967; Werler & McCallion, 1951; VIMS records; (VHS; USNM, CM, AMNH)7.

Clemmys insculpta (Le Conte). Wood turtle. Rare, enters region only in NE Md. (Elk Neck; E. Shore, head of CB); terrestrial, but often in aquatic habitats; more abundant above fall-line; max. size, 9 in. (Conant, 1958b; Ernst, 1972b:125.1; Harris, 1969; Norden, 1967; Reed, 1956a; Schwartz, 1967; Williams & Handley, 1953).

Clemmys muhlenbergi (Schoepff). Bog turtle. Rare, enters region on flood plain of Susquehanna R. /Reports of this species from Fairfax Co., Va (Brady, 1924c) are in question (Klimkiewicz, 1972b) and its occurrence on the Va. coastal plain is doubtful7; meadow bogs, sluggish streams; endangered by destruction of habitat through draining and filling; max. size, 4 1/4 in.; listed in IUCN Red Book as rare (Honegger, 1968). (Barton & Price, 1955; Campbell, 1960; Cooper, 1949; Harris, 1969; McCauley, 1945; McCauley & Mansueti, 1943,44; Nemuras, 1966a, 1967, 1969; Schwartz, 1967).

Terrapene c. carolina (Linnaeus). Eastern bog turtle. Common to abundant, entire area; terrestrial; woodlands, fields; rarely aquatic but once observed swimming in 7 ft. of water, York R., Va., at ca 18 ppt. salinity; max. size, 6 1/2 in. /Anon., 1968; Conant, 1945; Dunn, 1918; Engeling, 1969a; Fowler, 1915; Hardy & Mansueti, 1962; Harrison, 1969; Neill, 1958; Reed, 1957a; Richmond & Goin, 1938; Schwartz, 1967; Stickel, 1950; VIMS records; Wood & Goodwin, 1954; (VHS; USNM, UM, AMNH)7.

Malaclemys t. terrapin (Schoepff). Northern diamond-backed terrapin. Estuarine, oligo-polyhaline, entire CB and most brackish tributaries; heads of tidal creeks, salt marshes; aquatic; occasionally basks on marsh; formerly of great commercial importance; decimated by over harvesting; recovering and abundant where marsh habitats remain intact; population increase in some areas apparently checked by incidental capture and death by drowning in crab pots; max. size, female, 8 3/4 in., male, 5 1/2 in. (Anon., 1968; Conant, 1945; Dunn, 1918; Engeling, 1969a; Hardy & Mansueti, 1962; Harris, 1969; Lawler & Musick, 1972; McCauley, 1945; Reed, 1957a; Schwartz, 1967; Werler & McCallion, 1951).

Malaclemys geographica (Lesueur). Map turtle. Uncommon, Susquehanna drainage (Harford & Cecil Cos., Md.); large open bodies of water, often basks; (Dunn's 1918 report of this species from Nansemond Co., Va. is undoubtedly in error or attributable to an introduction); max. size, female, 10 3/4 in., male, 6 1/4 in. (Conant, 1945; Harris, 1969; McCauley, 1945; Schwartz, 1967).

Malaclemys kohni (Baur). Mississippi map turtle. Introduced; one record from Patuxent R.; another, a juvenile, from Anne Arundel Co., Md.; native to Mississippi valley; max. size, female, 9 3/4 in., male, 5 in. (Cooper, 1961; Schwartz & Dutcher, 1961).

- Malaclemys pseudogeographica (Gray). False map turtle. Introduced but probably not established, Md.; one record; Alexandria, Va.; one record; native Mississippi valley; max. size, female, 9 in., male, 4 ½ in. (Dunn, 1918; Schwartz & Dutcher, 1961).
- Chrysemys p. picta (Schneider). Eastern painted turtle. Common to abundant, entire region; intergrades with C. p. marginata along fall-line; aquatic, often basks; lakes, marshes, sluggish streams, brackish parts of tidal rivers; max. size, 7 1/8 in. /Brady, 1927; Conant, 1945; Dunn, 1918; Ernst, 1971:106.1; Engeling, 1969a; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Neill, 1958; Reed, 1957a; Richmond & Goin, 1938; Werler & McCallion, 1951; VIMS records; (VHS; USNM, CM)7.
- Chrysemys c. concinna (Le Conte). River cooter. Detailed distribution in region poorly known; intergrades with C. f. floridana at and below fall-line; Piedmont rivers, scattered records north to Potomac R. (Fairfax Co.); /Recent authors (Cochran & Goin, 1970; Conant, 1958a; Crenshaw, 1955; Weaver & Rose, 1967) have accorded full species status to C. f. concinna. Chrysemys f. floridana and C. f. concinna certainly represent two separate but closely related phyletic lines and each form includes several geographic populations which are considered to be subspecies. However, because the concinna forms hybridize with floridana forms in the northern parts of their ranges, the recognition of concinna as a full species is here considered tentative pending detailed studies of northern populations of both forms7. /Dunn, 1918, 1920; McCauley, 1945; Weaver & Rose, 1967; Werler & McCallion, 1951; (VHS; USNM, MCZ, CM)7.
- Chrysemys f. floridana (Le Conte). Florida cooter. Detailed distribution in region poorly known; intergrades with C. c. concinna at and below fall-line; coastal plain in large permanent bodies of water, rivers, lakes, marshes with aquatic vegetation; reported as rare in Back Bay; recorded from brackish water; one record, probably an introduction, near Baltimore, Md. (Bayless, 1972; Neill, 1958; Schwartz, 1967; Weaver & Rose, 1967; Werler & McCallion, 1951).
- Chrysemys rubriventris (Le Conte). Red-bellied turtle. Common, entire region; large ponds, lakes, rivers, enters brackish waters; aquatic, often basks; max. size, 15 3/4 in. /Conant, 1945; Dunn, 1918; Hardy & Mansueti, 1962; Harris, 1969; Kramer, 1967; McCauley, 1945; Neill, 1958; Reed, 1957a; Richmond & Goin, 1958; Schwartz, 1967; Werler & McCallion, 1951; (VHS; USNM, MCZ, AMNH, CM)7.
- Chrysemys s. scripta (Schoepff). Yellow-bellied turtle. Scattered records, Va. north to lower peninsula and New Kent Co.; aquatic, basks; ponds, lakes; frequent introduction beyond normal range from pet trade; max. size, 10 3/4 in. /Engeling, 1969a; Reed, 1957a; (VHS; USNM, CM)7.
- Chrysemys scripta elegans (Wied). Red-eared turtle. Introduced and established in Md. near Baltimore, native to Mississippi valley; max. size, 11 in. (Cooper, 1959a, 1961a; Harris, 1969; Nemuras, 1964; Nemuras & Sparhawk, 1966).
- Chrysemys scripta troosti (Holbrook). Cumberland turtle. Introduced and established near Baltimore, Md.; native to Cumberland, Tennessee river valleys; max. size, 11 in. (Cooper, 1959; Harris, 1969; Mansueti, 1941).
- Deirochelys r. reticularia (Latreille). Eastern chicken turtle. One isolated population in ponds near Cape Henry, Virginia Beach, Va. (Cape Henry, Nansemond Co., locality given by Zug and Schwartz, 1971: 107.1 is in error). Nearest other population is south of Albemarle Sound, N.C.; ponds, marshes, sloughs and ditches; occasionally wanders on land, reported from brackish habitats; max. size, 10 in. (Neill, 1958; Rageot, 1968).
- Chinimys reevesi (Gray). Reeves turtle. (= Geoclemys reevesi). Introduced, one record from Anne Arundel Co., Md.; probably from pet trade; native to China and Japan; max. size, 4 in. (Cooper, 1961a).
- Family Cheloniidae - Sea turtles, four species and four genera in our area.
- Caretta c. caretta (Linnaeus). Atlantic loggerhead. Common, lower CB; occasional, upper CB; marine, but penetrates estuaries far into brackish water; nests in summer on Va. barrier beaches; may nest occasionally on Md. beaches; leaves CB in colder months; max. size, 84 in., 1000lbs.;

listed in IUCN Red Book as not in immediate danger, future precarious (Honegger, 1968). (Brady, 1924; Cooper, 1947; Dunn, 1918; Fowler, 1925; Hardy & Mansueti, 1962; Harris, 1969; Klimkiewicz, 1972a; McCauley, 1945; Mansueti, 1953; Reed, 1957a; VIMS records).

Chelonia m. mydas (Linnaeus). Atlantic green turtle. Rare in CB, marine, summer; max. size, 850 lbs., over 60 in., CB records mostly under 200 lbs. IUCN Red Book status, "drastically reduced - through over exploitation." (Honegger, 1968). (Agassiz, 1857; Brady, 1924; Engeling, 1969a; Hardy & Mansueti, 1962; Reed, 1957a; Robertson, 1947).

Eretmochelys i. imbricata (Linnaeus). Atlantic hawksbill. Rare, marine, known only from a shell labeled "Chesapeake Bay" in coll. of Nat. Hist. Soc. of Md.; max. size, 36 in., 100 lbs.; IUCN Red Book status, "a clearly endangered species" (Honegger, 1968).

Lepidochelys kempfi (Garman). Atlantic ridley. Occasional in CB, marine, summer; smallest marine species; max. size, 27 ½ in., IUCN Red Book status, "endangered" (Honegger, 1968). (Hardy, 1962; Hardy & Mansueti, 1962; Harris, 1969; Reed, 1957a; VIMS records).

Family Dermochelyidae - Leatherback turtles.

Dermochelys c. coriacea (Linnaeus). Atlantic leatherback. Occasional in CB; summer; marine; largest living turtle; max. size, 96 in., 1600 lbs.; IUCN Red Book status, "clearly endangered" (Honegger, 1968). (Agassiz, 1857; Ford 1879; Hardy, 1969; Hardy & Mansueti, 1962; Jones, 1968; Reed, 1957a; VIMS records).

Family Trionychidae - Softshell turtles.

Trionyx s. spinifera Leseuer. Eastern spiny softshell. Introduced; one record, Anne Arundel Co., Md.; native to St. Lawrence, Great Lakes and Mississippi R. drainages; max. size, female, 17 in., male, 8 ½ in. (Mansueti & Wallace, 1960).

Order Squamata - Lizards and snakes

Suborder Lacertilia - lizards, four families in our area. (Cooper, 1948a; Harris, 1969; McCauley, 1945; Smith, 1946; Tobey, 1972). (Size of lizards given herein is "snout-vent length" or so called "head-body length", the distance between the tip of the snout and the back of the anus.

Infraorder Iguania

Family Iguanidae - Iguanids, one species in our area. The green Anolis c. carolinensis has been reported from extreme S.E. Va. (Conant, 1958b; Tobey, 1972). These reports are based on sight records and no specimens have been found to substantiate the presence of the species in Va. The species is best excluded from the Va. list until voucher specimens have been collected.

Sceloporus undulatus hyacinthinus (Green). Northern fence lizard. Locally common, entire region; pine woods, dry uplands, field edges on logs, stumps, fences; breeds spring; nests late spring; max. size, 3 ¼ in. (Brittle, 1970; Collins, 1966; Conant, 1945; Dunn, 1918; Engeling, 1969a; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Klimkiewicz, 1972b; McCauley, 1945; McClellan et al, 1943; Reed, 1957a; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, AMNH)).

Infraorder Rhiptoglossa

Family Scinidae - Skinks, four species and 2 genera in our area. (Davis, 1968; Taylor, 1935)

Eumeces fasciatus (Linnaeus). Five-lined skink. Locally common entire region; woodland, saw-dust piles, abandoned out-buildings; breeds spring; nests late spring; max. size, 3 1/8 in. (Brady, 1921; Brittle, 1969; Conant, 1945; Davis, 1968; Dunn, 1918; Engeling, 1969a; Hardy & Mansueti, 1962; Klimkiewicz, 1972b; McCauley, 1945; Reed, 1957a; Richmond & Goin, 1938; Tobey, 1972; VIMS records; (VHS; USNM, CM, AMNH)).

Eumeces inexpectatus Taylor. Southeastern five-lined skink. Rare to locally abundant, W. Shore Va., absent Md. and E. Shore; bark and sawdust piles, woodlands; often arboreal, near ponds, found supratidally; max. size, 3 ¼ in. (Davis, 1968; Engeling, 1969a; Hoffman, 1953; Reed, 1957a; Richmond & Goin, 1938; Tobey, 1972; (VHS; USNM, CM, AMNH)).

Eumeces laticeps (Schneider). Broad-headed skink. Rare to locally common, entire region; woodlands, sawdust piles, standing hollow trees, often arboreal; breeds spring, nests mid-summer; max. size, 5 ½ in. /Conant, 1945; Davis, 1968; Fowler, 1946b; Hardy & Mansueti, 1962; Klimkiewicz, 1972b; Reed, 1957a; Richmond & Goin, 1938; Tobey, 1972; (VHS; USNM, CM, UM)7.

Lygosoma laterale (Say). Ground skink. Rare to locally abundant, W. Shore, Va. and Md. as far north as Anne Arundel Co.; E. Shore, Va. and Md. north to Talbot Co.; dry woodlands beneath litter, bark, etc.; nests mid-summer; max. size, 1 7/8 in. /Anon., 1970; Brady, 1927; Conant, 1945, 1958b; Dunn, 1918; Engeling, 1969a; Hardy & Mansueti, 1962; Harris, 1969; McCauley, 1945; Richmond & Goin, 1938; Tobey, 1972; (VHS; USNM, CM, UM, MCZ, AMNH)7.

Family Teiidae - Whiptails, one species on our area.

Cnemidophorus sexlineatus (Linnaeus). Six-lined race runner. Locally abundant; W. Shore Va. & Md., north to Baltimore; dry, open, sandy habitats often in association with Opuntia sp. cactus; often found on beaches in dunes; nests, summer; max. size, 3 in. /Collins, 1966; Dunn, 1918; Engeling, 1970; Hardy & Mansueti, 1962; Harris, 1969; McCauley, 1945; Reed, 1957a; Richmond & Goin, 1938; Tobey, 1972; (VHS; USNM, CM)7.

Infraorder Anguinoomorpha

Family Anguinidae - Lateral fold lizards, one species in our area. (Holman, 1971:110).

Ophisaurus attenuatus longicaudus McConkey. Eastern slender glass lizard. Rare, W. Shore Va., as far north as Hanover Co.; dry, grassy habitats; max. size, 11 3/8 in. /Burger, 1962; Holman, 1971:111; Tobey, 1972; (VHS; USNM, CM)7.

Suborder Serpentes - Snakes, two families in our area. (Harris, 1969; Kelly et al., 1936; McCauley, 1945; Tobey, 1964; Witt, 1962; Wright & Wright, 1957). Maximum size for snakes given herein is total length from tip of snout to tip of tail.

Infraorder Caenophidia

Family Colubridae - Colubrids, twenty four species and fourteen genera in our area. (A report of the pine snake, Pituophis m. melanoleucus from the Md. coastal plain (McCauley, 1945) is based on sight records. No specimens exist in established collections to substantiate the presence of this species on the coastal plain of Md. or Va. Thus I choose to omit it from the list for the present).

Natrix e. erythrogaster (Forster). Red-bellied water snake. Locally common W. Shore Va. north to lower peninsula (Newport News); E. Shore in Pocomoke R. drainage north to Wicomico and Dorchester Co's., Md., and into Delaware; /Cooper's 1969 report of this species from W. shore, Md., is of dubious validity (Hardy, 1972b; Harris, 1969)7; cypress swamps, ditches, canals; max. size, 62 in. /Conant, 1943, 1945; Engeling, 1970; Meanley, 1951; Werler & McCallion, 1951; VIMS records; (VHS; USNM, AMNH)7.

Natrix s. sipedon (Linnaeus). Northern water snake. Abundant entire region; may occasionally hybridize with N. fasciata in extreme S.E. Va., ubiquitous in aquatic habitats, lakes, streams, swamps, ponds, marshes, salt marshes; habitats with salinities at least as high as 12 ppt.; max. size, 51 in. /Brady, 1924b, 1927; Collins, 1966; Conant, 1945; Engeling, 1969a; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Klimkiewicz, 1972b; Neill, 1958; Reed, 1957a; Richmond & Goin, 1938; (VHS; USNM, CM, AMNH, UM)7.

Natrix taxispilota (Holbrook). Brown water snake. Common, W. Shore north to lower peninsula Va., New Kent Co., Chickahominy R., James drainage; cypress swamps, river "bottoms" lower flood plain; often basks in trees overhanging water, may enter brackish water; max. size, 69 in. /Neill, 1958; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM)7.

Regina r. rigida (Say). Glossy water snake. Locally occasional; isolated population New Kent Co., Va.; nearest other populations south of Albemarle Sound, N.C.; creeks, freshwater tidal marsh; may enter brackish water; max. size, 24 in. /Huheey, 1959; Huheey & Palmer, 1962; Neill, 1958; Richmond, 1940; (VHS; CM)7.

- Regina s. septemvittata (Say). Queen snake. Rare to occasional on coastal plain on E. Shore south to Kent Co., Md.; on W. Shore south to Caroline Co., Va., common above fall-line; small streams, marshes, climbs shrubs overhanging water; max. size, 36  $\frac{1}{4}$  in. (Collins, 1966; Conant, 1945; Hardy & Mansueti, 1962; Harris, 1969; McCauley, 1945; Murray, 1969).
- Thamnophis s. sauritus (Linnaeus). Eastern ribbon snake. Common, entire region; margins of ponds, streams, wet woods, marshes, behind barrier beaches; max. size, 38 in. /Conant, 1945; Engeling, 1969a; Fowler, 1915; Hardy & Mansueti, 1962; Klimkiewicz, 1972b; Neill, 1958; Reed, 1957a; Rossman, 1970; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, UM)✓.
- Thamnophis s. sirtalis (Linnaeus). Eastern garter snake. Common, entire region; ubiquitous; fields, edges of woodlands, margins of streams, ponds, marshes, adjacent to brackish water; max. size, 48 in. /Brittle, 1970; Collins, 1966; Conant, 1945; Engeling, 1969a; Fowler, 1951; Hardy & Mansueti, 1962; Harris, 1969; Klimkiewicz, 1972b; McCauley, 1945; Neill, 1958; VIMS records; Werler & McCallion, 1951; Witt, 1964; (VHS; USNM, CM)✓.
- Storeria d. dekayi (Holbrook). Northern brown snake. Locally rare to abundant, entire region; woodlands, fields, vacant lots in cities, gardens; max. size, 18  $\frac{1}{4}$  in. /Brittle, 1969; Conant, 1945; Engeling, 1969a; Fowler, 1925; Hardy & Mansueti, 1962; Klimkiewicz, 1972b; Reed, 1957a; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; Witt, 1962; (VHS; USNM, CM)✓.
- Storeria o. occipitamaculata (Storer). Northern red-bellied snake. Rare to occasional, entire region; no records E. Shore, Va., but probably present; dry upland woods, pine forest, woodland-field ecotones, under cover; max. size, 16 in. /Conant, 1945; Hardy & Mansueti, 1962; Klimkiewicz, 1972b; Reed, 1957a; Werler & McCallion, 1951; (VHS; USNM, CM)✓.
- Virginia striatula (Linnaeus). Rough earth snake. Occasional, W. Shore, Va., north to Henrico Co., and lower peninsula; secretive, woodland, beneath dead wood, leaves; max. size, 12  $\frac{3}{4}$  in. /Engeling, 1970; VIMS records; (VHS; USNM, CM, UM)✓.
- Virginia v. valeriae Baird & Girard. Eastern earth snake. Occasional, entire region; records lacking for Queen Anne's Co., south to Dorchester Co., E. Shore Md., and W. Shore Va., north of middle peninsula; secretive, fields, woodlands; max. size, 12  $\frac{5}{8}$  in. /Conant, 1945; Cooper, 1948b, 1958b; Fowler, 1925; Hardy & Mansueti, 1962; Murray, 1969; Reed, 1957a; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, UM)✓.
- Heterodon platyrhinos Latreille. Eastern hog-nose snake. Occasional to common entire region; dry sandy uplands, woods, fields, barrier beach dunes; one taken in York River in 12 m water, 20 ppt. salinity; max. size, 43 in. /Brady, 1924; Collins, 1966; Conant, 1945; Engeling, 1969a; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Hardy & Olmon, 1971; Klimkiewicz, 1972a; Neill, 1958; Reed, 1957a; VIMS records; (VHS; USNM, CM, UM)✓.
- Diadophis p. punctatus (Linnaeus). Southern ring-necked snake. Rare to occasional, entire region; intergrades with D. p. edwardsi on E. Shore and along fall line; W. Shore, Md. specimens closer to edwardsi; damp wooded hillsides, under litter; max. size, 17  $\frac{1}{2}$  in. /Collins, 1966; Conant, 1945; Engeling, 1969a; Fowler, 1925; Hardy & Mansueti, 1962; Mansueti, 1942; McCauley, 1945; Reed, 1957a; Werler & McCallion, 1951; Witt, 1962; (VHS; USNM, CM, UM)✓.
- Carpophis a. amoenus (Say). Eastern worm snake. Locally rare to common, entire region; secretive; fossorial; woodlands; edges of fields; collected near CB under driftwood; max. size, 13 in. /Brittle, 1969, 1970; Conant, 1945; Engeling, 1969a; Hardy & Mansueti, 1962; Klimkiewicz, 1972a; Richmond & Goin, 1938; Reed, 1957a; VIMS records; (VHS; USNM, CM, UM, MCZ)✓.
- Farancia a. abacura (Holbrook). Eastern mud snake. Rare to occasional; north to James R., Va.; swamps, ditches, canals; found in salt marshes; max. size, 80 in. /Neill, 1958; Werler & McCallion, 1951; (VHS; USNM)✓.

- Farancia e. erythrogramma (Latreille). Rainbow snake. Rare to locally common; W. Shore; scattered localities north to Charles Co., Md., on the Potomac R.; no records for middle peninsula or Northern Neck, Va.; sandy fields adjacent to marshes; spring fed streams, partially fossorial; taken in salt water; max. size, 60 in. /Cooper, 1960; McCauley, 1939, 1945; Neill, 1958, 1964; Richmond, 1945a; Richmond & Goin, 1938; (VHS; USNM, CM, UM)7.
- Coluber c. constrictor Linnaeus. Northern black snake. Common, entire region; fields, edges of woodlands, barrier beach dunes, salt marsh edges; dry upland habitats; max. size, 73 in. /Brady, 1924b; Brittle, 1970; Collins, 1966; Conant, 1945; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Klimkiewicz, 1972a; Neill, 1958; Reed, 1957a; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, UM, AMNH)7.
- Opheodrys aestivus (Linnaeus). Rough green snake. Common, entire region, edges of fields, ponds, streams; climbs shrubs; cryptic, found in supratidal vegetation; max. size, 42 in. /Brady, 1924b; Collins, 1966; Conant, 1945; Engeling, 1969a; Fowler, 1925; Hardy & Mansueti, 1962; Murray, 1969; Neill, 1958; Reed, 1957a; Richmond, 1952; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, UM, AMNH)7.
- Elaphe g. guttata (Linnaeus). Corn snake. Rare to locally common; sandy pine woods; fields, farm lands; secretive; max. size, 72 in. /Brittle, 1969, 1970; Conant, 1945; Hardy & Mansueti, 1962; McCauley, 1945; Reed, 1957a; VIMS records; (VHS, UM)7.
- Elaphe o. obsoleta (Say). Black rat snake. Common; entire region; woodlands, farms, out buildings; partially arboreal; max. size, 101 in. /Brittle, 1970; Collins, 1966; Conant, 1945; Fowler, 1915, 1925; Hardy & Mansueti, 1962; Klimkiewicz, 1972a; Reed, 1957a; Richmond & Goin, 1938; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, UM, AMNH)7.
- Lampropeltis calligaster rhombomaculata (Holbrook). Mole snake. Locally common, W. Shore north to Baltimore, Md., partially fossorial; farm and woodlands; in contradiction to most reports, often seen active on surface during day in our area; max. size, 45 in. /Brittle, 1969; Cooper, 1961b; Harris, 1969; Howden, 1946; Murray, 1969; Nemuras, 1966b; VIMS records; (VHS; UM, CM)7.
- Lampropeltis g. getulus (Linnaeus). Eastern king snake. Occasional, entire region; sandy pine woods, near water; edges of swamps; max. size, 82 in. /Brady, 1927; Brittle, 1970; Collins, 1966; Conant, 1945; Engeling, 1969a; Fowler, 1925; Hardy & Mansueti, 1962; Nemuras, 1966b; VIMS records; Werler & McCallion, 1951; Witt, 1962; (VHS; USNM, CM, UM)7.
- Lampropeltis triangulum temporalis (Cope). Coastal plain milk snake. Rare, entire region; intergrades with L. t. triangulum along fall line, and L. t. doliata in southern Va. (W. Shore); sandy woodlands, burrows into rotting stumps & logs; secretive; max. size, 39 3/4 in. /Anon., 1959, 1970; Conant, 1945; Fowler, 1915; Hardy & Mansueti, 1962; Mansueti, 1962; Mansueti, 1942; McCauley, 1945; Reed, 1957a; Werler & McCallion, 1951; (VHS; USNM, MCZ, CM)7.
- Cemophora coccinea copei (Jan). Southeastern scarlet snake. Rare, E. Shore, Md., occasional to common W. Shore Md. & Va.; fossorial; secretive; edges of fields, pine woods; max. size, 32 1/4 in. /Conant, 1945, 1958b; Cooper, 1950b; Engeling, 1969a; Fowler, 1945a; Hardy & Mansueti, 1962; McCauley, 1945; VIMS records; Werler & McCallion, 1951; (VHS; USNM, CM, UM)7.
- Family Viperidae - Pit vipers, four species and three genera in our area. (VENOMOUS)
- Agkistrodon contortrix mokasen (Daudin). Northern copperhead. Locally common, entire region; shows characters intergradient with A. c. contortrix, on E. Shore and W. Shore in S. Va.; woodlands, farms, fields, in association with wild blueberry shrubs; VENOMOUS; max. size, 53 in. /Anon., 1970; Brittle, 1970; Collins, 1966; Conant, 1945; Engeling, 1969a; Hardy & Mansueti, 1962; Reed, 1957a; VIMS records; Werler & McCallion, 1951; Wood, 1954; (VHS; USNM, AMNH)7.

- Agkistrodon p. piscivorus (Lacepede). Eastern cottonmouth. Occasional to abundant, W. Shore Va., north to lower peninsula, Newport News; swamps, creeks, ditches, marshes, enters brackish water; VENOMOUS; max. size, 74 in. (Engeling, 1969a; de Rageot, 1969; Neill, 1958; VIMS records; Werler & McCallion, 1951; Witt, 1962; Wood, 1954).
- Sistrurus m. miliaris (Linnaeus). Carolina pigmy rattlesnake. Rare, one record, extreme S.E. Va., W. Shore, Virginia Beach; nearest population south of Albemarle Sound, Va.; may be introduction; VENOMOUS; max. size, 21 in. (Tobey, 1960; Witt, 1962).
- Crotalus horridus atricaudatus Latreille. Canebrake rattlesnake. Occasional to common, W. Shore, Va., north to lower peninsula, (Newport News), canebrakes, swamp edges, woodlands; VENOMOUS; max. size, 74 ½ in. (Engeling, 1969b; Tobey, 1960; VIMS records; Werler & McCallion, 1951; Wood, 1954).



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## BIRDS DEPENDENT ON OPEN WATER OR WETLANDS

Marvin L. Wass

Two volumes, both published in paperback and now out-of-print, are essential to a general knowledge of ornithology in Chesapeake Bay and adjacent environs. These are: A Checklist of the Birds of Virginia by Joseph J. Murray (1952) and Birds of Maryland and the District of Columbia by Robert E. Stewart and Chandler S. Robbins (1958). The latter volume is interesting because of its quantitative ecological information, with counts made of breeding pairs in many habitats. This work was obtained too late to include data for more than a few species in this compilation. Information contained herein is largely from Audubon Field Notes and its successor, American Birds. The Raven, journal of the Virginia Society of Ornithology, contains a great many records but a complete review of these and other journals must await a more definitive work.

Records of the past two decades provide much new data, particularly for the Eastern Shore. Christmas Bird Counts (CBC's) for Tidewater areas in Virginia, except Brooke, were checked for recent records. In these one can discern the effect on Back Bay of the dune-breaching Ash Wednesday storm of 1962, the erratic wanderings of ducks, and dramatic population changes in a few species.

This list contains 223 species. Most of these obviously depend on an aquatic habitat, but a number of fringe species, particularly swamp dwellers, are subjective, as are the Killdeer, Golden Plover, swallows and some sparrows. Those designated as occurring in swamps appear to be more common there than in upland forests, but only thorough censuses in varied habitats can verify this. Selection of swamp species was largely based on the Maryland account (Robbins and Stewart, 1958) and information provided by F. R. Scott. Five species, the Yellow-bellied Flycatcher, and the Connecticut, Palm, Tennessee and Wilson's Warblers breed in northern bogs but are not associated with wetlands here, although the Palm Warbler is most abundant coastwise.

I am particularly indebted to F. R. Scott for his categorization of the included species according to seasonal occurrence and preferred habitat. Of the 222 species, only 85 (38%) have bred recently in Virginia; 62 of these being fairly common to abundant (Table 2). Five other species, four waterfowl and the Great Black-backed Gull have recently bred on the Eastern Shore seaside but breeding populations were not established. Twelve species breed only locally and most have restricted nesting areas. Only nine species have populations stable all year; only two of these, the Oystercatcher and Belted Kingfisher, being truly water dependent. Although 93 species have occurred in all seasons; 31 of these do not normally breed here.

A total of 66 species are most common as transients, 53 are equally abundant in winter and as transients and 51 are equally present in summer and during migration. Only 3 birds, the Anhinga, Wilson's Petrel and Swainson's Warbler are most likely to be seen in summer; two arctic-boreal species, the Dovekie and Snow Bunting have occurred only in winter. The 39 stragglers, species occurring three times or less, may be divided into 17 summer wanderers and 22 boreal, or western strays. The Black-capped Petrel and the White-tailed Tropicbird were single hurricane waifs found inland and not known from the coastal plain. Exotic waterfowl occasionally escape, and the Cinnamon Teal which nested at Ocean City may have been such a bird. Other stragglers will arrive, but some, e.g. Bachman's Warbler, are unlikely to appear again.

The Peregrine Falcon nested in western Virginia until 1947 and the Golden Eagle may once have nested there (Murray, 1952). As these great raptors were declining, the Glossy Ibis and Cattle Egret were becoming common to abundant on the Eastern Shore. From the north the Herring and Great Black-backed Gulls were increasing, both finally nesting on the Eastern Shore. Although spectacular, they seem poor substitutes for the Caspian and Roseate terns which once nested there; nor for the Short-eared Owl and Marsh Hawk which may have controlled microtines in summer.

Of greater ecological interest is the habitat information provided by Scott. His categories are open water, marsh, wooded swamp and beach. Open water is divided into ocean, seaside estuaries (Eastern Shore bays), Chesapeake Bay (includes estuarine tributaries), and fresh water. Marshes are either salt or fresh. Assigning species to these various habitat categories, or combinations thereof, reveals some of the complexity of the aquatic ecosystem in the lower Bay.

Under the heading of open water, 86 species are entered, 16 oceanic, 22 fresh water, five from seaside estuaries and four in Chesapeake Bay. The 42 species less restricted to habitat have 12 in all areas except freshwater, 11 in the Bay and fresh water, seven in the ocean-Chesapeake Bay and Chesapeake Bay-estuarine bay combinations. Two species, the Osprey and the Caspian Tern, occur in all open-water habitats. The Bald Eagle and the Belted Kingfisher are resident in freshwater, Chesapeake Bay and seaside bays, although the mighty eagle is now seldom seen at the coast. Only the Common Tern occurs over the ocean and in coastwise estuaries.

Placed in the marsh, swamp and beach categories are 140 species, mostly waders, ducks, rails, shorebirds, terns and passerines. The largest group is that allied to swamps, 30 species; followed by fresh marsh, 29; salt marsh, 28; salt and fresh marsh, 23 and beach, 20. Four species occur in salt and fresh marsh and swamps; three are at home on salt marsh or beaches and the Yellow-crowned Night Heron tolerates swamps and salt marsh. The Purple Sandpiper favors rock riprap, the Golden Plover prefers plowed fields and Lincoln's Sparrow seeks dense cover. Fifteen stragglers are not included in this listing.

Others occur near water but are less dependent: The Ipswich Sparrow frequents dunes. The Brown-headed Nuthatch seems tied to loblolly pine near water. Tree Swallows nest over water at Chincoteague and swarm over myrtle bushes in fall. Bank and Rough-winged Swallows nest in river banks. Barn Swallows nest in numbers under piers and boat sheds and all swallows seem to rely heavily on giant cordgrass marshes for roosting in the fall migration. It may be decades before students determine preferences for all of our smaller birds. Species which prefer a certain habitat in one area may occupy a different one elsewhere; e.g. the White-breasted Nuthatch apparently breeds only in swamps on the coastal plain (Scott, 1969). Two species not included here, the Red-shouldered Hawk and Hairy Woodpecker seem to prefer nesting in swamps.

A brief perusal of American Birds emphasizes the importance of coastal reserves. In the 1970-71 CBC's, at least 25 of the 28 counts with over 150 species were on a seacoast. Cape Charles was eighth among the 903 counts with 173 species. Chincoteague National Wildlife Refuge had 153 and Bodie-Pea Island 151. Of those species which recently began nesting in Virginia, most first nested at Chincoteague NWR. It remains to be seen whether public ownership of Virginia's barrier islands will allow breeding of the beach nesters, which are further restricted each year. Of the true water birds breeding in Virginia, over 30 species either nest only on the Eastern Shore seaside or are most common there.

"Avant garde" colleagues have encouraged my use of the systematic order presented by Mayr and Short (1969). This work, substantiated by 511 references, may be somewhat followed in the next revision of the A.O.U. checklist. The combining of genera, 37 in this list, seems sensible and may hasten such work in other groups. These groupings particularly occur among the herons, shorebirds and terns.

The lower Chesapeake Bay, its tributary rivers, the nearby Eastern Shore seaside with its array of bays, flats, marshes, beaches, and dunes; and southward, the shallow Back Bay, provide habitats for myriad waterfowl, waders, shorebirds, gulls and terns in season. Westerly, the great pocosin Dismal Swamp and those swamps associated with rivers in tidal fresh water are a haven for many less-known passerines and typically support more species than do adjacent upland forests. To gain basic environmental knowledge of these swamps, more work like that of Meanley (1969) in the Dismal Swamp must be done, particularly during the heat, ticks, insects, dense briars, and lush poison ivy of April to July.

Many habitat censuses have been made in Maryland but Virginians lag in this endeavor. Increasing pressures are being placed on marshes, and swamps may be changed even more rapidly by the activities of beavers and loggers. The competition of the nutria with birds in the Back Bay should be studied. Hopefully, this hurried compilation will lead to a more careful work on the water and wetland birds of the Chesapeake ecosystem, perhaps to include the Delmarva Peninsula.

The eagle and the peregrine are endangered species and the eagle could be the next species to fall from the Virginia list of breeding species. American Birds (Dec. 1971) has a "Blue List" of birds which seem to be decreasing. This ominous list includes the Black-crowned Night Heron, Marsh Hawk, Osprey, Oystercatcher, Least Tern, Barn Owl, and several known only as stragglers. Since the Barn Owl depends largely on well-built duck blinds for nest sites, its numbers could perhaps be increased by providing housing in less built-up areas. The Osprey also uses man-made platforms, but the other species may simply need suitable habitat. The Osprey and Barn Owl suffer more from DDT and PCB's in some areas than in others.

Now that the Peregrine Falcon has been bred in captivity, it may be possible to save it and other species from total extinction, if not from extirpation in nature. In a sense, all species are influenced by man. A few have benefited by man's design; notably the Canada Goose and Gadwall. The Wood Duck and most other birds nesting in holes or man's structures could also benefit. On the other side, species such as the Herring Gull, Fish Crow, Blue Jay, Starling, Purple Grackle and Cowbird, which man seems to have benefited, may slowly reduce numerous other species by parasitism, competition and predation.

Birds have suffered from being easily seen and sometimes decimated in the past. Now they may benefit, in contrast to plants and other animals, by their visibility if enough people are concerned. The present work results from the effort of many more persons than were involved in other parts of the checklist. Some are mentioned by name in the list, but most are noted by their initials as they appeared in Audubon Field Notes and their names appear below. Some of the life histories done by the industrious Arthur C. Bent were used, especially for food habits. Particular mention must be made of F. R. Scott, an indefatigable birder who has succeeded Joseph J. Murray as editor of The Raven, and of Mitchell A. Byrd, president of the Virginia Society of Ornithology, who has banded many thousands of waders and passerines. In addition, Dr. Byrd's students have banded most of the ospreys fledged in Virginia in the past 3 years.

|                              |                   |                      |
|------------------------------|-------------------|----------------------|
| J. M. Abbott                 | Roberta Fletcher  | M. Newton            |
| I. J. Abramson               | E. F. Folsom      | Gordon Orians        |
| Donald R. Ambrosen           | Granger H. Frost  | J. A. Pond           |
| J. E. Ames                   | Robert E. Gilmore | J. O. Pullman        |
| H. T. Armistead              | M. Gochfeld       | B. L. Pyle (Mrs.)    |
| Martha Armstrong             | L. C. Goldman     | F. C. Richardson     |
| R. L. Askins                 | J. H. Grey        | J. H. Roberts        |
| S. S. Baker (Mrs.)           | Gisela A. Grimm   | W. F. Rountrey       |
| Arthur C. Bent               | Charles W. Hacker | F. G. Schneider      |
| F. G. Buckley (Mrs.)         | Gustav W. Hall    | D. R. Simonson       |
| Paul A. Buckley              | C. O. Handley     | R. L. Smith          |
| F. C. (L. E.) Burford (Mrs.) | Darelyn Handley   | District of Columbia |
| Mitchell A. Byrd             | Henry Hesperheide | Audubon Society      |
| S. Calver                    | Jonathan Higman   | C. C. Steirly        |
| C. W. Carlson                | P. L. Hurlock     | C. E. Stevens        |
| H. M. Church (Mrs.)          | W. H. Julian      | G. W. Stewart        |
| A. E. Conway                 | Norma Katz        | John Terborgh        |
| W. A. Cooper                 | Robert S. Kennedy | R. W. Thomen         |
| D. A. Cutter                 | V. M. Kleen       | Tom Thomson          |
| Paul D. Daly                 | Marcia Lakeman    | Jacob M. Valentine   |
| C. W. Darden (Mrs.)          | L. Machen (Mrs.)  | C. R. Vaughn         |
| Paul G. DuMont               | T. W. Martin      | Romie Waterfield     |
| Philip A. DuMont             | Travis McCormick  | Robert J. Watson     |
| S. H. Dyke                   | E. T. McKnight    | E. G. Webster, Jr.   |
| W. E. Efford                 | Gale Monson       | Tom Weiboldt         |
| Gene Evans                   | Marcia Nelson     | A. E. Weinrich       |
|                              |                   | Bill Williams        |



Seasonality and Habitats  
of Va. Wetland Birds

Seasonal Occurrence

|                          | Res. | Sum.       | Win. | Tran. | Stra. |
|--------------------------|------|------------|------|-------|-------|
| Common Loon              |      | r          | c    | a     |       |
| Red-throated Loon        |      |            | c    | a     |       |
| Red-necked Grebe         |      |            | s    | s     |       |
| Horned Grebe             |      | r          | a    | a     |       |
| Eared Grebe              |      |            | r    | r     |       |
| Western Grebe            |      |            |      |       | X(3)  |
| Pied-billed Grebe        | X    | loc<br>s-b | c    | c     |       |
| Sooty Shearwater         |      |            |      | r     |       |
| Greater Shearwater       |      |            |      | s     |       |
| Cory's Shearwater        |      |            |      |       | X     |
| Black-capped Petrel      |      |            |      |       | X     |
| Leach's Petrel           |      |            |      |       | X     |
| Wilson's Petrel          |      | c          |      |       |       |
| White-tailed Tropicbird  |      |            |      |       | X(1)  |
| Brown Pelican            |      | r          |      | r     |       |
| White Pelican            |      |            |      |       | X     |
| Man-o-war Bird           |      |            |      |       | X     |
| Gannet                   |      | r          | u    | c     |       |
| Brown Booby              |      |            |      |       | X     |
| Double-crested Cormorant |      | s          | s    | a     |       |

Preferred Habitat

| Ocean | Open Water |     |             | Marsh |       |       |       |
|-------|------------|-----|-------------|-------|-------|-------|-------|
|       | *Se-Es     | CB. | Fresh Water | Salt  | Fresh | Swamp | Beach |
| X     | X          | X   |             |       |       |       |       |
| X     | X          | X   |             |       |       |       |       |
|       | X          | X   |             |       |       |       |       |
| X     | X          | X   |             |       |       |       |       |
|       | X          | X   |             |       |       |       |       |
|       |            |     | X           |       | X-b   |       |       |
| X     |            |     |             |       |       |       |       |
| X     |            |     |             |       |       |       |       |
| X     |            |     |             |       |       |       |       |
| X     |            | X   |             |       |       |       |       |
|       |            |     |             |       |       |       |       |
|       | X          |     |             | X     |       |       |       |
|       |            |     |             |       |       |       |       |
| X     |            |     |             |       |       |       |       |
| X     |            | X   |             |       |       |       |       |
|       |            | X   |             |       |       |       |       |
| X     |            | X   |             |       |       |       |       |

b-breeds, a-abundant, c-common, fc-fairly common, u-uncommon, s-scarce, r-rare, \*-seaside estuaries.

|                            | Res. | Sum. | Win.     | Tran. | Stra. |
|----------------------------|------|------|----------|-------|-------|
| Great Cormorant            |      |      |          |       | X     |
| Anhinga                    |      | r    |          |       |       |
| American Bittern           | X    | r-b  | u        | fc    |       |
| Least Bittern              |      | fc-b |          | fc    |       |
| Black-crowned Night Heron  | loc  | fc-b | u        | fc    |       |
| Yellow-crowned Night Heron | loc  | u-b  | r        | u     |       |
| Green Heron                | X    | c-b  | r        | c     |       |
| Cattle Egret               | X    | c-b  | r        | c     |       |
| Little Blue Heron          | X    | c-b  | u        | c     |       |
| Reddish Egret              |      |      |          |       | X     |
| Louisiana Heron            | X    | a-b  | s        | a     |       |
| Snowy Egret                | X    | a-b  | r        | a     |       |
| Common Egret               | X    | c-b  | loc<br>u | c     |       |
| Great Blue Heron           | X    | c-b  | c        | a     |       |
| Wood Ibis                  |      |      |          |       | X     |
| Glossy Ibis                | X    | a-b  | r        | a     |       |
| White Ibis                 |      | r    |          | r     |       |
| American Flamingo          |      |      |          |       | X     |
| Fulvous Tree-duck          |      |      | s        | s     |       |
| Mute Swan                  |      |      |          |       | X     |
| Whistling Swan             |      | r    | a        | a     |       |
| White-fronted Goose        |      |      |          |       | X     |

| Ocean | Se-Es | CB | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|----|-------|------|-------|-------|-------|
| X     |       | X  |       |      |       |       |       |
|       |       |    | X     |      |       |       |       |
|       |       |    |       | X    | X-b   |       |       |
|       |       |    | X-b   |      |       |       |       |
|       |       |    |       | X-b  | X     |       |       |
|       |       |    |       | X-b  |       | X-b   |       |
|       |       |    |       | X-b  | X-b   |       |       |
|       |       |    |       | X-b  |       |       |       |
|       |       |    |       | X-b  | X     | X-b   |       |
|       |       |    |       | X    | X     | X-b   |       |
|       |       |    |       |      |       |       |       |
|       |       |    |       | X-b  |       |       |       |
|       |       |    |       | X    | X     |       |       |
|       |       |    |       |      |       |       |       |
|       |       |    | X     | X    | X     |       |       |
|       |       |    | X     |      |       |       |       |
|       |       | X  | X     |      |       |       |       |
|       |       |    |       |      |       |       |       |

|                   | Res. | Sum.        | Win.      | Tran. | Stra. |
|-------------------|------|-------------|-----------|-------|-------|
| Snow Goose        |      | r           | a         | a     |       |
| Blue Goose        |      |             | loc<br>u  | u     |       |
| Canada Goose      |      |             | a         | a     |       |
| Brant             |      | r           | a         | a     |       |
| Black Brant       |      |             |           |       | X     |
| Wood Duck         | X    | c-b         | loc<br>c  | a     |       |
| European Widgeon  |      |             | r         | r     |       |
| American Widgeon  | X    | r           | a         | a     |       |
| Gadwall           | X    | loc<br>fc-b | c         | c     |       |
| Common Teal       |      |             |           |       | X     |
| Green-winged Teal | X    | r           | a         | a     |       |
| Mallard           | X    | u-b         | a         | a     |       |
| Black Duck        | X    | fc-b        | a         | a     |       |
| Pintail           | X    | r           | a         | a     |       |
| Bahama Duck       |      |             |           |       | X     |
| Blue-winged Teal  | X    | loc<br>u-b  | r         | c     |       |
| Cinnamon Teal     |      |             |           |       | X     |
| Shoveler          |      | r           | loc<br>fc | fc    |       |
| Canvasback        |      | r           | c         | c     |       |
| Redhead           |      |             | u         | u     |       |
| Ring-necked Duck  |      |             | c         | c     |       |
| Greater Scaup     |      |             | a         | a     |       |

| Ocean | Se-Es | CB | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|----|-------|------|-------|-------|-------|
|       |       |    | X     | X    | X     |       |       |
|       |       |    | X     | X    | X     |       |       |
|       |       | X  | X     |      | X     |       |       |
|       | X     |    |       | X    |       |       |       |
|       |       |    |       |      |       |       |       |
|       |       |    | X     |      |       | X-b   |       |
|       |       |    | X     |      |       |       |       |
|       |       | X  | X     |      | X     |       |       |
|       |       | X  | X     |      | X-b   |       |       |
|       |       |    | X     |      |       |       |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       |      | X-b   | X     |       |
|       |       |    |       | X-b  | X-b   | X     |       |
|       |       |    | X     |      | X     |       |       |
|       |       |    |       |      |       |       |       |
|       |       |    | X     |      | X-b   |       |       |
|       |       |    |       |      |       |       |       |
|       |       |    | X     |      | X     |       |       |
|       |       | X  | X     |      |       |       |       |
|       |       | X  | X     |      |       |       |       |
|       |       |    | X     |      |       |       |       |
|       |       | X  | X     |      |       |       |       |

|                        | Res. | Sum. | Win.     | Trans    | Stra. |
|------------------------|------|------|----------|----------|-------|
| Lesser Scaup           |      | r    | a        | a        |       |
| Common Eider           |      |      | loc<br>r | loc<br>r |       |
| King Eider             |      | r    | loc<br>s | loc<br>s |       |
| Harlequin Duck         |      |      |          |          | X     |
| Oldsquaw               |      |      | a        | a        |       |
| Common Scoter          |      | r    | c        | a        |       |
| Surf Scoter            |      |      | a        | a        |       |
| White-winged Scoter    |      |      | fc       | c        |       |
| Bufflehead             |      |      | a        | a        |       |
| Common Goldeneye       |      |      | c        | c        |       |
| Hooded Merganser       | X    | r-b? | fc       | fc       |       |
| Red-breasted Merganser |      | s    | a        | a        |       |
| Common Merganser       |      |      | c        | c        |       |
| Ruddy Duck             |      | r    | a        | a        |       |
| Swallow-tailed Kite    |      |      |          |          | X     |
| Rough-legged Hawk      |      |      | u        | u        |       |
| Golden Eagle           |      |      |          |          | X     |
| Bald Eagle             | X    | s-b  | u        | u        |       |
| Marsh Hawk             | X    | s-b  | c        | c        |       |
| Osprey                 | X    | c-b  | r        | c        |       |
| Peregrine Falcon       |      |      | r        | u        |       |
| Clapper Rail           | X    | a-b  | fc       | a        |       |

| Ocean | Se-Es | CB  | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|-----|-------|------|-------|-------|-------|
|       |       | X   | X     |      |       |       |       |
| X     |       | X   |       |      |       |       |       |
| X     |       | X   |       |      |       |       |       |
|       | X     | X   |       |      |       |       |       |
| X     | X     | X   |       |      |       |       |       |
| X     | X     | X   |       |      |       |       |       |
|       | X     | X   | X     |      |       |       |       |
|       | X     | X   |       |      |       |       |       |
|       |       |     | X     |      |       |       |       |
|       | X     | X   |       |      |       |       |       |
|       |       |     | X     |      |       |       |       |
|       |       |     |       | X    |       |       |       |
|       | X-b   | X-b | X-b   |      |       |       |       |
|       |       |     |       | X-b  |       |       |       |
| X-b   | X-b   | X-b | X-b   |      |       |       |       |
| X     |       | X   |       |      |       |       |       |
|       |       |     |       | X-b  |       |       |       |

|                        | Res. | Sum.        | Win.      | Tran. | Stra. |
|------------------------|------|-------------|-----------|-------|-------|
| King Rail              | X    | fc-b        | r         | fc    |       |
| Virginia Rail          | X    | u-b         | s         | u     |       |
| Sora                   |      | r           | r         | a     |       |
| Yellow Rail            |      |             |           | r     |       |
| Black Rail             | X    | fc-b        | r         | fc    |       |
| Purple Gallinule       |      | r           |           | r     |       |
| Common Gallinule       | X    | loc<br>fc-b | s         | fc    |       |
| American Coot          | X    | loc<br>r-b  | a         | a     |       |
| American Oystercatcher | X    | c-b         | loc<br>c  | c     |       |
| Semipalmated Plover    |      |             | r         | a     |       |
| Piping Plover          | X    | fc-b        | r         | fc    |       |
| Wilson's Plover        |      | u-b         |           | u     |       |
| Killdeer               | X    | c-b         | c         | a     |       |
| American Golden Plover |      |             |           | s     |       |
| Black-bellied Plover   |      | fc          | c         | a     |       |
| Ruddy Turnstone        |      | u           | fc        | a     |       |
| American Woodcock      | X    | u-b         | loc<br>fc | c     |       |
| Common Snipe           |      |             | fc        | c     |       |
| Long-billed Curlew     |      |             |           |       | X     |
| Whimbrel               |      | r           | r         | c     |       |
| Willet                 | X    | a-b         | loc<br>u  | a     |       |
| Spotted Sandpiper      | X    | s-b         | r         | c     |       |

| Ocean | Se-Es | CB | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|----|-------|------|-------|-------|-------|
|       |       |    |       |      | X-b   |       |       |
|       |       |    |       |      | X-b   |       |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       | X-b  | X-b   |       |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       |      | X-b   |       |       |
|       |       | X  | X     |      | X-b   |       |       |
|       |       |    |       |      |       |       | X-b   |
|       |       |    |       | X    |       |       |       |
|       |       |    |       |      |       |       | X-b   |
|       |       |    |       |      |       |       | X-b   |
|       |       |    |       |      | X     |       |       |
|       |       |    |       | X    |       |       | X     |
|       |       |    |       |      |       |       | X     |
|       |       |    |       |      |       | X-b   |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       | X    |       |       |       |
|       |       |    |       | X-b  |       |       |       |
|       |       |    |       | X    | X     |       |       |

|                         | Res. | Sum. | Win.     | Tran.    | Stra. |
|-------------------------|------|------|----------|----------|-------|
| Solitary Sandpiper      |      |      |          | c        |       |
| Greater Yellowlegs      |      |      | fc       | a        |       |
| Lesser Yellowlegs       |      |      | u        | a        |       |
| Marbled Godwit          |      | r    | r        | u        |       |
| Hudsonian Godwit        |      |      |          | u        |       |
| Short-billed Dowitcher  |      |      | r        | a        |       |
| Long-billed Dowitcher   |      |      | r        | u        |       |
| Knot                    |      | s    | s        | a        |       |
| Purple Sandpiper        |      |      | loc<br>u | loc<br>u |       |
| Dunlin                  |      | u    | a        | a        |       |
| Least Sandpiper         |      | u    | s        | c        |       |
| Baird's Sandpiper       |      |      |          | r        |       |
| White-rumped Sandpiper  |      | r    |          | u        |       |
| Pectoral Sandpiper      |      |      |          | fc       |       |
| Semipalmated Sandpiper  |      | fc   | fc       | a        |       |
| Western Sandpiper       |      |      | s        | fc       |       |
| Sanderling              |      | u    | a        | a        |       |
| Ruff                    |      |      |          | r        |       |
| Stilt Sandpiper         |      |      |          | fc       |       |
| Buff-breasted Sandpiper |      |      |          | r        |       |
| American Avocet         |      | r    | r        | loc<br>s |       |
| Black-necked Stilt      |      | r    |          | loc<br>s |       |

| Ocean | Se-Es | CB | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|----|-------|------|-------|-------|-------|
|       |       |    |       |      | X     |       |       |
|       |       |    |       | X    | X     |       |       |
|       |       |    |       | X    | X     |       |       |
|       |       |    |       | X    |       |       |       |
|       |       |    |       | X    |       |       |       |
|       |       |    |       | X    | X     |       |       |
|       |       |    |       |      |       |       | X     |
|       |       |    |       | X    |       |       |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       | X    |       |       |       |
|       |       |    |       | X    |       |       | X     |
|       |       |    |       |      |       |       | X     |
|       |       |    |       |      | X     |       |       |
|       |       |    |       | X    | X     |       |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       |      | X     |       |       |

|                          | Res. | Sum. | Win. | Tran. | Stra. |
|--------------------------|------|------|------|-------|-------|
| Red Phalarope            |      |      | r    | r     |       |
| Northern Phalarope       |      |      |      | s     |       |
| Wilson's Phalarope       |      |      |      | s     |       |
| Pomarine Jaeger          |      |      |      | r     |       |
| Parasitic Jaeger         |      |      | r    | u     |       |
| Great Skua               |      |      |      |       | X     |
| Laughing Gull            | X    | a-b  | s    | a     |       |
| Bonaparte's Gull         |      | r    | u    | a     |       |
| Sabine's Gull            |      |      |      |       | X     |
| Black-headed Gull        |      |      |      |       | X     |
| Little Gull              |      |      |      |       | X     |
| Ring-billed Gull         |      | fc   | a    | a     |       |
| Black-legged Kittiwake   |      |      |      |       | X     |
| Glaucous Gull            |      |      |      |       | X     |
| California Gull          |      |      |      |       | X     |
| Lesser Black-backed Gull |      |      |      |       | X     |
| Herring Gull             | X    | c-b  | a    | a     |       |
| Iceland Gull             |      |      |      |       | X     |
| Great Black-backed Gull  |      | fc   | a    | a     |       |
| Black Skimmer            |      | a-b  | r    | a     |       |
| Gull-billed Tern         |      | fc-b |      | fc    |       |
| Royal Tern               | X    | a-b  | s    | a     |       |

| Ocean | Se-Es | CB | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|----|-------|------|-------|-------|-------|
| r     |       |    |       |      |       |       |       |
|       |       |    |       | X    | X     |       |       |
|       |       |    |       | X    | X     |       |       |
| X     |       |    |       |      |       |       |       |
| X     |       |    |       |      |       |       |       |
| X     | X     | X  |       | X-b  |       |       | X     |
| X     | X     | X  |       |      |       |       |       |
|       |       | X  |       |      |       |       |       |
|       |       | X  |       |      |       |       |       |
|       |       | X  | X     |      |       |       |       |
| X     |       |    |       |      |       |       |       |
|       | X     | X  |       |      |       |       | X     |
|       |       |    |       |      |       |       |       |
| X     | X     | X  |       |      |       |       | X-b   |
|       | X     |    |       |      |       |       | X     |
|       | X     |    |       | X-b  |       |       |       |
| X     | X     | X  |       |      |       |       | X-b   |

|                           | Res. | Sum.     | Win. | Tran. | Stra. |
|---------------------------|------|----------|------|-------|-------|
| Sandwich Tern             |      | r-b      |      | r     |       |
| Caspian Tern              |      | r        |      | fc    |       |
| Common Tern               | X    | a-b      | r    | a     |       |
| Roseate Tern              |      | r        |      | r     |       |
| Forster's Tern            | X    | a-b      | fc   | a     |       |
| Sooty Tern                |      |          |      |       | X     |
| Least Tern                |      | fc-b     |      | fc    |       |
| Black Tern                |      | loc<br>s |      | c     |       |
| White-winged Black Tern   |      |          |      |       | X     |
| Razorbill                 |      |          |      |       | X     |
| Thick-billed Murre        |      |          |      |       | X     |
| Dovekie                   |      |          | r    |       |       |
| Black Guillemot           |      |          |      |       | X     |
| Barn Owl                  | X    | u-b      | u    | u     |       |
| Barred Owl                | X    | fc-b     | fc   | fc    |       |
| Short-eared Owl           | X    | r-b      | u    | u     |       |
| Ruby-throated Hummingbird |      | c-b      |      | c     |       |
| Belted Kingfisher         |      | c-b      | c    | c     |       |
| Pileated Woodpecker       |      | fc-b     | fc   | fc    |       |
| Eastern Phoebe            | X    | c-b      | u    | c     |       |
| Acadian Flycatcher        |      | a-b      |      | a     |       |
| Traill's Flycatcher       |      | r-b      |      | u     |       |

| Ocean | Se-Es | CB | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|----|-------|------|-------|-------|-------|
| X     |       |    |       |      |       |       | X-b   |
| X     | X     | X  | X     |      |       |       |       |
| X     | X     |    |       |      |       |       | X-b   |
|       | X     |    |       |      |       |       | X     |
|       | X     | X  |       | X-b  |       |       |       |
|       |       |    |       |      |       |       | X     |
| X     | X     | X  |       |      |       |       | X-b   |
|       |       |    |       | X    | X     |       |       |
|       |       |    |       |      | X     |       |       |
| X     |       |    |       |      |       |       |       |
| X     |       |    |       |      |       |       |       |
|       |       |    |       | X    |       |       |       |
|       |       |    |       |      |       | X-b   |       |
|       |       |    |       | X-b  |       |       |       |
|       |       |    |       |      |       | X-b   |       |
|       | X     | X  | X     |      |       |       |       |
|       |       |    |       |      |       | X-b   |       |
|       |       |    | X     |      |       | X     |       |
|       |       |    |       |      |       | X-b   |       |
|       |       |    | X-b   |      |       |       |       |



|                              | Res. | Sum.<br>loc | Win. | Tran. | Stra. |
|------------------------------|------|-------------|------|-------|-------|
| Tree Swallow                 | X    | u-b         | u    | a     |       |
| Bank Swallow                 |      | loc<br>s-b  |      | c     |       |
| Rough-winged Swallow         |      | fc-b        |      | fc    |       |
| Barn Swallow                 |      | a-b         |      | a     |       |
| Fish Crow                    | X    | c-b         | c    | a     |       |
| White-breasted Nuthatch      | X    | loc<br>u-b  | u    | u     |       |
| Brown-headed Nuthatch        | x    | fc-b        | fc   | fc    |       |
| Winter Wren                  |      |             | c    | c     |       |
| Long-billed Marsh Wren       | X    | a-b         | u    | a     |       |
| Short-billed Marsh Wren      | X    | r-b         | u    | u     |       |
| Catbird                      | x    | c-b         | u    | a     |       |
| Blue-gray Gnatcatcher        |      | a-b         |      | a     |       |
| Water Pipit                  |      |             | fc   | fc    |       |
| White-eyed Vireo             |      | c-b         |      | c     |       |
| Black-and-White Warbler      |      | fc-b        | r    | c     |       |
| Bachman's Warbler            |      |             |      |       | X     |
| Blue-winged Warbler          |      |             |      | fc    |       |
| Golden-winged Warbler        |      |             |      | r     |       |
| Parula Warbler               |      | c-b         |      | c     |       |
| Yellow-throated Warbler      |      | fc-b        |      | fc    |       |
| Black-throated Green Warbler |      | loc<br>c-b  |      | c     |       |
| Prairie Warbler              |      | c-b         |      | c     |       |

| Ocean | Se-Es | CB  | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|-----|-------|------|-------|-------|-------|
|       |       |     | X     | X    | X     |       |       |
|       |       |     | X-b   |      |       |       |       |
|       |       |     | X-b   |      |       |       |       |
|       |       |     | X-b   | X    |       |       |       |
|       |       |     | X     | X    |       |       |       |
|       |       |     |       |      |       | X-b   |       |
|       |       | X-b |       |      |       |       |       |
|       |       |     |       |      |       | X     |       |
|       |       |     |       | X-b  | X-b   |       |       |
|       |       |     |       | X-b  | x     |       |       |
|       |       |     |       |      |       | X-b   |       |
|       |       |     |       |      |       | X-b   |       |
|       |       |     |       |      |       |       | X     |
|       |       |     |       |      |       | X-b   |       |
|       |       |     |       |      |       | X     |       |
|       |       |     |       |      |       | X     |       |
|       |       |     |       |      |       | X-b   |       |
|       |       |     |       |      |       | X     |       |
|       |       |     |       |      |       | X-b   |       |
|       |       |     |       |      |       | X-b   |       |

|                         | Res. | Sum.       | Win. | Tran. | Stra. |
|-------------------------|------|------------|------|-------|-------|
| Myrtle Warbler          |      |            | a    | a     |       |
| American Redstart       |      | a-b        |      | a     |       |
| Northern Waterthrush    |      |            |      | c     |       |
| Louisiana Waterthrush   |      | fc-b       |      | fc    |       |
| Swainson's Warbler      |      | loc<br>u-b |      | r     |       |
| Prothonotary Warbler    |      | a-b        |      | a     |       |
| Yellowthroat            | X    | c-b        | s    | a     |       |
| Kentucky Warbler        |      | fc-b       |      | fc    |       |
| Hooded Warbler          |      | c-b        |      | c     |       |
| Canada Warbler          |      |            |      | r     |       |
| Bobolink                |      |            |      | fc    |       |
| Eastern Meadowlark      | X    | c-b        | c    | c     |       |
| Red-winged Blackbird    | X    | c-b        | a    | a     |       |
| Yellow-headed Blackbird |      |            |      |       | X     |
| Boat-tailed Grackle     | X    | c-b        | c    | c     |       |
| Rusty Blackbird         |      |            | u    | fc    |       |
| Brewer's Blackbird      |      |            |      |       | X     |
| American Goldfinch      | X    | c-b        | fc   | a     |       |
| Savannah Sparrow        |      |            | c    | a     |       |
| Ipswich Sparrow         |      |            | s    | s     |       |
| Henslow's Sparrow       |      | fc-b       |      | fc    |       |
| Sharp-tailed Sparrow    | X    | loc<br>s-b | fc   | c     |       |

| Ocean | Se-Es | CB | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|----|-------|------|-------|-------|-------|
|       |       |    |       | X    |       | X     |       |
|       |       |    |       |      |       | X-b   |       |
|       |       |    |       |      |       | X     |       |
|       |       |    |       |      |       | X-b   |       |
|       |       |    |       |      |       | X-b   |       |
|       |       |    |       |      | X-b   |       |       |
|       |       |    |       |      |       | X-b   |       |
|       |       |    |       |      |       | X     |       |
|       |       |    |       | X    |       |       |       |
|       |       |    |       | X-b  |       |       |       |
|       |       |    |       |      | X-b   |       |       |
|       |       |    |       |      | X     |       |       |
|       |       |    |       |      |       | X     |       |
|       |       |    |       |      |       |       | X     |
|       |       |    |       |      |       |       | X     |
|       |       |    |       | X    |       |       |       |
|       |       |    |       | X-b  | X     |       |       |

|                   | Res. | Sum. | Win. | Tran. | Stra. |
|-------------------|------|------|------|-------|-------|
| Seaside Sparrow   | X    | a-b  | u    | a     |       |
| Lincoln's Sparrow |      |      | r    | r     |       |
| Swamp Sparrow     |      |      | a    | a     |       |
| Song Sparrow      | X    | c-b  | a    | a     |       |
| Snow Bunting      |      |      | u    |       |       |

| Ocean | Se-Es | CB | Fr-Wa | Salt | Fresh | Swamp | Beach |
|-------|-------|----|-------|------|-------|-------|-------|
|       |       |    |       | X-b  |       |       |       |
|       |       |    |       |      |       |       |       |
|       |       |    |       | X    | X     | X     |       |
|       |       |    |       | X-b  | X-b   |       |       |
|       |       |    |       |      |       |       | X     |

## CLASS AVES

## Family Gaviidae

Gavia immer. Common Loon. Winter resident, rare at Washington, D. C., abundant on the sea coast. Occasional straggler in summer. Winter (CBC's): Murray (1952) reported the Common Loon as being more common than the Red-throated. This has been true at Chincoteague since 1959, but at Back Bay the reverse has always held. Numbers of the two species seem to fluctuate similarly. The all time highs of 1970 for both species were greater than the '69 CBC by 5.2 for the Common Loon and 12.4 for the Red-throated. The Common Loon has suffered terrific die-offs on Lake Michigan, loses nesting sites every year in the northern states and many have been killed when caught in pound nets. Yet it seems relatively stable at present.

Gavia stellata. Red-throated Loon. Common winter resident lower CB, ocean, Back Bay, possibly increasing (917 in '70 CBC vs 508 in '67); Chincoteague, 29-XI-70, 222. Wallops I., 10-III-71, 5000, CRV. Food: Mainly small fish.

## Family Podicepsidae

Podiceps grisegena. Red-necked Grebe. Rare winter resident. Lower Chesapeake Bay and coast. (16 of 29 count records from Chincoteague). Doubtfully increasing (7 in '70 count vs 5 in '68). Food: Small fish, crustaceans, mollusks.

Podiceps auritus. Horned Grebe. Abundant winter resident. All tidal waters, scarce in freshwater sections. Sporadic, possibly declining, low of last 14 counts was 239 in '61, high was 3,514 in '66, 3 highest counts of '69 & '70 declined from 24-39% in '70. Alexandria, 2-XI-57, 385; Hampton, 19-XI-70, 2000. Gloucester Pt., spring migration, '71, noted by winter no. of 2-4 increasing to 8, 19-III; to 34, 29-III, dwindling to 10, 21-IV, and often by 1 per day to 1, 30-IV, with none later. Two in breeding plumage, Chincoteague Causeway, 3-IV-57. Oil spill kill of ca 400 in YR seemed to reduce local population until 1970-71. Food: Crustaceans and minnows in salt water.

Podiceps nigricollis. Eared Grebe. Rare late fall straggler lower Chesapeake Bay and Atlantic coast. Not reported by Murray (1952). Stable since '65, (8 records, all single, Craney I., 5, PAB et al, MAB: Chincoteague, 29-XII-69, 1, (PAD & PGD, 1970); Back Bay, 31-XII-66, 1 in almost full breeding plumage, PWS et al; Dyke, Fairfax Co., 3-XII-69, 1, JMA. Only spring record, 27-III-69, 1, MAB. Food: Probably decapod crustaceans and molluscs in Va.

Aechmophorus occidentalis. Western Grebe. Rare straggler; not in Murray (1952). Dulles Airport, Loudon Co., Va., 14-19-X-64, 1, LJA, JMA, et al. Second sight record for Va. Food: Small fish and invertebrates.

Podilymbus podiceps podiceps. Pied-billed Grebe. Common winter resident in fresh water, frequent in salt water. Rare summer breeder. Summer: Chincoteague Refuge, 9-VII-55, 1 nest with 7 eggs, FRS; 21-V-61, 14 nests with eggs, TWM; 3-VIII-68, 2 young, MAB. Winter: 24-VII-70, 1 incubating, MAB, RSK. Erratic, Back Bay count 257 in 1968, 33 in 1970. Probably stable. Food: Invertebrates and small fish.

## Family Procellariidae

Puffinus griseus. Sooty Shearwater. Oceanic. Scarce spring migrant, one summer record. Records all coastal, from 4-IV to 8-VII, 55-69. Food: Squid and small fish.

Puffinus gravis. Greater Shearwater. Oceanic. Rare summer straggler, Chincoteague, 10-VIII-57, 1 found dead, PAD. Food: Fish and squid.

Puffinus diomedea. Cory's Shearwater. Oceanic. Rare summer straggler, Back Bay Refuge, 14-VII-68, 1 specimen (first Va. record), RW. Food: Fish, crabs.

Pterodroma hasitata. Black-capped Petrel. One record, a bird brought alive to Blacksburg, 30-VIII-1893, after a terrific coastal storm (Murray, 1952).

## Family Hydrobatidae

Oceanodroma leucorhoa. Leach's Petrel. Rare summer and autumn straggler. Cape Charles Ferry, 17-VIII-45, 3, Mrs. Reed; 28-VII-48, 6, FRS. Chincoteague Causeway, 5-X-48, Buckalew (Murray, 1952).

Oceanites oceanicus. Wilson's Petrel. Erratic summer visitor, / $\bar{3}$ -VI-('66) -11-IX('63) F. C. (L.E.) B./ Cape Charles Ferry, 11-VII-55, 111, FRS. CB Bridge-Tunnel, 5-VII-68, 110, FGB, PAB. CB mouth, 20-VII-72, 75 on water; 10 m. inside CB, ca 400 in one flock, John Norcross. Food: probably plankton.

Phaethon lepturus catesbyi. White-tailed Tropicbird. Bird picked up dying in Staunton, Va., 15-X-54, during hurricane, by May Artis Danner (Murray, 1955).

#### Family Pelecanidae

Pelecanus occidentalis. Brown Pelican. Rare summer straggler. Nearly all recent records single birds, 11-IV to 12-XI. Virginia Beach, 2-VIII-70, Stevens; 24-VII-71, ad. and 1 imm., RLA. The Brown Pelican has declined on the Gulf Coast, but nesting success was quite good in the Carolinas in '71, almost 1500 young being fledged, B. Neeley, U.S.F. & W.S., and R. Steiner. Food: Mostly mullet and menhaden.

Pelecanus erythrorhynchos. White Pelican. Murray (1952) had four 19th century records, 3 from the Washington area and a sighting at Bone I. One was at Blackwater NWR. Md., 28-II to first week in V-70. GWS, WHJ.

#### Family Fregatidae

Fregata magnificens. Man-o'-war Bird. Chesapeake Bay Bridge-Tunnel, 3-VII-68, immature harassing terns (Buckley, 1970).

#### Family Sulidae

Sula bassana. Gannet. Oceanic. Common winter resident offshore. Most common as a transient in XI 7 III, seen every month except VI & IX; 27-III-48, 1000, Mrs. Reed (Murray, 1952).

Sula leucogaster. Brown Booby. Lynnhaven Inlet, 27-VI-68, to 29-IX-68, 1 imm.; Ches. Bay, off Smithville, Northampton Co., 9-13-VII-68, 1 imm. (different bird) sat on end of rowboat eating bait-fish offered it (Buckley, 1970). First Va. record.

#### Family Phalacrocoracidae

Phalacrocorax auritus. Double-crested Cormorant. Mainly as abundant transient; usually scarce in winter. 1970 CBC's: Back Bay, 76; Cape Charles, 71; Little Creek 58 and Chincoteague, 28, were 3 to 28 times higher than in any other year, except at Newport News, where only 3 were seen, as against 86 in 1966. Spring flights are especially conspicuous. Apparently stable. Food: fish, eels being often eaten.

Phalacrocorax carbo carbo. Great Cormorant. Rare spring and autumn straggler from Europe. Craney I., 31-X-62, 2, LEB et al; CB Bridge Tunnel I, 12-IV-69, 1, MAB.

#### Family Anhingidae

Anhinga anhinga leucogaster. Anhinga. Rare summer straggler. Alexandria (Roache's Run) 1st wk. in VIII, Bartsch et al. Dismal Swamp (Lake Drummond), VIII-35, H. Barber (Murray, 1952).

#### Family Ardeidae

Botaurus stellatus. American Bittern. Common spring and fall migrant, frequent in winter near coast. CBC's indicate a stable population. Food: Insects, frogs, fish, crayfish, mice and shrews. Murray thought this bittern was probably resident at Norfolk and listed 3 eggs, June 3, at Washington.

Ixobrychus exilis exilis. Least Bittern. Rare migrant. Murray recorded this shy bittern as a locally common summer resident in marshes below Alexandria, with young in July. Norfolk, 20-VII-26, nest. No breeding records occur in recent Audubon Field Notes. Washington, D. C., 27-IV and 25-IX, ACB. Hampton, 11-III-56, Hampton Roads Bird Club. Species probably decreasing as marshes disappear, esp. tall grass marsh. Food: Same as American Bittern; perhaps more insects.

Nycticorax nycticorax. Black-crowned Night Heron. Common, permanent resident on the coast. Breeding: Hollis Marsh I, 10-VII-55, 20 young banded, JMA et al. Hog I, 23-VI-56, 50 nests, most with young; 1-VI-57, 60 nests, FRS. Hollis Marsh I, 25-VI-55, 30 pairs; VI-57, 75 pairs, JMA. Northumberland Co. (Smith Pt.) 9-VI-68, 57 (no nests), FRS. Post-breeding: Chincoteague, 26-IX-65, 145, ML & MN. Winter: CBC total of 467 for 1970 almost triple that of '69 and 4 times that of '68. Apparently increasing. Food: Mainly crustaceans, also insects, frogs, fish, mice and rats.

- Nycticorax violaceus. Yellow-crowned Night Heron. Scarce inland to frequent on Eastern Shore in summer, increasingly rare in winter. Breeding: Norfolk, good sized colony, last egg hatched 21-VIII-61, CWD. Hampton, '65, 5 pairs nesting, 7 young raised, V-68, 1 nest, 3 young, "continuation of a sharp decline", WPS. Mockhorn I Refuge, 27-VI-65, 11 adults, 5 young, MAB et al. Coastal Va., 1970, 5 colonies, Norfolk, colony of 8 nests produced 24 young, CWD; Mockhorn I, 2 colonies ca 100 pairs, MAB. Small colony at Gloucester Point was driven out in mid-60's. Winter CBC's, '57-63, 19 seen; only 3 since then. Increase in population obviously possible with protection of nest sites. Food: Largely crabs and crayfish, likely mostly fiddler crabs in coastal Va.
- Butorides virescens. Green Heron. Common to abundant summer resident, rare in winter. Breeding: Parramore I, 18-VIII-56, young left nest, FRS. Assawoman Inlet, 30-V-57, 102 nests, most with young, JMV, FRS. Probably nests in most tidewater counties where unmolested. Winter: Only 7 CBC dates. Probably stable but likely to decrease through habitat destruction. Food: Minnows, tadpoles and crustaceans.
- Bubulcus ibis. Cattle Egret. Abundant spring and late summer migrant, rare in winter. This small egret, a common sight in Africa and eastward to Indonesia, arrived in South American in the 1940's and reached Virginia in the early 50's. Chincoteague NWR, 12-VI-55, 4, JT. Breeding: Wachapreague, 18-VI-61, 1 nest, FRS. Wakefield, Westmoreland Co., Va. 1969, 25 summered, probably bred, FRS & RJW. South Point, Md., early VI-69, 200 pairs, MAB; 15-VIII-69, many eggs and small young, 387 young banded during summer, MAB, VMK. Post breeding: Fields between Kiptopeke and Wachapreague, 9-VII-66, 350, FCB. Cape Charles, 20-IX-69, 249 migrating. FRS. CBC records are coastal and single except for 2 at Chincoteague (1963) and 49 at Back Bay (1967). This agrarian species could be leveling off but seems likely to increase further, perhaps affecting other waders, thru nest site competition, as it increases.
- Egretta caerulea. Little Blue Heron. Common summer resident on coast, frequent in winter. Breeding: Hog I., 23-VI-56, 60 nests, most with young, 1-VI-57, 100 nests; Chincoteague, 18-VIII-68, nest of young; Wachapreague, 23-VIII-69, young in nest, FRS. Hollis Marsh I., 25-VI-55, 200 pairs, JMA. Post-breeding: Chincoteague, 14-IX-58, 750, FRS. Winter (CBC's) 41, '70, 12, '69. Apparently stable. Food: insects, crustaceans, amphibians and fish.
- Egretta rufescens. Reddish Egret. Rare straggler in white phase. Norfolk (Stumpy Lake), VI-42, 1 observed on 4 dates, Mrs. Reed; 2-6-11-51, 6, WFR. (Murray, 1952).
- Egretta tricolor. Louisiana Heron. Distribution as with Snowy Egret. Breeding: Hog I., 23-VI-56, 400 nests, most with young; 1-VI-57, 400 nests; 7-VI-58, 450 pairs, FRS. Alexandria, 26-VIII-61, 1 nest, FRS et al. Hog I., 8-VI-69, 325 pairs, MAB, a tremendous increase since 1967. Md., heronry near Chincoteague, 1970, 600 pairs, MAB. Post breeding counts: Chincoteague NWR, 20-VIII-65, 470, FRS. Winter: 1970, Chincoteague, 36; Cape Charles, 20; Back Bay, 1. Seems to be increasing slightly. Food: Probably more invertebrates and amphibians than fish are eaten.
- Egretta thula. Snowy Egret. Abundant summer resident on coast, scarce inland. Rare in winter, except at Cape Charles and Chincoteague. Breeding: Hog I., 1-VI-57, 500 nests, 7-VI-58, 350 pairs, FRS, JMV. Late record, Wachapreague, 23-VIII-69, few small young in nests, FRS. Post-breeding: Chincoteague NWR, 18-IX-56, 1200, JMV; 28-VIII-65, 2220 FGS et al. Winter (CBC's): 1970 Cape Charles, 40; Chincoteague, 14, double all previous count totals. Stable or possibly increasing.
- Egretta alba. Common Egret. Common summer resident, breeding in coastal heronries. Frequent on coast in winter, rare inland. Most abundant during post breeding season northward migration. Chincoteague NWR, 18-IX-56, 700, JMV; Hopewell, 17-VII-58, 196, JMA & FRS; Stumpy Lake, Norfolk, 14-VII-70, 587, FCB. Breeding: ES (Hog I.), 23-VI-56, 10 nests, mostly with young; New Kent Co., 15-VI-58, 10 pairs, FRS. Hollis I. Marsh, 25-VI-53, 300 pairs, VI-57, 200 pairs, JMA. Winter (CBC's): Chincoteague, 1970, 57. Stable or decreasing slightly. Food: Similar to that of the Great Blue Heron, perhaps more arthropods, such as fiddler crabs.

Ardea cinerea. Great Blue Heron. Abundant permanent resident, although scarcer in winter. A few heronries in swamps are occupied only by this species, which prefers large sycamores as nesting trees. F. R. Scott flies over coastal Virginia every spring to check on these heronries, which are occupied long before the trees leaf out. A heronry near North Carolina has been saved by the Nature Conservancy. The rapid growth in bird watching is exemplified by CBC's of this species: 1952 (2 counts), 9; 1956 (5 counts), 60; 1960 (7 counts), 107; 1966 (8 counts - first Cape Charles count), 320. A possible increase in this species is indicated by the 1970 CBC of 578, 210 more than in 1969, 5 of the 9 counts reporting all time highs. However, higher counts of this conspicuous heron could well be due to an increase in observers. Shooting of "Tommy" or "blue cranes" still occurs locally. Food: The Great Blue Heron is a most polyphagous species, eating fish usually, but also insects, crustaceans, mice, shrews, rats, frogs, snakes and turtles.

Family Ciconiidae

Mycteria americana. Wood Ibis. Rare summer straggler. Murray has a record of 4 in New Kent Co, 1893 and of one seen from the York R. Bridge, 8-V-49, Mrs. T. P. Thompson. Since this species is now on the endangered list, it is unlikely to be seen this far north again.

Family Threskiornithidae

Plegadis falcinellus. Eastern Glossy Ibis. Abundant summer resident, rare in winter. The Glossy Ibis was hypothetical in Virginia until the early 1950's. It is close to becoming the most abundant breeding wader on the coast, but no one has a good explanation for its Atlantic Coast population explosion (FRS, pers. comm.). Breeding: Hog I, 23-VI-56, 1 nest, FRS; 1-VI-57, 3 nests, FRS, JMV; mid VI-61, 50 pairs, CCS et al; 375 pairs, 26-V-68, MAB. Wachapreague, spring-62, 12 nests with 1-3 eggs scattered among nests of Snowy Egrets and Louisiana Herons, FRS. Chincoteague, 1970, new heronry contained ca 800 pairs of adults among the total of 3000 pairs of birds, MAB. Post breeding: Chincoteague Refuge, 28-VIII-65, 800, FGS et al; 29-VIII-70, 700, PGD. Species has now been seen in IV & V at several places on the western side of Ches. Bay. Winter: Chincoteague, 4 CBC's, 59-70. Probably still increasing and may eventually nest along Ches. Bay. Food: Fish, insects, crabs, snails, young moccasins.

Eudocimus albus. White Ibis. Post-breeding wanderer, with increasing numbers seen in VI and VII. Chincoteague Refuge, 5-VI-65, 1, BLP, RLP, 1968: Back Bay, 26-VI, 30, PD, RW; Norfolk Airport, 30-VI, 100, CWD et al; Hog I., Surry Co., 20-VII, 5, PAB. Williamsburg, 29-VIII-70, 11, MAB, RSK. Possibly increasing now but eventual decrease is more likely. Food: Fiddler crabs, fish, insects, crayfish, snails.

Family Phoenicopteridae

Phoenicopterus ruber. American Flamingo. Rare straggler. Chincoteague, NWR, 9-XI-69, 1 seen flying with Snow Geese, GE et al.

Family Anatidae

Dendrocygna bicolor. Fulvous Tree-Duck. Rare straggler IV-XI. Back Bay, 19-X-60, 1, first Va. record, TMcC. JHG. Hog I. Refuge, Surry Co., Va., 4-7-XI-61, 42, CCS. Chincoteague, 1965, 8 present thru nesting season, PLH et al; 29-VI-61, 1, TWM; 10-VIII-69, 1, PGD.

Cygnus olor. Mute Swan. Nonmigratory swan slowly spreading out from New York-New Jersey area. Dyke, Fairfax Co., 8-III-69, 1, HTA.

Cygnus columbianus. Whistling Swan. Abundant winter resident, mainly upper Ches. Bay, Back Bay and N. C. Presquile NWR, 22-IX-66, 27, JCF. In the severe winter of 69-70, swans were seen in Gloucester Co. on the York River and also the Ware River, where 32 stayed for 2 months. Leedstown, 10-III-70, 60, FRS. CBC's at Back Bay range from 111 ('66) to 14, 400 ('61); Cape Charles and Chincoteague counts being about 1 to 3% of Back Bay no. Probably increasing slightly; very subject to lead shot poisoning. Food: Mainly vegetation and seeds of aquatic plants, but shellfish are also eaten. Over 500 were flushed from a cornfield at Ridgely, Md., 26-II-70, RF.

- Anser albifrons. White-fronted Goose. Rare straggler from the west coast. Back Bay, 23-XI-25, 2 imm. shot; 7-I-38, 1, W.U. Howard; 5-11-II-39, 2, Harry Bailey (Murray, 1952).
- Anser hyperboreus. Snow Goose. Abundant winter resident at Chincoteague and Back Bay. Back Bay and Curles Neck, 13-X-63, 1st flights. Chincoteague Ref., mid - XI-68, 15,000, EFF. Back Bay, 24-XI-69 40,000, REG; and V-64, 15, DRA. CBC's: Back Bay, 465 ('55) to 65,000 ('64). Chincoteague, 0.7% ('64) to 437% ('61) of Back Bay count. Stable, or possible increasing. May require management in future if winter food supply is endangered by overfeeding. Food: Saltmarsh cordgrass roots mainly, also other marsh grasses and planted grain. (This species is now considered synonymous with the Blue Goose (Mayr & Short, 1970).
- Anser caeruleus. Blue Goose. Common winter resident at Hopewell (Presquille Ref.); 13-X-63, first flight, FRS; 18-XII-70, 225. CBC's: Hopewell, 6-205; Back Bay, 0-10; Chincoteague, 0-23 except 822 in '59. Probably stable. Food: Roots and vegetative parts of marsh plants.
- Branta canadensis. Canada Goose. Abundant winter resident; breeding range being extended southward through ease of rearing in captivity and imprinting. Pair bred at Chincoteague in 1971, because female had a broken wing. Early fall record: Hopewell, 15-IX-68, 40, FRS. Late spring record: Bull Run, Fairfax Co., 17-V-69, 9, Moxsoon. Winter: On all 9 CBC's for first time in 1970, setting records for Chincoteague and Cape Charles. Back Bay has varied from 880 ('62) to 20,000 ('58); Hopewell from 6 ('56) to 10,300 ('66). Of all the N. Am. waterfowl the Canada goose has perhaps fared the best, now having a stable, if not increasing population. Food: nearly all vegetation in winter.
- Branta bernicla. Brant. Abundant winter resident on ES. Once common in lower Ches. Bay and showing signs of reappearing there. Fall: Cedar I, 8-VIII-64, 1, PWS et al. Chincoteague, 12-XI-55, 10,000, FRS, CCS. Spring: Chincoteague, 14-V-60, 300, ETM et al. Parramore I, 28-V-64, 87, Mrs. Burford, Winter CBC's: Chincoteague, 1,600 ('64) to 32,000 ('66). Cape Charles had a record 8,724 in '70, after none in '69. Little Creek had 1,000 in '69, quadrupling earlier records. Population evidently still increasing, after suffering severe reduction from eel grass blight 40 years ago. Food: Diet switched from eel grass to sea lettuce in Va., making flesh all but inedible. Recently started feeding in grain fields.
- Branta nigricans. Black Brant. Rare straggler from west coast. Specimen from Cobb I, IX-1888. Captain Crumb reported 1 or 2 shot each winter. Apparently no records in this century (Murray, 1952).
- Aix sponsa. Wood Duck. Common permanent resident in swampy areas, abundant in winter and during migration at Presquille NWR; scarce to rare on coast. Breeding: No data, but breeding wherever nest trees or boxes are adequate in swamps. Eggs, early IV (Murray, 1952). Migration: Presquille NWR, X-62, 500, JHR; '63, 1200 at end of fall migration; 7-26-XI-69, 200, PDD. Winter (CBC's): Presquille, 18 ('57) - 1600 ('66). Little Creek and Washington had all time highs of 34 and 49 in '70. Rare at all other areas. Food: Fruits and nuts of woody plants and yellow pond lily. Said to be only duck eating quantities of "wampee duck corn" (arrow arum seed). Increased over its low nos. of the '30's, but could probably be increased many-fold if hunters would put up and maintain nest boxes.
- Anas penelope. European Widgeon. Occasional straggler from Europe. Murray listed 20 killed in Va. (9 from Back Bay) and 10 seen (5 in Back Bay). Records occur from early October to mid-April. Chincoteague NWR, 3-X-67, 1, JOP. Williamsburg, 28-III-11-IV-59, JHG, NK. Reported from at least 19 mid-Atlantic localities, winter, 69-70. A European x American Widgeon hybrid was also reported.



Anas penelope americana. American Widgeon. Rare summer breeder; abundant, altho erratic, winter visitor, often found on salt water. Breeding: Chincoteague, 1956 nesting season, 10 and broods, JMV. The fantastically high '69 CBC of 78,850 at Back Bay contrasts with counts of 11-134 in '62-'66. This count more than doubled the total of those taken since 1954, although 40,000 were seen in 1951. On the other hand, the Newport News count has been exceptionally stable, varying only from 158-2082 in 16 years and being over 1000 for 9 consecutive years. Possibly decreasing; '70 CBC less than 1/4 that of '69.

Anas strepera. Gadwall. Frequent to abundant winter resident; increasingly common breeder from North Carolina northward on the coast; rare inland. Breeding: Murray hinted at its increase but gave no nesting records. Chincoteague, 12-V-56, nest with eggs, JMV et al; 25-VI-65, 25, '70, production excellent, FRS. Back Bay, '68, several broods, DRA. Fisherman's I, 19-VI-68, 1 pr. with 8 young, JMA. Smith Pt., Northumberland Co., 23-VII-66, 1, FRS. Winter (CBC's): Back Bay, 1 ('55)-1400 ('69); Cape Charles 18 ('65) - 130 ('70); Chincoteague 73 ('62) - 850 ('64). The ability of this species to increase its breeding range and numbers in the midst of considerable human populations testifies to the success of wetlands conservation and indicates the potential for greater increases. Food: Widgeon grass and other submerged aquatics, plus a sizeable proportion of invertebrates.

Anas crecca. Common Teal. Rare straggler. Murray took a specimen at Lexington, 11-IV-37. Other records are from the Potomac R. area, the last at Hunting Creek, 9-III to 7-IV-56, JMA.

Anas carolinensis. Green-winged Teal. Abundant winter resident on the coast, often common inland; has bred at Chincoteague. Breeding: Chincoteague, 1956, 50 present, some broods seen, JMV; 9-VIII-64, hen with brood, FRS. Alexandria & Mason's Neck, 4-VII and VIII records, JMA. Winter (CBC's): Chincoteague, 37 ('63) - 4200 ('61); Back Bay, 6 ('51) - 918 ('66); Cape Charles, 4 ('66) - 146 ('70); Hopewell, 1, ('69) - 400 ('70); Washington, 25 ('63) - 463 ('59); Little Creek, 5 ('69) - 87 ('68). The CBC total for 1970 was the 2nd highest. The data typify the gregarious and wandering nature of ducks. This teal has obviously increased since Murray (1952). Food: Mostly seeds of marsh grass, some insects and mollusks.

Anas platyrhynchos platyrhynchos. Mallard. Abundant winter resident in tidal fresh water, common on the coast. Breeding in small numbers on refuges and where attracted by tame mallards. Breeding: Back Bay, up to 6-VII-69, 15 broods, REG. Chincoteague, 20 nesting, 2 broods seen VI-57, JMV. Craney I, 13-VI-65, hen with 9 young, PWS. Winter (CBC's): The erratic migrations of ducks are typified by the mallard counts. In 1970, when hunter's complained bitterly about the lack of ducks, an all time record total of 6693 was set for the 9 areas included. However, the total would have been higher in 1963 had Cape Charles been included. Perhaps little significance can be attached to Fort Belvoir's low count of 1 in '51 and its highest (410) in '70 and paralleling it, Back Bay's 10 in '51 and high of 2,759 in '70. Until '67, Hopewell usually had more than the other counts combined. The mallard prefers freshwater more than most other ducks do. It is said to be decreasing, but a close association with man precludes its extinction. Food: Primarily seeds of marsh plants, also aquatic insects.

Anas platyrhynchos rubripes. Black Duck. Abundant winter resident and most common duck breeding widely in Tidewater marshes. Chincoteague Ref., VI-57, 35 broods, JMV. Back Bay, to 6-VII-69, 6 broods, REG. Nests at Grandview, Hampton, 10-IV-69, MAB et al, and Ellen I, Gloucester Co., IV-71, 1 with 8 eggs, KLM, indicate the willingness of this duck to nest wherever it is unmolested. Winter (CBC's): Black duck numbers seem to follow those of the mallard, but always exceeding on the Eastern Shore and at Fort Belvoir and usually so at Back Bay, Little Creek and Washington. The Chincoteague count of 13,400 may stand for all time since the species is said to be declining greatly, although Back Bay had its highest count in '70. Food: Similar to the mallard's, but including more animal food, especially univalve mollusks.

- Anas acuta. Pintail. Abundant winter resident on coast and inland. Rare breeder. Breeding: Roach's Run, near Washington, '36 & '37, 10-28 young each year (Murray, 1952). Chincoteague NWR, 71, 2 broods, J. C. Appel. Summer records: Dyke, Fairfax Co., 10-VII-65, 6, JMA. Chincoteague NWR, 28-VIII-70, 19, TT. Winter (CBC's): Back Bay, 125 ('62)-4350 ('67); Hopewell, 42 ('56) - 1500 ('64); Washington, steady decline, 1901 ('59) - 52 ('70); Chincoteague, 199 ('62) - 5046 ('66). Numbers stable. Food: Widgeongrass, and other aquatic, some invertebrates.
- Anas bahamensis. Bahama Duck. Pungo, Back Bay, 17-XII-37, 1, Dr. R. C. Murphy (Murray, 1952). Chincoteague, ca 14-XI-66, 1, T. J. Reed.
- Anas discors. Blue-winged Teal. Frequent transient and occasional nester. Breeding: Murray gave records from Stumpy Lake, Norfolk; Seashore State Park and the Eastern Shore. Chincoteague, '57, 30 nesting, JMV; 5-V-59, 1 nest with 7 eggs, TWM; 21-VIII-65, 6 half-grown young, FRS. Goose I, '58, pr. and young, JMA. Hampton, 28-IV-62, JAP, et al; 30-V-64, nest with 20 eggs, WPS et al. Migration: Chincoteague NWR, 8-III-69, MAB, GWH. Winter (CBC's): 21 records, unusual in that all range from 2-11, except for one single and 30 at Newport News ('67). Total for all CBC's is only 107. The meager records indicate a stable population. Food: Widgeon grass, seeds of smartweeds and other marsh plants, 25% of diet is mollusks and insects.
- Anas cyanoptera. Cinnamon Teal. Ocean City, Md., nest abandoned by 30-VI-62, eggs infertile, SHD. Perhaps an escapee.
- Anas clypeata. Shoveler. Winter resident, rare inland to occasionally plentiful at Chincoteague, rare in summer, apparently nested at Chincoteague, '57, JMV. Winter (CBC's), Chincoteague, '64, 1400; exceeding combined counts of other areas except in '68. Scarce at Washington, not at Fort Belvoir or Newport News. Stable or slightly decreasing.
- Aythya valisineria. Canvasback. Frequent to abundant winter resident and frequent summer straggler. Murray declared it to be the most common duck at Back Bay with counts up to 20,000. Summer records come from Craney I, Goose I, and Hollis Marsh I, PWS, JMA. The peak of the fall migration in 1962 at Back Bay was estimated at 15,000 (DA), yet since the 1961 CBC of 900, only 86 have been seen, with 0's for 4 CBC's. Both Little Creek and Newport News had their 2nd highest CBC's in 1970. The highest reported CBC was 1,678 ('67) at Fort Belvoir. The Washington CBC record closely parallels that of the Ring-necked Duck. This fabulous waterfowl may not be in danger but it will always require close scrutiny. Its population seems to be afflicted by a preponderance of drakes, often 4-1. Food: Wild celery, pondweeds and considerable animal food in brackwater.
- Aythya americana. Redhead. Formerly common, but now scarce winter resident. Summer: Hollis Marsh I., 10-VII-55, 1 pr., JMA et al; Craney I, VI-VIII-64, PWS. Migration: Back Bay, fall '62, peak of 12,000, DA. Winter (CBC's): Back Bay, 40,000 ('57); only 4 others over 100 in all areas. As often absent as present in most count areas. Food: Aquatic plants, some insects and mollusks. Seems to be continuing its decrease.
- Aythya collaris. Ring-necked Duck. Winter resident, more common inland. Murray reported this freshwater devotee as greatly increased and common in winter on the coast. It seems to fall in a great gray category of birds which go unnoticed by bird watchers except at CBC time. The latter reveal some interesting tidbits: The ecological devastation of the Ash Wednesday storm in Back Bay is shown by the '61 count of 1000 followed by none in the next 5 years. Little Creek had more in the combined '55-56 counts than in all counts since. Washington climbed from 3 in '59 to 409 in '64 and has steadily declined, except for 0 in '67, to 15 in '70. To cap it all, the great duck areas, Back Bay, Hopewell and Chincoteague had none in '70 to augment the record low total of 60. Unless CBC's are in the wrong places, this species is in trouble. Food: Plants and seeds, with 1/4 being animal.

Aythya marila. Greater Scaup. Occasional to abundant winter resident, scarce summer straggler. The peregrinations of the 2 scaups, assuming perfect ability in all CBC participants, is ridiculously mystifying. In '57, Fort Belvoir had 1200 Greater and 1 Lesser Scaup, while Little Creek had 65 Lesser and 1 Greater Scaup. Newport News tallied 2010 Lesser Scaup in 15 CBC's while finding only 2 of the Greater. Mathews had the top CBC (567) of Lesser Scaup in '69, but found no Greater. Conversely, Chincoteague had 1,002 Greater Scaup in 9 counts but only 84 Lesser. Only at Back Bay has the FW&S estimate of 1 Greater: 3 Lesser Scaup seemed to hold if all counts are totaled. However, for any one year, it has been quite untrue; in '57 and '61, when 460 and 400 Lesser Scaup were seen, no Greater appeared. In '58, there were 122 Greater Scaup and only 3 Lesser. Summer: Craney I, Hampton Roads, all summer, '59, 8, JEA, WFR. Food: Largely invertebrate in winter; wild celery and pondweeds in fresh-oligohaline waters.

Aythya affinis. Lesser Scaup. Abundant winter visitor. Winter (CBC's): Overall ratio of Greater to Lesser Scaups ca 6:5 at Fort Belvoir and 5:9 at Little Creek. A bag limit of 4 has recently obtained for the scaups in Ches. Bay, double the no. for other ducks, although 1970 totals of only 212 Lesser and 61 Greater Scaup were recorded, an all time low, considering the areas censused. Summer: Goose I, V-59, 9 (7 summered), JMA. Craney I, '59, 1 all summer, JEA, WFR. Scaups obviously require annual attention by observers able to separate the two, if they are to be safely harvested. Food: As in the Greater Scaup, but probably more animal food as they range further south.

Somateria mollissima. Common Eider. Rare winter straggler seen increasingly frequently since installation of the CB Bridge Tunnel. Little Creek, 26-XII-56, 1, PWS, HH. Craney I, 27-IX-63, PWS. Cape Charles, 29-XII-68, 1, PAD.

Somateria spectabilis. King Eider. Formerly a rare winter visitor, XII-I (Murray, 1952). Now annual, since building of Ches. Bay Bridge Tunnel. Wallops I., 6-VI-58, 1, FRS, JMV. Bridge Tunnel, 29-XI-69, 1, FRS, JMV. Bridge Tunnel, 29-XI-69, 1, FCB, CWD. CBC's: Little Creek, 4 ('69), 11 ('70).

Histrionicus histrionicus histrionicus. Harlequin Duck. Rare straggler, mouth of Ches. Bay. Not in Murray (1952). CB Bridge Tunnel, 19-VI-6 VII-68, RA et al; 30-III, 12-IV-69, PAB, MAB et al. More frequent northward.

Clangula hyemalis. Oldsquaw. Abundant winter resident along the coast and in lower Ches. Bay; occasional inland. Fall migration: Mt. Vernon, 7-X-65, 5, JMA. Alexandria, 9-XI-63, 70, ETM. Potomac R. off Lewisetta, 29-XI-70, 650, FRS. Winter (CBC's): Chincoteague, 6 ('59)-1132 ('70); Little Creek, 0 (5 times)-387 ('69); Cape Charles, 2 ('65)-352 ('69). These data indicate considerable wandering or year-to-year fluctuation. However, this deep-diving species ranges over much of the lower Ches. Bay and a total census would be difficult.

Melanitta nigra. Common Scoter. Rare to abundant winter resident in lower Ches. Bay and along the coast. Not as common as other scoters (Murray, 1952). Chincoteague NWR. Winter (CBC's): Murray's comment on abundance is borne out in all areas. At Chincoteague 8,730 more Am. Scoters have been seen, but exceeded Surf Scoter only on 4 counts. Most bizarre switch for this species was at Chincoteague with 1 ('63) followed by 16,300 ('64). All 3 species were very low in '68, but plentiful last years. Food: Mollusks, crustaceans, fishes, echinoderms, eelgrass & widgeongrass.

Melanitta perspicillata. Surf Scoter. Abundant saltwater resident in winter. Average, 25-XI to 3-III; six records near Washington (Murray, 1952). Potomac R., off Lewisetta, 28-XI-70, 6000, FRS. Fort Belvoir, 21-XII-69, 2, PAD, PGD, only CBC record. Other CBC's: Chincoteague, 0 ('68)-4772 ('62); Cape Charles, 18 ('68)-5045 ('67). All counts: 227 ('68)-8890 ('67). Fluctuations bear some resemblance to that of the other two scoters, all three being low in '68-'69. Surf Scoter outnumbered White-winged at Chincoteague 4.5 to 1 (12 counts); at Cape Charles 32 to 1 (6 counts). Obviously gregarious and wandering, but rather stable.

- Melanitta fusca. White-winged Scoter. Common to abundant visitor in lower Ches. Bay and along the coast, rare at Fort Belvoir. Chincoteague, 28-VIII-65, 1, FGS et al. Winter: York River, 2-III-47, 850, FRS. (CBC's), Chincoteague, 0 ('63)-2350 ('64); Cape Charles, 2, ('68)-221 ('69); scarcer elsewhere. Fluctuating but stable overall. Food: Mainly marine invertebrates especially mollusks; some eelgrass.
- Bucephala albeola. Bufflehead. Abundant winter resident on the coast and common inland. Migration: York R., near Yorktown, 11-III-61, 450; 16-IV-61, 270, FRS. Winter (CBC's): Only missing from 6 of 114 counts. Max. nos.: Cape Charles, 5475 ('66); Chincoteague, 2193 ('65); Mathews, 688 ('70); Fort Belvoir, 298 ('64), Newport News, 235 ('62); Little Creek, 264 ('55), Washington, 192 ('63); Hopewell, 51 ('68); and Back Bay, 34 ('60). All occurred in different years, an indication of the equable dispersal of the Bufflehead, a bird watchers' delight, stable and undesired by epicures. Food: Chiefly invertebrates, more vegetation in freshwater areas.
- Bucephala clangula. Common Goldeneye. Common to abundant winter resident in meso- to euhaline open water. Winter (CBC's): Highest counts in '69 & '70, both years 688, resulting from the addition of the Mathews count. Fluctuation seems less than in most ducks, but is still marked; as note ranges for Newport News, 4 ('53)-450 ('62); Little Creek, 1 ('68) - 105 ('60). Chincoteague, 33 ('68) - 329 ('65). This hole nesting whistler is little hunted and appears stable. Food: Largely invertebrates, aquatics in fresher water. Stomach of an oil-killed bird from the York R. contained only xanthid crabs.
- Mergus cucullatus. Hooded Merganser. Frequent to common near coast in winter, scarcer inland; recently nested for first time in Md. Eastern Shore, 3 different localities, mid VI-61, TWM et al. Chincoteague NWR, 25-XI-61, 500, TWM. Murray said this was "the most generally distributed" of the 3 mergansers in the interior. However CBC's show it highest at Little Creek, 8 ('57)-234 ('68); followed by Cape Charles, 70 ('67)-155 ('70) Chincoteague, Newport News, Back Bay and Hopewell. This strikingly beautiful duck, altho having its highest nos. in '61, is in good shape. Like all hole-nesting ducks, except the wood duck, its fate depends mainly on northern forestry practice.
- Mergus serrator. Red-breasted Merganser. Common to abundant winter resident in meso- to euhaline waters. Hampton, 9-XI-70, 3000, WPS. CBC's: Back Bay, 5 ('65)-279 ('57); Little Creek, 14 ('64), 142 ('55) except 6074 ('56) & 6692 ('57); Cape Charles 124 ('68)-352 ('67); Chincoteague 13 ('60)-413 ('67); Newport News, 5 ('56)-172 ('61); Hopewell (only 2 counts), 3 ('55), 70 ('65). This merganser seems more stable than most ducks, and although die-offs have occurred, no decrease is evident.
- Mergus merganser. Common Merganser. Winter resident common to abundant in freshwater, rare to frequent on the coast. Breeding: Dyke, Va., 1 pr, 1 young, VI-VII-65, SSB et al. Migration: Chincoteague NWR, 2-X-65, LLH. Average stay, 20-XI to 27-IV (Murray 1952). CBC's: Fort Belvoir, 2 ('68)-431 ('55); Hopewell, 9 ('56)-253 ('63); Washington, 7 ('69)-215 ('59). Present every year at Cape Charles (1-6), but not in other coastal counts. A hole-nester which may be expected to decline unless bird lovers' put up next boxes in its breeding range. All records from 6 main count areas for this species were established at least 8 years ago.
- Oxyura jamaicensis. Ruddy Duck. Abundant in fresh to mesohaline waters, less common on the coast, few occasionally summering. Chincoteague, summer '61, breeding suspected. Migration: Alexandria, 2-X-66, 29; 13-IV-59, 2100, JMA. Summer: Hunting Creek, summer '65, 7; Goose I, summer '59, 8, JMA. Craney I, 29-V-69, 20, PAB. Winter: (CBC's): Washington, D. C. has exceeded other areas since '60 (usually all areas combined), except in '69 when Ft. Belvoir had 4776; peak was 9611 ('62). Counts in '70 lower everywhere except at Washington, by 94% at Ft. Belvoir. Fortunately, this pert little duck continues in abundance being little subject to gunning. Food: largely insect larvae (incl. tabanid larvae), mollusks, crustaceans and freshwater aquatics.

## Family Accipitridae

Elanoides forficatus. Swallow-tailed Kite. Rare southern straggler. All records in April (2) and August (2). Seashore State Park, Norfolk, 19-IV-59, Mrs. LEB et al. Only record since those in Murray, (1952).

Buteo lagopus. Rough-legged Hawk. Rare winter visitor in Virginia. Included here because, since Chincoteague has had a CBC, 22 have been seen there, 24 at the other areas combined. Uniformity of scattered records indicates stability. Food: Principally lemmings in summer, meadow mice in winter.

Aquila chrysaetos. Golden Eagle. Rare winter visitor on the coast. Kiptopeke Beach, 24-X-68, FRS. CBC's (3 records): Fort Belvoir 2, Chincoteague I. Chickahominy R., XII-70, 1 imm., John Norcross. Murray had records of 36 shot and 12 seen in Va. It no longer nests south of Pennsylvania and is increasingly rare.

Haliaeetus leucocephalus. Bald Eagle. Rare permanent resident, now confined to oligohaline and freshwater areas. Murray listed our national emblem as a "common resident along the coast and along Chesapeake Bay; eggs, February 15 to March." Records in Audubon Field Notes and its successor, American Birds, document the disaster which has befallen the American king of birds and made it a ghostly emblem warning of environmental destruction. Nesting: Va. shore of Potomac between Mt. Vernon and Quantico, 5-IV-59, 15 nests (6 occupied, 4 young), JMA. Ches. Bay area of Va., 1964, 9 young produced, JMA, FRS, et al; 1966, 24 active nests, 1 young raised; a ray of hope appears in 1968, 47 active nests, of 26 checked by 1-VI-68, 5 produced young, Bald Eagle Nest Survey.

Fortunately, the CBC explosion came in time to document the eagles plight, particularly on the coast. In 1955, 5 areas tallied 11 eagles; in 1966, only 1, an adult was seen. In '55-58, 26 were reported from Back Bay, vs only 4 in the years since. It remains to be seen whether this symbol of our might will survive in the United States, since it is obviously still decreasing. Food: Mainly fish, also crippled water birds.

Circus cyaneus. Marsh Hawk. Abundant winter resident in coastal marshes, scarce inland. Formerly bred on coast but not commonly; no nest records (Murray, 1952). Cedar I, Va., 22-VI-68, 1, MAB. Winter (CBC's): Back Bay, 2 ('56)-49('68). Chincoteague, 1 ('63)-51 ('70). Considering no. of areas reporting, the lowest count (47) was in '66 and the highest (154) in '70. It is difficult to believe that any raptor could be increasing but at least the Marsh Hawk remains common. Food: Rodents, reptiles, birds and amphibians.

## Family Pandionidae

Pandion haliaetus. Osprey. Common to abundant summer resident all along the coast and up Chesapeake Bay, (Murray, 1952). Following the disappearance of the Bald Eagle from so many areas, the Osprey's affliction has received increasing attention. Virginia and Maryland populations have not suffered to the extent of those further north, but the chlorinated hydrocarbon snare seems still to be tightening. Murray related Tyrell's finding in June, 1934, of 76 nests around Smith's Point, Northumberland Co.; Scott (1969) believed this number would be decreased by about 25%. No recent nestings have been successful on the James R. Robert S. Kennedy, a student of Mitchell A. Byrd, observed osprey nesting in Tidewater Va. for 2 seasons. He found nesting success relatively good on the E. Shore in '70 but in '71, 55 nests produced only 15 young. Mathews Co. and areas, along the Bay northward remain productive. Early migration: Yorktown, 28-II-70, 1, RSK. Winter: Only 6 CBC dates, 3 of those from Hopewell, where 6 appeared in '67. The osprey suffers increasingly from a lack of suitable nesting sites, but the cumulative effect of DDT and PCB's is likely far more serious. Food: Fish, eel and catfish bones found in York R. nest. Sick and injured fish probably often taken.

## Family Falconidae

Falco peregrinus. Peregrine Falcon. Scarce transient and rare winter resident on the coast. Murray recorded the peregrine as an uncommon transient and also reported several nestings in western Virginia and two occupied nests not far from the coast, April 14, 1946, reported by Jones. Migration: Assateague I., 11-XI-69, 4, COH, DH. Kiptopeke Beach, 21-XI-69, 2, MAB, et al. Wachapreague (near Parramore I), 26-IX-71, 1, MW and several others. Winter: 14 records from 7 areas, all singles except Cape Charles, 2, '69 & '70. The Peregrine Falcon, fastest bird and most prized for falconry, no longer breeds in eastern United States. Those seen in winter come from Labrador and Greenland.

## Family Rallidae

Rallus longirostris longirostris. Clapper Rail. Abundant breeder in coastal marshes, common in winter. Cobb & Wreck Is., 24-28-VI-55, nest with 7 eggs. Abbott, (1955). Hog I, Surry Co., nest, C. C. Steirly. Towles Point, 25-V-68, 7, farthest penetration up the Rapahannock (Scott, 1969). Winter: Ship Shoal I, 13-XII-69, 40, FRS et al. CBC's: Cape Charles, 22-58; Chincoteague, 5-29; Little Creek, 0-15; Newport News, 0-9; Back Bay (3 dates) 2-14. The marsh hen continues to be a popular game bird on the Eastern Shore. The season opens early in Sept. and is quite long, so that several "rail tides" may occur, allowing hunters to reach these weak flyers. Large nos. may perish naturally if northeast winds cause prolonged high tides. Finding of 4 highway kills by the author in the spring of '69 indicates higher mortality during migration. CBC's indicate a possible slight decrease. Food: Periwinkles, fiddlers, other crustaceans, insects and seeds.

Rallus longirostris elegans. King Rail. Fairly common summer resident in fresh tidal marshes (Murray, 1952). Rare to scarce in winter on the coast. Murray mentioned it nesting at Washington; eggs 30-V to 18-VI. Back Bay NWR, 25-V-68, downy young, PAB et al. Winter (CBC's): Most seen at Cape Charles, 1 ('70)-7 ('68); Back Bay has had 0-13; Chincoteague none. Food: Plant seeds, snails and numerous arthropods.

Rallus aquaticus limicola. Virginia Rail. Breeds in fresh and brackish marshes (Murray, 1952). Scarce winter resident, most common in migration. Washington, breeds locally, eggs 26-V to 3-VI. Species is common enough that migration records do not appear in Aud. Field Notes. Winter (CBC's): Most common at Cape Charles, scarcer at Back Bay and Chincoteague. Marsh preservation is vital to this species and all other rails. Food: Some seeds, but mostly animal; arthropods, snails, slugs and small fish.

Porzana carolina. Sora. Common to abundant migrant, occasional on coast in winter, one presumed breeding record. Breeding: Langley Field, Hampton, 9-VI-38, F. C. Lincoln; "rather good evidence" (Murray, 1952). CBC's: Quite consistent at Cape Charles, 0-5; rare at Back Bay, Little Creek, Mathews and Newport News. Migration: Sandbridge Road, Back Bay, 18-IX-56, 75 dead after cold front and strong winds, PW. Food: Smaller seeds of marsh plants; mollusks, insects, spiders and crustaceans. The Sora must have decreased greatly since two men killed 1,235 in 2 days, 5 & 16-IX-1881, in a James River marsh (Murray, 1952). Except at Cape Charles, all CBC records (6) are singles since '60.

Coturnicops noveboracensis. Yellow Rail. Rare migrant. Murray mentions 2 specimens killed 4-X-1879 and 28-III-1884 in Potomac marshes. Only AFN record seems to be the Cape Charles CBC of 1 in '67. Food: Freshwater snails, insects, spiders, crustaceans, and seeds of sedges and smartweeds.

Laterallus jamaicensis. Black Rail. Rare transient, one breeding record. Northampton Co., 16-VI-11, set of eggs, H. B. Bailey. Chincoteague, 10-VI-55, 2, EK; 27-VII-55, 1, JMV. Back Bay, 9-V-56, 4, RW. Dameron Marsh, 17-IV-54, JT; marsh at Lewissetta, 5-IX-66 (Scott, 1969). Only CBC record, Fisherman's I, 29-XII-68, MAB. The Black Rail is surely less rare than records indicate, a result of the difficulty of flushing this tiny skulker.

Porphyryula martinica. Purple Gallinule. Rare wanderer, all records listed by Murray (1952) were in May. Pungo Marsh, 17-V-38, Mrs. Reed. Back Bay beach, 19-V-46, Perkins.

Gallinula chloropus. Common Gallinule. Fairly common transient, rare and local breeder. Breeding: Swamp near North Landing and Stumpy Lake, adults with young '42-44, W. F. Rountry. Near Washington, eggs, 3-VI-17, 30-V-19, 11-V-22; young, VI-IX. E. Shore (Hog I), 17-VI-11, set of eggs, H. B. Bailey. Goose I, pr. building nest, 11-VII-59; adult with 3 young, 31-VII-60; Hunting Co., Fairfax Co., 9-VII-66, pr. with 8 week-old young, JMA. Saluda, 30-III-69, 4, MAB; Goose I. Cape Henry, 19-III to 19-V and 30-IX to 30-X (Murray, 1952). CBC's: Cape Charles, every year, 1-3; Back Bay, sporadic, 1-5; Little Creek, 1 ('70); Chincoteague, 15 ('60).

Fulica americana. American Coot. Common to abundant winter resident in fresh and brackish areas with rooted aquatics. Rare in summer, breeding locally. Breeding: Murray reports 2 pairs breeding in Byrd Park, Richmond, apparently rearing 2 broods in a season. He also cited its reported breeding at Knott's I. Stumpy Lake, Norfolk, VII-56, young, WFR. Chincoteague NWR, summer '61, few pairs, probably breeding, TWM. Saluda, Middlesex Co., Va., 20-V-68, nest with 7 eggs, MAB. Migration: Chincoteague, X-67, 8600, EFF. Dyke, 16-X-65, 250, JMA. VIMS, '71, 1 stayed all summer. Winter (CBC's): Back Bay, less than 100 on 8 counts, highly variable, 10,000 ('51), 0 ('63), 19,800 ('70); Cape Charles, 97-226; Little Creek, 0-143; Newport News, 0-111; Chincoteague, 0-1091; Washington, 1-77 (last 10 years). In '62 & '63, the totals for all counts were 13 & 16. This hunter-despised rail seems very capable of adapting to man and should survive as long as its habitat does. Food: Mostly vegetation, but some, as the approx. 20 at VIMS every winter, must eat a lot of invertebrates.

#### Family Haematopodidae

Haematopus ostralegus. American Oystercatcher. Abundant permanent resident on the Eastern Shore seaside, and showing signs of moving into Ches. Bay. Breeding: Cobb & Wreck I's, 14-VI-55, 150, 3 nests, JT. Cedar I, 4-VIII-60, 35-40, incl. 4 family groups, PWS. Hog I., 12-VIII-61, 104, LCG et al. Tangier I, 11-VI-65, 5 adults, first breeding season record for Ches. Bay, FRS. New Point Comfort Light, VII ca. 1966, pair which acted like they had a nest among the boulders, MW. Migration: Assawoman I. (northern end), 5-IX-60, 245, AEW. Yorktown, 26-XI-66, MAB. CBC's: Only Cape Charles, 69 ('66)-313 ('70) and Chincoteague, 3 ('59)-148 ('70); except 1 at Newport News ('61). This striking shorebird has increased dramatically since Bent (1929) reported that no nests or young were seen on Cobb I in 1907. In the 1970 CBC, 160 more were seen than in 1965, the previous record year. Food: Fiddler crabs, oysters, shrimps, barnacles, insects, sea worms.

#### Family Charadriidae

Charadrius hiaticula semipalmatus. Semipalmated Plover. Abundant transient along the coast; average dates at Cape Henry, 2V-17V, 28VII-4XI (Murray, 1952). Alexandria, 4-VI-61, 20, JMA. Species evidently so common that migration records are not worth publishing for the coast. CBC's: In 2/3 of the counts at both Cape Charles & Chincoteague. Apparently stable or even increasing slightly. Food: Small polychaetes, mollusks, crustaceans and insects.

Charadrius melodus. Piping Plover. Common migrant, frequent nester and uncommon winter resident on the outer coast, rare inland. Breeding: Murray listed no recent records. Cedar I, 4-VIII-60, 1 downy young, PWS. Cobb I, 18-VI-66, 8 adult, 5 young, FCB. Chincoteague, NWR, 17-V-68, nest with 4 eggs, ETM, RLS. Cedar I, 22-VI-68, nest with 4 eggs, MAB. Migration: Chincoteague, 21-IX-68, 60, CWC et al: 2-IV-69, 65, MAB. CBC's: Cape Charles & Chincoteague, 0-9 at each. Due to human pressures on dune habitats, this sand-bound plover is likely to decrease somewhat. Food: Insects and marine invertebrates.

Charadrius wilsonia. Wilson's Plover. Seems more common in summer on the E. Shore than is Piping Plover. Breeding: Bent (1929) reported 22 egg records, for Va., 4V-20VI. Cobb I., 18-VI-66, 12 adults, 15 young, FCB. Near Wallops I, 17-VI-61 nest with 1 egg and 2 young, CCS et al. Cedar I, 10-VI-69, nest photographed on washover, 1 egg destroyed, 1 pipped and 1 chick out; 2 others seen running near parents, MW. Grandview, Hampton, 10-V-51, WFR (Murray, 1952). It is also strange that no records are available from mid-June through April. This species seems almost certain to decrease.

Charadrius vociferus. Killdeer. Permanent resident, breeding away from shorelines, but dispersed along sandy shores of the bay and coast in winter. Breeding: Williamsburg, 24-III-56, nest with 4 eggs, JHG. Lexington, eggs present, 1-IV to 9-VII, (Murray, 1952). Robert J. Huggett was shown a nest with 3 young at Seaford, York Co., 8-IV-72. CBC's: A quite uniformly distributed species present every year for most tidewater counts. Back Bay: 7('52)-166 ('69), Cape Charles, 21('67)-401('70); Chincoteague, 1('59)-150('70); Fort Belvoir, 4('60 & '61)-129('57); Hopewell, 1('58)-111('56); Little Creek, 19('63)-362('57); Newport News, 42('64)-172('61), Washington, 26('66)-234('59). This shorebird is probably the only bird considerably water-dependent which has been recorded on all of the 114 counts checked, although 3 were only singles. The total of 966 in '70 was 200 above the '69 record, a result of the large Cape Charles count. The striking "kill-dee" suffers from being common and a nongame species, in that little study seems to have been done on it. As the shorebird most closely associated with man, it fares well, but its fate will depend much on future agricultural practice. Food: Largely animal, in Va., probably insects in summer, marine worms and crustaceans in winter, also some seeds.

Pluvialis dominica. American Golden Plover. Occasional to frequent fall migrant. Very rare in spring, since this species goes north through the Mississippi Valley. Fall: Wallops I, 12-VIII to 3-X (Bent, 1929). Craney I, 18-VIII-69, FCB et al. Hog I, 18-IX-55, 3, JT. Chincoteague, 19-IX-62, 61, FGS. Arlington, 5-X-63, 62, JMA. CBC's: 3 records, Newport News, 11('62); Chincoteague, 1('65); Back Bay, 46! ('70). Spring: Hampton 28-IV-62, 5, JAP et al. Newport News, 4-V-63, 1, LM. Chincoteague, 18-V-63, 1, SHD, FGS. Back Bay Ref., 25-V-63, 1, PAB et al. Food: Insects; marine worms, crustaceans & mollusks; berries.

Pluvialis squatarola. Black-bellied Plover. Abundant on coast and during migration. Spring: Hopewell, 27-V-62, 10, FRS. Cape Charles AFB, 27-V-69, 520, FCB. Chincoteague, 28-V-69, 382, MAB. CBC's: Cape Charles, 311 ('65)-716('68); Chincoteague 69 ('68)-362('69). Back Bay, 0-22; Little Creek, 0-17; Newport News, 0-22. In good shape, as are most Arctic nesters. Food: Marine invertebrates, some insects.

Family Scolopacidae

Arenaria interpres interpres. Ruddy Turnstone. Abundant migrant common in winter on Eastern Shore seaside. Spring: Back Bay, 18-V-63, 350, WFR, PWS. Chincoteague, 16-V-64, 1200, FGS. Dyke, 15-IX-68, 1, JMA. CBC's: Cape Charles, 16('68)-139('70); Chincoteague 3('59)-63('70). Newport News, 28!('68), Grey; only 1 or 2 on other 4 dates. Population stable. Food: Marine invertebrates.

Scolopax minor. American Woodcock. Apparently more common in summer than realized earlier. Abundant at Cape Charles in winter; common to scarce elsewhere. Breeding: Back Bay Ref., 2-IV-68, nest of 3 eggs, FGB, PAB. CBC's: Cape Charles, 3('65)-122('68); Back Bay, 0-10; Chincoteague, 0-20. Other areas counts 1 or 2, except 3 at Mathews ('70). The woodcock has suffered from prolonged cold spells in the south and from pesticides in the north. In Virginia, hunting pressure is low and the winter population relatively stable. Swamps are vital to the continued breeding success of "this recluse of the boggy thickets". Food: Principally earthworms, but also slugs, insects, centipedes and spiders.



Gallinago gallinago. Common Snipe. Occasionally abundant in migration; common on the coast where low marshes are extensive. Chincoteague Bay, near Horntown, Va., 15-XI-60, 300, TWM. Cobb I, 19-VIII-39, "Brooks saw good numbers and heard a flock of 500 a few days earlier"; an unprecedented record reported by Murray (1952). CBC's: Distribution more uniform than shown by most species. Back Bay, 22('70)-100('61); Cape Charles, 2('65)-26('68); Chincoteague 4('62)-39('66); Hopewell, 1-27; Little Creek, 0-20; Newport News, 0-6; Washington, 1-19. Steady declines at Back Bay, Little Creek, Newport News, and Washington may indicate habitat loss. Food: Earthworms, insects and their larvae, some seeds.

Numenius arquata americanus. Long-billed Curlew. This magnificent curlew of the prairies has long been only a rare straggler on the east coast where once it was an abundant game bird. Murray (1952) refers to a specimen taken 11-IV-1842 on the Potomac; to 3 seen at Ragged I, 1932; and one at Rogue I, 18-IV-41. Armistead (1970) saw one at Cape Charles, 28-XII-69.

Numenius phaeopus. Whimbrel. Common migrant on the Eastern Shore, rare in winter. Chincoteague, 15-IV-61, 1, TWM, et al; Cedar I, 6-VI-68, 14 Whimbrel, MAB. Wallops I, 7-VII-62, 44, TWM, FRS; Metompkin Inlet, 7-VII-68, 25, Dyke. Chincoteague, 13-XII-59, 1, TWM. CBC's, Chincoteague, 2('63), 1('64), 1('65). Cape Charles, 4-1('66-'70). The Whimbrel is much increased in recent decades, but will probably do well to maintain present numbers. Food: Earthworms, sandworms, insects, small mollusks, and crustaceans. Fairly common summer resident inland (Murray, 1952), scarce to common during migration, very rare in winter.

Catoptrophorus semipalmatus. Willet. Abundant nester on Eastern Shore seaside, scarce to frequent in winter. Breeding: Cobb I, 1875, breeding in large nos., H. B. Bailey; 1907, no more than 3 pr. breeding; 1922, 15 pr. bred (Bent, 1929). Cedar I, 12-VI-55, 150 prs. nesting, 35 nests found, eggs of one half-hatched, JT. Assawoman I, 30-V-57, 19 nests (2 only 25 ft. apart), FRS, JMV. Metompkin I, 24-V-69, 47, MAB. CBC's: Cape Charles, 10 ('70)-69('69); Chincoteague, 0-4; Little Creek, 1('62); Mathews, 2('70). If marshes are protected the cry of the Willet seems sure to increase around lower Ches. Bay. It very likely nests now on Plum Tree I and in Gloucester Co., where it has been seen at the Poropotank R. and the Guinea Marshes in summer. It is possibly the most abundant nester on the E. Shore, since its nests are found in marshes and on dunes and are dispersed over great areas. Food: Probably fiddler crabs to a great extent in summer.

Tringa hypoleucos. Spotted Sandpiper. Craney I, 4-VII-65, 37; 27-X-63, 1, PWS. Chincoteague NWR, 24-XI-67, 1, ML, MN. CBC's: Newport News, 1('60); 2('65). Cape Charles, 1, ('69). Bent (1929) referred to it as "best known of our sandpipers". Hopefully this will always be so, yet the species is quite certain to suffer as increasing humans flock with their pets, to water courses in summer. Food: Insects, crustaceans, worms.

Tringa ochropus solitaria. Solitary Sandpiper. Scarce to fairly common transient. Cape Henry, 5 records in IV-&V; fall, 23-VII to 17-LX (Murray, 1952). No recent Virginia records were noted. F. R. Scott (in litt.) refers to it as a common transient along streams of freshwater marshes.

Tringa nebularia melanoleuca. Greater Yellowlegs. Common to abundant on Eastern Shore in winter and in migration, scarcer inland, although common in spring along brackish marshes. Cape Henry, 27-III to 10-VI and 26-VII to 30-X. CBC's: Cape Charles 22('68)-68('70); Chincoteague, 5('68), 54('70). Scarce to rare at Back Bay, Little Creek, Hopewell and Newport News. The record no. in '70 is encouraging for this tattler gifted with "exasperating loquacity". Bent (1927) wrote nostalgically of the glorious days when shorebirds were fair game. On 11-X-04, 463 Greater Yellow-legs were sent from Newburyport to a stall in Boston. Food: Killifish, crustaceans, insects, worms and snails.

- Tringa flavipes. Lesser Yellowlegs. Common transient and winter visitor, but evidently less frequent than the Greater Yellow-legs. Frequent in winter on Eastern Shore seaside, rare elsewhere. Langhorne's Pond, Albermarle Co., 16-VIII-55, 66, CES (after Hurricane Connie). Fort Belvoir, 1, 21-XII-69, PAD, PGD. CBC's Cape Charles, 37 ('70), 19 in all 5 previous years. Chincoteague, 0-28, rare at Back Bay, Hopewell, Little Creek and Mathews. More migration data is needed on the yellow-legs. Bent (1927) states that the Lesser Yellow-legs is more abundant but Murray (1952) reports the Greater more common at Cape Henry. Strangely, Bent had no winter records north of Florida. Species probably no more than stable. Food: More insectivorous than its larger congener.
- Limosa fedoa. Marbled Godwit. Migrant, formerly common on the coast, but now rare (Murray 1952). "Occasional" might be justified now, in spite of 4 amazing CBC's at Cape Charles. All records are strictly coastal except for 1 at Rigby I, Mathews Co., 14-IX-55, JT, LG. Spring: Fisherman's I, 9-V-68, 1. 29-V-68, 4; Smith I, 1-VI-69, 6, PAB et al. Murray and no spring records. Fall: Hog I, 18-VI-61, 2 (a pair), FRS, CCS. Fisherman's I, 19-VI-68, 1, FGB, PAB. Chincoteague, 28-VIII-65, FGS et al; 29-XI-70, 1, PGD. Craney I, 8-IX-69, 5, FGB et al. CBC's: Cape Charles, 36-43 for 4 counts; unbelievably high and so uniform that one wonders if a persistent flock returned each year. Chincoteague 4('60). Nesting only on the prairies of the Dakotas and Saskatchewan, this magnificent shorebird seems most likely to decrease.
- Limosa haemastica. Hudsonian Godwit. Rare to occasional fall migrant, one spring record. Murray (1952) gave 2 records, both at Chincoteague: 3-X-48 and 9-IX-49. All records are coastal and cover almost every year of the past decade. Spring: Back Bay NWR, 25-V-68, 1, PAB et al. Chincoteague, 15-VII to 15-VIII-63, 1, RLP, FGS: 11-VIII-68, 7, GM. 21-IX to 24-X-61, 5, FGS. 30-IX-67, 14, ML, MN, 7-XI-70, 1, CWC. Stumpy Lake, 14-17-X-PAB et al. Craney I, 27-X-63, 1, PWS. Frequency of sightings and numbers seen give hope for this species; always so rare that even Audubon never saw a live one.
- Limnodromus griseus. Short-billed Dowitcher. Common migrant, occasionally abundant on the Eastern Shore in July. Murray (1952) reported this once heavily-gunned species as "now not common", migrating 2-V to 12-VI and 29-VII to 14-IX. Fall migration: Chincoteague NWR, 20-VII-63, 2500, FGS. Metompkin Inlet, 7-VII-68, 500, SHD. Warren, Va., 4-VIII-64, 2, SC. CBC's: Only 4 dates, Little Creek, 10('66); Chincoteague, 1('61), 7('63), 3('70). Adequate habitat has allowed this species to regain some of its former numbers.
- Limnodromus scolopaceus. Long-billed Dowitcher. Murray had no published records but knew of 2 specimens at the National Museum taken at Bone I, 140VII-1880. Many records are now available. Chincoteague, 17-VII-65, 15, JMA; 27-VIII-66, 30, FGS et al; 4-X-62, 50, FGS. Craney I, 28-IX-67, 15; Stumpy Lake, 15-X-66, 8, PAB. Five III-V records in '67 & '68; 5 CBC records (1-11) at Chincoteague. This species is obviously increasing.
- Calidris canutus rufus. Knot. Erratic; occasionally abundant in migration, but more often common to scarce. Fisherman's I, 22-V-68, 1000, FGB, PAB. Goose I, 24-V-58, 1; 10-VIII-58, 1, JMA. CBC's: Recorded on one count each for Back Bay, 8('57); Cape Charles, 18('67); and Little Creek, 1, ('66). Fantastic is the 520 count at Chincoteague in '70; only 2 CBC records having occurred there before. The Knot will likely never be known again as it was in Massachusetts when they gathered "in exceedingly large numbers, estimates of which were useless" (Mackay, in Bent, 1927), but recent reports of the "redbreast" are encouraging. Food: Coquinas, horseshoe crab eggs, insects and crustaceans.
- Calidris maritima. Purple Sandpiper. Increasingly frequent transient and winter visitor at the mouth of Chesapeake Bay and Craney I. Murray (1952) had only 2 records, one each for the Cape Charles and Little Creek breakwaters. Chincoteague NWR, 26-X-68, 7, CWC. Ches. Bay Bridge Tunnel, 3-X-70, k, RLA. Craney I, 25-26-XI-60, 50, JEA, et al. Bridge Tunnel, about 15-III-68, 2 wintering birds left; 9-29-V-68, 20 present, FBG, PAB. CBC's: Little Creek, 1 ('55)-36('68).

- Other records at Cape Charles (4) and Newport News (2). The "rock snipe" has definitely benefited by the use of granite rip-rap. Food: Small crabs, shrimp, mosses, algae, spiders, mollusks.
- Calidris alpina. Dunlin. Most abundant shorebird near the coast during migration and in winter; rare in summer. Cobb I, 18-VI-66, 60 summering, FCB. CBC's: Cape Charles, 3954('69)-15,859('66); 1('61)-5, 649('70). The finding of only one Dunlin in '61, followed in '66 by 18,264 shows that shorebirds can be even more erratic than ducks. Murray reported it as "now only a fairly common transient"; July 19 to May 24, scarce in winter, sometimes absent. Fortunately, the "red-back", most abundant sandpiper in Europe, fares well here, too. Food: Likely a polyphagous opportunist.
- Calidris minutilla. Least Sandpiper. Frequent to abundant transient, uncommon in winter on the coast to rare in Ches. Bay. Chincoteague, 6-IV-55, 200, JT. Parramore I, 20-VIII-55, 10, PAD, DACS. Hopewell, XII-69, 26, FRS. CBC's: Cape Charles, 0-49; Chincoteague, 2-28 (all since '64); Fort Belvoir, 21('69); 1 or 2 records in 5 remaining areas. Food: Green flies, mosquitoes, small crustaceans, worms and insects.
- Calidris bairdii. Baird's Sandpiper. Rare transient, numerous fall records, only one for spring. Four Mile Run, 3-IX-1894, immature collected, R. S. Mathews, Alexander I, 9-23-X-30, 10 (3 collected), Ball (Murray, 1952). Chincoteague NWR, 16-V-64, 1, FGS. Alexandria, 23-VII-61, 1, JMA. Alexandria, 12-27-X-63, 2, ETM. All records of the past decade are of 1-3 birds. Migrating mainly thru the Mississippi Valley, its continued visits in Chesapeake Bay area will depend on barrier island and wetland retention. Food: Amphipods, algae, insects.
- Calidris fuscicollis. White-rumped Sandpiper. Once rare, now frequent on the Eastern Shore, with one flock seen in '64 seemingly manyfold that of all other observations. Murray (1952) documented numerous earlier observations beginning 14-28, V-1894, with a male and 2 females taken on Smith I, by E. J. Brown. Cobb I, 10-IX-27, 12, J. F. Kuerzi. Curles Neck, 26-V-50, 11, FRS. Back Bay, 7-V-60, 7, PWS; 12 & 16-V-68, 20, PAB et al. Chincoteague, 17-V-64, 1500! FGS. Fisherman's I, 13-VI-68, 20, FGB, PAB; 19-VI-61, CCS et al. Alexandria, 25-VIII to 13-X-63, 4, JMA, ETM. Chincoteague NWR, 10-XI-69, 25, COH, DH; 22 & 29-XI-70, OCH et al. Murray believed this "peep" was not simply overlooked earlier. It's increase on the coast is most gratifying. Food: Insects, marine invertebrates and widgeon grass.
- Calidris melanotos. Pectoral Sandpiper. Common spring and fall migrant on the Eastern Shore, scarcer inland. Spring: Back Bay NWR, 30-III-69, 52, FGB, PAB. Washington, 23-IV to late V. Fall: Washington, 23-VIII to 15-X (Murray 1952). Shirley, Va., 11-VII-66, 10, FRS. Chincoteague NWR, 17-VII-65, 12, JMA: 20-VII-63, 300, FGS. Curles' Neck, 31-VII-55, 115 in a wet meadow, FRS. Langhornes' Pond, Albermerle Co., 18-VIII-55, 40, after Hurricane Connie, CES. Craney I, 25-XI-60, 1, FRS. CBC's: Back Bay, 1('55); Chincoteague, 5('63). Species could be increasing slightly. Food: Algae, seeds, insects, crustaceans, mollusks.
- Calidris pusilla. Semipalmated Sandpiper. Abundant migrant and winter visitor on the Eastern Shore, scarce to fairly common inland. Cape Henry, 2-V to 11-VI and 19-VII to 30-X. Chincoteague, 6-IV-55, 6, JT, 17-V-64, 25,000, FGS. Parramore I, 20-VIII-55, 30, PAD, DCAS. CBC's: Cape Charles, 69('67)-423('68); Chincoteague, 0('68)-399('66); rare at 4 other areas. This "peep" is the most abundant shorebird and likely the one most often seen in Tidewater areas. No longer allowed as a potpie ingredient, it should delight man as long as he remains concerned. Food: Small items of almost everything edible in its habitat.
- Calidris mauri. Western Sandpiper. "Rather common fall transient, although rare in spring" (Murray, 1952). Cooke (1929) termed it accidental at Washington, although Ball reported 44 local specimens only 3 years later and called it "not uncommon" in fall (Murray, 1952). It is apparently too common to receive much attention in Audubon Society journals. Murray's several records included the first one, Virginia

Beach, 6-IX-1884. Only recent migration record is Parramore I, 20-VIII-55, 350, PAD, DCAS. It nests only in Alaska and Murray gave only 2 spring records: Cape Henry, 19-V & 14-VI-45. CBC's: Cape Charles, 0-17; Chincoteague, 0-15; dramatic is the one Little Creek record, 95('67). Fate of this species is dependent on events in the Alaskan tundra. Food: As in other "peeps."

Calidris alba. Sanderling. Abundant transient and winter resident on beaches of the coast and lower Ches. Bay; rare inland. Peaks of migration in mid-V and mid-VIII (Murray, 1952). Chincoteague NWR, 28-VIII-65, 7,500, FGS et al. CBC's: Chincoteague, 181('61)-164('66). Cape Charles, 68('65)-812('70). Back Bay, 0 (thrice)-937('66). Little Creek, 23('61), '70)-268('66). Newport News, 0('56)-259('67). Mathews 53('69)-69('70). High counts in recent years bode well for this nigh ubiquitous runner-before-the-breakers of ocean beaches. Food: Coquinas, mole crabs, and amphipods dwelling in sand beaches; fly larvae from wrack; insects, marine invertebrates and seeds from drift lines.

Philomachus pugnax. Ruff. Rare straggler from Europe; at least 9 records for Va. Spring: Alexandria, 10-22-IV-64, 1, PAD et al. Back Bay, 30-III-69; 2; 22-IV-68, 1, PAB et al. Fall: Chincoteague NWR, 28-VI-64, FGS et al; 15, 19-VII-63, 2, SHD, FGS. Food: Insects, in summer, seeds in winter.

Micropalama himantopus. Stilt Sandpiper. Frequent to abundant transient in fall on the Eastern Shore, rare inland and in spring. Back Bay, 25-VIII-46, 200, Perkins; Cape Henry, 5 records in VIII & IX, one 10-V-48, several inland for fall (Murray 1952). Spring: Back Bay NWR, 30-III-69, 2; 12IV-16V-68, up to 18, FGB et al. Chincoteague NWR, 17-V-64, 8, FGS. Fall: Chincoteague NWR, 28-VI-64, 1; 3-VII-64, 12; 25-VII-64, 300, MN et al; 26-VII-61, 500; 27-VIII-66, 300, FGS et al; 10-XI-69, 1, COH, DH; 3-VIII-68, 88, MAB, GWH. Stumpy Lake, 7-IX-63, 100, WAC et al. Wash. D. C. area, 22-IX-57, 14, JMA. As with other tundra-nesting shorebirds, the Stilt Sandpiper seems in no danger. Food: Fly and mosquito larvae, crustaceans, mollusks & seeds.

Tryngites subruficollis. Buff-breasted Sandpiper. Rare migrant in fall, only one spring record. Chincoteague NWR, 1-V-64, 1 MGF et al; 24-VIII-68, 6, CWC et al; 27-VIII-66, 10, FGS et al. Craney I, 2-IX-58, 1, HH, EGW; 17-IX-66, 3, PAB et al. Arlington, 29-IX-63, 1, JMA. Dependent on nesting conditions in the Alaska-Mackenzie tundra, and wintering conditions on the Argentine pampas.

#### Family Recurvirostridae

Recurvirostra americana. American Avocet. First recorded from Wallops I, IX-25 (Murray, 1952), the Avocet has increased dramatically, although still all coastal. Spring: Craney I, 27-III-69, 1, MAB et al; 4-8-V-69, 2, JEA et al. Chincoteague, 15-IV-V-61, 2-5, ETM et al. Wallops I area, 17-VII-65, 2, CWH et al. Back Bay, 21-X-55, 3, JP et al. Hunting Creek, 13-22-X-56, JMA. Chincoteague, 1-IX-64, 6, FGS et al; 11-IX-65, 14, ML, MN; end-XI-69, signif. nos., PGD. Craney I, 29-X-67, 6, PAB; 12-X-69, 35, Chincoteague, 4('70). This showy water-slicer once nested in New Jersey marshes but was extirpated as a breeder to beyond the Mississippi R. Its increasing numbers indicate that it could return to the East. Food: Miscellaneous invertebrates, minnows and seeds; possibly corixids and sheepshead minnows in salt ponds.

Himantopus himantopus mexicanus. Black-necked Stilt. Occasional straggler, mainly in spring, from the far west or South Carolina. Murray (1952) reported it from Cobb I, 8-VI-29 and Sandbridge, 9-V-40. A total of 17, some perhaps duplicates, were reported from Back Bay and Chincoteague, '68-'70. Back Bay, '66, 2 throughout nesting season, DRA; 27-IV-68, 5, FGB et al; 25-IV-69, 4, RW. Chincoteague NWR, 4-29-V-69, 2, HMC et al; Fall: Chincoteague NWR, 28-VIII-70, RSK, BW; 24-XI-69, COH, DH. Seems to be increasing in the east during migration. Food: Freshwater insect larvae, crustaceans, mollusks, small fish.

## Family Phalaropodidae

Phalaropus fulicarius. Red Phalarope. Occasional on the coast, probably occurs annually at sea off Virginia. Murray (1952) had 3 records, all inland. Spring: James R., Surry Co., 4-IV-60, 1, CCS. Chincoteague, 16-25-V-63, 3, SHD, et al. Summer: Craney I, 16-VI-62, 1, Ames. Fall: Wachapreague (12 miles offshore) 10-X-70, 11, Burford; Alexandria, 22-IX-63, 1, ETM et al. The Red Phalarope is circumboreal and feeds on plankton at sea where most of its time is spent.

Phalaropus lobatus. Northern Phalarope. Occasional both spring and fall along the coast, rare inland, probably occasionally common off the coast. Murray had several records and many more have since accumulated. Winter-spring: Craney I, 1-I-57, 4; 19-V-57, 3, JEA, PD. Chincoteague, 18-V-63, 12, SHD et al. Back Bay NWR, 27-V-68, 73 after a coastal storm, PD. Summer-fall: Chincoteague, 6-VIII-66, 1, ML, MN. Craney I, 23-IX-69, 6, MAB, GWH; 22-IX-70, 11 CWD et al. Species could be increasing slightly - or migrating eastward more often. Food: Freshwater insects, invertebrates in summer.

Phalaropus tricolor. Wilson's Phalarope. Occasional to frequent fall straggler, rare in spring. Spring: Back Bay NWR, 12-IV to 3-V-68, 5, FGB, PAB. Fall: Chincoteague, 19-VII-13-VIII-63, 5, RLP, FGS; 1-IX-64, 22-IX-70, 11, CWD et al. Appears to be increasing its Virginia visits. Food: Freshwater insects and crustaceans.

## Family Stercorariidae

Stercorarius pomarinus. Pomarine Jaeger. Oceanic species seen occasionally, mainly in fall, on the coast. Spring: 20 mi. east of Cape Henry, 8-IV-64, 1, PWS. Back Bay NWR, 25-V-68, 1, PAB et al. Summer: Back Bay, 7-VI-56, 1 sick on beach, JP. Fall: Chincoteague, NWR, 1-VIII-64, RLP et al. Va. Beach 24-XI-67, 2, FGB, PAB. Status unknown. Food: Fish obtained by harassing terns.

Stercorarius parasiticus. Parasitic Jaeger. Oceanic winter marauder seldom seen from shore. Murray (1952) had records from V, VIII & IX. Several records in the same months and XI have since accrued. Spring: Cape Henry (1-6 mi. offshore), 1-V-62, 8, PWS. Back Bay NWR, 9-XI-69, 1, COH, DH. This species occurs regularly offshore where birders seldom venture. Being an Arctic nester, one may hope this species is stable. Food: Probably nearly all fish in winter.

Catharacta skua skua. Great Skua. Oceanic straggler, 2 records noted, Richard Pough, noted conservationist, saw one from a ship off the entrance to Ches. Bay, 8-II-40. (Murray, 1952). Ake saw one off Va. Beach, 22-V-71.

## Family Laridae

Larus atricilla. Laughing Gull. Abundant breeding bird on seaside of the Eastern Shore. Rare to scarce in winter. Breeding: Virginia probably has the best nesting area on the East Coast for the Laughing Gull. Chincoteague, 11-VI-60, 450 pr. colony; colony near Wachapreague, 21-VIII-60, non-flying juveniles, VSO group. Egg dates (48 records): 25-V to 19-VII (Bent, 1921). Migration: Ingram Bay (Northumberland Co.), 9-VI-62; 360, FRS. Cape Henry, 18-X-67, 1750, FGB, PAB. CBC's: Not seen consistently at any area. Newport News counts outnumber all others combined. Species probably decreasing somewhat. Food: Mostly small fish, some garbage. In Delaware, 8,000-10,000 fed on horseshoe crab eggs, 14-V-71, DAC.

Larus philadelphia. Bonaparte's Gull. Common to abundant winter visitor on the coast, scarce inland. Migration: Hampton, 22-III-59, 450, ETM et al. Alexandria, 14-17-IV-59, 200, JMA. CBC's: Back Bay, 0(3 yrs)-5250 ('69). Little Creek, 3 ('61)-433 ('68). Total of 9 possible counts (5-8 in each yr): 1322 ('66)-7634 ('69). Found every year on all 6 coastal counts except Back Bay. The diminutive "bony", a tree-nester in the taiga, seems possibly to be increasing, although its migrations are erratic. Food: Largely insectivorous inland; small fish in winter.

Xema sabini. Sabine's Gull. Rare straggler. Back Bay, NWR, 4-X-67, 1 adult Ches. Bay Bridge-Tunnel. 20-22-VI-68. 1 sub-adult (Buckley, 1970).

- Larus ridibundus ridibundus. Black-headed Gull. Rare straggler from Europe. Cape Henry, 24-XI-67, 1, FGB, PAB. Back Bay NWR, 25-V-68, 1 in winter plumage, PAB et al. Ches. Bay Bridge Tunnel, 29-XI-70, PGD. CBC's: 1 ('66), 1 ('70).
- Larus minutus. Little Gull. Very rare straggler, but may be expected now that it breeds in Ontario. First state record, Ches. Bay Bridge Tunnel, 5-XII-64, CWC et al.
- Larus delawarensis. Ring-billed Gull. Abundant winter resident and transient throughout tidewater. Immatures plentiful in summer. CBC's: Present on all counts. Little Creek, 1560 ('55)-27,200 ('66). As with the Herring Gull the highest total count was in '66(37,938); counts since then being less than half that number. The Ring-billed Gull, an inland nester, may be decreasing. Food: More agrarian than other gulls, eating grain and insects. Also eats garbage and marine organisms.
- Larus tridactylus. Black-legged Kittiwake. Boreal oceanic straggler listed as hypothetical by Murray. Potomac R., Hunting Creek Inlet, 28-X-56, 1, JMA, "a very remarkable record", AFN. Cape Henry, 6-XII-67, 1 imm., PAB; 10-XII-67, ad & 1 imm, FGB, PAB. Chincoteague NWR, 28-XII-67, 1, JMA.
- Larus hyperboreus. Glaucous Gull. Occasional straggler. Murray (1952) gave 3 sight records, 2 from near Washington in II and 1 from Norfolk in V. Since then there have been at least 12 sightings from Chincoteague NWR to Back Bay, in the months of IV-VI-VIII, X & XII. CBC records at Cape Charles (2), Chincoteague (1) and Washington (1).
- Larus californicus. California Gull. Very rare straggler. Hunting Creek, Fairfax Co., 22-II-67, JMA.
- Larus fuscus graellsii. Lesser Black-backed Gull. Rare straggler. Buckalew collected an adult female near Chincoteague NWR, 7-10-48 (Murray, 1952). Fisherman's I, 2 & 5-IV-69, 1 ad., PAB et al.
- Larus argentatus. Herring Gull. Abundant winter visitor and common in summer, breeding on the Eastern Shore since 1948. Breeding: Gull Marsh I, (near Cobb I), 12-VI-48, 2 pairs of adults and 2 young, Buckalew; Chincoteague, 11-VI-60, 3 nesting pairs (1 nest with young), FRS. Hog I, 7-VIII-61, some nesting, LEB. Fisherman's I, 21-VI-64, 5 nests with eggs and young, PWS. Chincoteague, 26-VI-65, several large non-flying young, MAB et al. Fisherman's I, 5-VI-65, 28 nests, PWS, 1966, 39 nests, FGB, PWS; 17-V-68, 1st eggs laid, FGB, PAB. CBC's: Little Creek, 1500 ('55)-40, 200 ('66). Hopewell, 5 ('58)-327 ('70). Back Bay, 85 ('51)-4590 ('66). Highest total count, 62,224 ('66), twice as high as any count since then. The Herring Gull is stable, if not increasing. Food: Garbage, fish refuse, eggs and young of other birds. Breeding of the large gulls on the barrier islands may have an adverse effect on breeding terns.
- Larus glaucooides. Iceland Gull. Rare boreal straggler in IV-V & IX-I. Spring: Hunting Creek, 2 & 4-IV-56, 1, AH et al. Ingram Bay, Northumberland Co., 9-VI-62, 2, FRS. Fisherman's I, spring '68, 1 eating tern eggs until 29-V-68, PAB, et al. CBC's: Back Bay, 1 ('60). Cape Charles, 1 ('69). Little Creek, 1 ('63). Probably a stable species.
- Larus marinus. Great Black-backed Gull. Once a rare winter visitor and uncommon 20 years ago as a winter visitor, 20-VIII to 28-IV; this awesome gull is now abundant in winter, common in summer, and the latest addition to the breeding birds of Va. Formerly coastal it is now often common in the tidal rivers. Summer: Craney I, 4-VIII-61, 100, JEA, WFR; 13-VI-65, 90; 31-VI-66, 64, PWS. Lewisetta, 5-IX-66, 130, FRS. Brooke, 23-XII-69, 280; 22-XII-70, 320 ETM. The southward explosion of this species is seen in the CBC's: Back, 13 ('58)-512 ('70); Fort Belvoir, 1 ('61)-129 ('69). Cape Charles had the highest count, 1368, in its first count ('65). The '70 9-count total of 2939 was 1008 over the next high in '66. The irruption of this predaceous gull is unexplained, since it does not appear to be a "garbage gull". It and the Herring Gull have largely stopped the breeding of Laughing Gulls in Maine. (Nisbet, 1971). Food: Eggs and young of other seabirds, passerines forced down at sea, discarded or robbed fish.

Rynchops nigra. Black Skimmer. Abundant summer resident on the Eastern Shore, breeding on sand beaches of smaller islands. In 1907, large colonies occurred on Cobb, Pig, and Wreck Is. (Bent, 1921). Stevens estimated 400 nests on Wreck and 90 on Cobb, 11-VIII-51 (Murray, 1952). Craney I, 19-VII and 2-VIII, several nests with eggs and young, PWS, first record away from immediate coast. Fisherman's I, 5-VII-65, 1000 active nests, PWS. Nested on Cedar I in '56 & '60, but human interference probably prevents nesting there now. This favorite of tourists seems likely to decrease. Reported on 3 CBC's at Chincoteague. Food: Small fishes and shrimp caught mostly at night.

Sterna nilotica. Gull-billed Tern. Beach-nesting tern abundant in past century on the Eastern Shore, a rare breeder by 1913 and still rare in late 40's (Murray, 1952). Now frequent to common breeder. In 1890's breeding in abundance, reduced to 1,000 on Cobb I by 1900; Wreck I, 1907, 8-10 pairs, Cobb I, 1909, 10 prs (Bent, 1921). Fisherman's I, 19-VI-61, 50 prs, CCS et al; 1-VII-66, 40 nests with eggs. Cedar I, 8-VIII-62; 55 prs, FRS. Smith I, 1-VI-69, over 200, Buckleys. Craney I, 5-VII-64, nest with 2 eggs, PWS. Food: Largely insects caught over marshes.

Sterna maxima maxima. Royal Tern. Usually abundant breeder in recent years on the Eastern Shore, but nesting attempts often defeated by high tides, humans or dogs. In 1880, a colony on Cobb I had several thousand nests but only a few nested in 1935 (Murray 1952). Craney I, 5-VIII-61, several 100, young barely able to fly, JEA, WFR. Fisherman's I, 5-VI-65, 2200 nests with eggs; 5-VII-65, 1500-1800 2/3-grown young unable to fly, PWS; 1-VII-66, 500 young, 200 nests with eggs just hatching, FGB. Near Wachapreague, 16-VI-68, colony of 600 reduced to 200 by earlier storm (birds finally quit because of storms, dogs and Laughing Gulls), MAB. Ship Shoal I, 21-V-71, colony of some 3000, most pairs apparently incubating, MAB, RSK. CBC's: Only one record in last 3 years, earlier up to 10 at Little Creek. The Royal Tern will require protection from man if it is to maintain its present numbers. Food: Small fish.

Sterna sandvicensis. Sandwich Tern. Scarce summer visitor and rare breeder. Murray (1952) had 2 records: an adult mail taken at Cobb I, 12-VII-1880 and a set of eggs taken in 1912 by Bailey who found it extremely rare. Wachapreague, 8-V-59, 2, Mrs. LEB. Fisherman's I, 5-VI-65, 1 (nesting unproven). Back Bay, 4-X-59, 1, FGB et al. Breeding: Fisherman's I, 19-VII-68, 2 adults, 12 young, FGB et al. This small tern is widely distributed and may breed again in Virginia if barrier islands are kept free of predatory mammals in the nesting season. Food: Small fish, some squid and shrimp.

Sterna caspia. Caspian Tern. Common migrant and scarce summer visitor. The only nesting records for Va. seem to be those of Bailey (Bent, 1921) who said that "a few pair still breed on one of our coastal islands". Murray reported the Caspian increased although the Royal Tern had greatly diminished. It is more common inland than on the coast. Migration: Cape Henry, 8-IV to 27-VII to 12- XII (Murray, 1952). Arlington, 13-IV-63, 60, JMA. Jamestown area, 2-V-59, 100, MA et al; 1-IX-57, 90, JHG, WE. Shirley, 24-VII-66, 15, FRS. Records for June have occurred at Goose I, JMA; Dyke, JMA; Chincoteague, FGS; and Fisherman's I, Buckleys. This large "sea-swallow" may be decreasing. Having once nested in Virginia it would seem that it might be encouraged to do so again. Food: small shrimp and fish; mussels in freshwater.

Sterna hirundo. Common Tern. Common summer resident on the Eastern Shore, nesting in colonies; mainly on Fisherman's Island. Very rare in winter. Sandbridge, 5-V-62, 215 migrating, WAC, PWS. Potomac Shore (Northumberland Co.), 10-V-69, 181, FRS. Chincoteague NWR, 29-XI-70, 9, PGD. CBC's: 8 scattered records, mostly singles from 5 areas. The increase in large gulls would seem to doom any increase in this species. Food: Mostly small fish, 3-4 inches long.

Sterna dougallii, Roseate Tern. Uncommon nester and scarce transient on the Eastern Shore. Breeding: Small groups with Common Terns at Cobb, Wreck and Isaacs islands in 1920 (Murray, 1952). Fisherman's I, 25-V-69, 10; Smith I, 2, 1-VI-69, PAB et al. Migration: Hampton, 15-IV-56, 8, GO. Chincoteague, NWR, 3-VIII-68, 2, JMA. This tern may have decreased. Food: Small surface fishes and pelagic mollusks.

Sterna forsteri, Forster's Tern. Abundant as a breeder on the Eastern Shore in seaside marshes and in migration. Occasional to rarely abundant in winter. Breeding: Eggs 25-V to 15-VI (Murray, 1952). Wreck I, 28-VI-07, 50 prs. Eggs 30-V to 12-VII (Bent, 1921). Chincoteague, eggs, 7-V-61, FRS. Ingram Bay (Northumberland Co.), 9-VI-62, 130, all immature, FRS. Migration: Chincoteague, 8-IX-67, 1850, MAB. Goose I, 4-X-58, 440, JMA. Cape Henry, 29-XI-67, 450, FGB, PAB. CBC's: Back Bay, (0 on 10 dates-3050('69); Little Creek, 0-399('67); no inland records. Possibly increasing. Food: Feeds less on fish than do other terns, more on insects.

Sterna fuscata fuscata, Sooty Tern. Rare summer straggler. Fisherman's I, 17-VI-70, 1, RLA et al. Second Va. record.

Sterna albifrons, Least Tern. Extremely abundant a century ago, this little tern was decimated for hat ornaments, so that none were seen on Cobb I in 1907 (Bent, 1921). It increased quickly with protection but small nesting colonies at Jamestown, Gloucester Pt., and elsewhere have been destroyed, so that nesting seems mostly confined, in Va., to the Eastern Shore now. The beach at Back Bay had nests in one colony in '38 and 30 nests in '46, but none have been reported recently. Hollis Marsh, 10-VIII-55, 12 nests with eggs, JMA; Dameron Marsh, 9-VI-62, 15 nests with eggs; Smith Point, 23-VI-66, small colony; near Windmill Point, colony found by M. Nichols (Scott, 1969). Craney I, 7-VII-63, 50 prs. nesting; 5-VII-64, 200 prs., PWS. Nests on several Eastern Shore islands, but no counts are at hand. This tiny tern seems certain to decrease.

Chlidonias nigra, Black Tern. Coastal transient, locally common. Murray (1952) reported single IV and V records. Chincoteague, 14-VI-55, 4; 25-VI-55, 25, JMV; 10, 11-VIII-57, 300, PAD et al; 15-IX-58, 450, JHG et al. Hopewell, 4-IX-55, 19, RJW, FRS. Since this tern is dependent on freshwater marshes it seems likely to decrease, but lack of recent records seems due to commonness of species. Food: Largely aquatic insects, also minnows, crayfish and spiders.

Chlidonias leucopterus, White-winged Black Tern. Very rare straggler. Chincoteague, 16-V into VIII-63, 1, and again in '64 to 9-VIII, FGS et al.

#### Family Alcidae

Alca torda, Razorbill. Rare winter visitor. Murray recorded specimens taken from 15-X to 29-III. Wreck I, 6-VI-64, dried specimen, AEC et al. Chincoteague NWR, 25-I-69, 1, Folsom.

Uria lomvia, Thick-billed Murre. Rare winter visitor. Murray listed many early records from the Arlington-Washington area and several from the coast, 22-XI to 26-I. Lack of recent records indicates possible decrease of this large alcid.

Plautus alle, Dovekie. Rare coastal visitor in winter. Murray provides numerous records, 28-XI to 5-II. On the latter date, in 1940, Richard Pough reported 25-50 flushed hourly by a steamer while off the coast of Va. Wallops I, 15-XI-70, 1, CRV.

Cephus grylle, Black Guillemot. Rare straggler taken by Capt. Crumb on Cobb I (Murray, 1952).

#### Family Tytonidae

Tyto alba pratincola, Barn Owl. Uncommon resident. Murray reported it breeding in towers but said nothing about its use of duck blinds. Eggs were reported from 25-I to 5-V. Breeding: Chincoteague, '60, offshore duck blinds, 5 nests with eggs or young. Assateague, 22-VII-59, 2 nests (7 eggs, 7 young) in duck blinds. Fisherman's I, 21-VI-64, nest with 2 eggs, PWS; 27-IX-69, nest with 4 eggs, MAB et al. Wachapreague, 29-X-61, nest with 2 eggs, FRS, CCS. The monkey-faced owl seems almost entirely dependent on adequate duck blinds in the Ches. Bay areas. Autos



probably account for most of the predation on this species, which seems likely to decrease. Food: Mostly rodents, some sparrows & Blackbirds, 80 pellets taken from a YR blind averaged over 2 mouse skulls per pellet.

Family Strigidae

Strix varia varia. Barred Owl. Most common in swamp areas; abundant in the Dismal Swamp (Murray, 1952). Flood-plain and swamp forests, 6 breeding pairs on 1,142 acres of lowland forest along Patuxent River in 1943 (Stewart and Robbins, 1958).

Asio flammeus. Short-eared Owl. Uncommon winter resident, most frequent on the Eastern Shore. Bailey reported it breeding in marshes of the Eastern Shore and along Ches. Bay. The last nest record seems to be one at Leesburg, 17-IV-50 (Murray, 1952). CBC's: Back Bay (4 counts) 1 (thrice)-15('68). Cape Charles, 0-5. Chincoteague, 1 (thrice)-31 ('65). Road kills and agricultural practices will probably produce further declines in this mouser.

Family Trochilidae

Archilocus colubris colubris. Ruby-throated Hummingbird. In moist forests and hedgerows; particularly attracted to jewelweed and trumpet creeper flowers; 13 breeding pairs in 85 acres of flood-plain forest (Stewart and Robbins, 1958). Two nests over small creek in West I. Swamp, Pamunkey R., July, 1970; seen at trumpet vine flowers.

Family Alcedinidae

Ceryle alcyon alcyon. Belted Kingfisher. Common resident, nesting along shores and water courses, wherever banks afford adequate nesting sites. Murray's records of nesting are all inland; eggs, 25-IV to 10-V. Species is too common to produce migration records in AFN. CBC's: Present all count dates except 3. Back Bay, 0-('51)-18('60); Cape Charles, 15('65)-31('70); Little Creek, 7('56,'64)-24('67); Newport News, 2('58)-16('67); Chincoteague, 11('59)-42('68); Fort Belvoir, 0('51)-18('64); Hopewell, 0('59)-10('64); Washington, 3('60,'63)-17('68). One cannot assume by nos. that this species is increasing since increased coverage might allow overcounting. Food: Fish, frogs, crayfish.

Family Picidae

Dryocopus pileatus. Pileated Woodpecker. Common permanent resident; largely confined to swamps on the coastal plain, where it seems to nest almost entirely in large sycamores. Wood ducks have probably been much dependent on nest holes made by the "logcock". This striking species is certain to decrease as the last peeler-sized trees come out of the swamps. Beavers are likely detrimental to its habitat. Food: Mostly grubs and beetles in decaying wood in Va. Also sassafras and poison ivy berries in fall.

Family Tyrannidae

Sayornis phoebe. Eastern Phoebe. Common summer resident, except on the coast (Murray, 1952). Scarce in winter. Murray listed no nest records east of Richmond, but it has nested on our house in Gloucester several times (2 broods in '70). It is included here because it often nests under bridges and seems confined to swamps in winter. The coastwise nesting increase of this flycatcher is heartwarming to the nostalgic.

Empidonax virescens. Acadian Flycatcher. Flood-plain and swamp forests; 46 breeding pairs per 100 acres in lowland seepage swamp, Prince Georges Co., 1946 (Stewart and Robbins, 1958). Abundant in the Dismal Swamp and at Richmond (Murray, 1952).

Empidonax traillii traillii. Traill's Flycatcher. Rare transient formerly known, and more appropriately, as the Alder Flycatcher. Nests in alder and willow thickets, possibly south to Virginia (Murray, 1952).

Family Hirundinidae

Tachycineta bicolor. Tree Swallow. Abundant transient. Highly dependent on oligohaline marshes for roosting in fall and, along the coast, on wax myrtle berries during northers. Evidently once nested more commonly in coastal Virginia. Murray lists nest records for Back Bay, upper end, 15-VI-27; King Wm. Co. (Aylett); and Smith I, 10-VI-1897. One seen at Cheatham Annex, York Co., in VI-69, probably nested in a dead stub in Cheatham pond. CBC: Cape Charles, 31('69).

Riparia riparia. Bank Swallow. Breeding "restricted to areas over open water, marshes and barrier beaches (Stewart and Robbins, 1958). Scarce to uncommon transient, 12 Cape Henry records (Murray, 1952). Scott (1969) reported a colony with 71 nests found by Church and Hacker at Stratford and a smaller one near Wakefield.

Stelgidopteryx ruficollis. Rough-winged Swallow. Commonly nests solitarily in stream banks. A pair once attempted to nest at VIMS. Murray reported it uncommon near the coast, but reported probable nesting at Cape Henry. Maynard Nichols has found it nesting in bluffs along the Rappahannock.

Hirundo rustica erythrogaster. Barn Swallow. Common to locally abundant summer resident in Tidewater. Long dependent on man for nesting sites, this swallow is increasingly dependent on waterside structures, since old barns and sheds are disappearing. Has appeared at VIMS in III but usually in early IV. Observations indicate that the Fish Crow may be a predator of this swallow. Future status seems entirely in man's hands.

#### Family Corvidae

Corvus ossifragus. Fish Crow. Abundant on the Eastern Shore and common JMA. Dyke, 23-VIII-70, 45, JMA. CBC's: Back Bay, 3('56)-130('58); Cape Charles, 1('65)-49('70); Chincoteague, 17('67)-277('70). Appears stable or slightly increasing. Food: Grain, insects, carrion, bird eggs.

#### Family Sittidae

Sitta carolinensis. White-breasted Nuthatch. Apparently almost entirely confined to swamps in the coastal plain (Scott, 1969). Murray had no nest records east of Richmond. Nested in a bird house at edge of Beaverdam Swamp, Gloucester, Va. in 1962. Meanley (1969) reported it common in Dismal Swamp where he saw 6 in 1/2 mile, one with nesting material, 11-IV-69.

Sitta pusilla. Brown-headed Nuthatch. "Open stands of loblolly pine near tidewater (usually at the margins of tidal marshes)." CBC in southern Dorchester Co., 1958, had 214 (Stewart and Robbins, 1958). Maynard Nichols found it fairly common in the White Stone area and Scott reports it up the Potomac to Sandy Point and up the Rappahannock to Warsaw (Scott, 1969).

#### Family Troglodytidae

Troglodytes troglodytes. Winter Wren. Common winter visitor, being present on most CBC's. Obviously most common in swamps with sizeable trees.

Telmatodytes palustris. Long-billed Marsh Wren. Common to abundant resident of coastal marshes, but probably nesting mostly in giant cord-grass and cattails of oligohaline marshes. CBC's: Back Bay 0('55)-65('66); Cape Charles, 3('66)-24('65); Little Creek, 0('64)-10('68); Chincoteague, 0('61)-11('68). Counts indicate stability, but this "over-builder" is entirely dependent on tall marsh vegetation. Food: Mainly grasshoppers.

Cistothorus platensis stellaria. Short-billed Marsh Wren. Rare to plentiful in winter on the coast. Peterson (1947) gave Northern Delaware as the southern breeding limit of this wren, but Murray (1952) presented evidence for its breeding in southeast Virginia; Pungo, 17-20-V-32, 6 prs. acted as if breeding, Howell; Sandbridge, 1951, VI & VII, 5 singing, Grey; VII, young bird seen, Rountrey. CBC's: Back Bay, 0('69)-37('66); Chincoteague, 0('67)-20('64); Cape Charles 2('69)-13('68). Absence for 7 years at Newport News after being present 6 years straight may indicate habitat loss. Status dependent on retention of high marsh habitat.

#### Family Mimidae

Dumetella carolinensis. Catbird. Especially in shrub swamps and brush of wet or moist sites; 80 pairs per 100 acres of shrub swamp, Prince Georges Co., 1945 (Stewart and Robbins, 1958). The few wintering seem to prefer swamps and shrubby shores.

## Family Sylviidae

Polioptila caerulea. Blue-gray Gnatcatcher. Brushy, partially open swamp and flood-plain forests, 7 breeding pairs per 100 acres in flood-plain forest. Pocomoke R., 21-IV-59, 77, PGD. (Stewart and Robbins, 1958). Beaverdam Swamp, 9-IV-72, 12 on 20 acres. Murray reported Cape Henry nests, 14-IV to 4-VI.

## Family Motacillidae

Anthus spinoletta rubescens. Water Pipit. Irregular winter visitor, late X-late IV (Murray, 1952). Often abundant in winter on the coast, scarce inland. CBC's: Back Bay, 0('64)-739('57); Cape Charles, 10('67)-1414('68); Chincoteague 1('61)-510('70); Little Creek, 0(thrice)-300('58). Hopewell had 300 in '61. If Back Bay and Little Creek counts are indicative, this wagtail may be decreasing, although the largest count (1726) was in '70.

## Family Vireonidae

Vireo griseus. White-eyed Vireo. Common summer resident of shrubby swamps. Cape Henry, 11-IV to 28-IX; eggs, 13-IV to 24-V. Eggs, VI-22-70 Beaverdam Swamp, Gloucester Co., MW. Species stable, probably extending range.

## Family Parulidae

Mniotilta varia. Black-and-white Warbler. Breeding in "second-growth river swamp" in Worcester Co., Md., 1948, 16 pairs per 100 acres. (Springer and Stewart, 1948). Apparently does not breed in flood-plain forests. Migration: Pocomoke R., 5-V-51, 46 (Stewart and Robbins, 1948). Scarce summer resident on the coast, nest at Cape Henry, 24-V-41 (Murray, 1952).

Vermivora bachmanii. Bachman's Warbler. Peterson (1947) said this swamp bird was "perhaps the rarest North American songbird". Murray (1952) reported a sighting by Weber and Griscom in the Dismal Swamp and one collected at Aylett, King William Co.

Vermivora pinus pinus. Blue-winged Warbler. Most numerous as transient in flood-plain and swamp forests; Pocomoke R., 5-V-51, 23; Patuxent Refuge, 10-V-50, 17 (Stewart and Robbins, 1948). Very rare on the Va. coast, although Murray (1952) believed that Bailey had found two nests near the coast.

Vermivora pinus chrysoptera. Golden-winged Warbler. As with previous species; Patuxent Refuge, 8-V-43, 17; 28-VIII-43, 14 (Stewart and Robbins, 1958).

Parula americana. Parula Warbler. Flood-plain and swamp forests. Breeding density per 100 acres ranges from 14 in upland seepage swamp forest to 47 in well-drained, flood-plain forest, both in Prince Georges Co., Md. Migration: Patuxent Refuge, 6-V-50, 112 (Stewart and Robbins, 1958). Nests built in Spanish moss at Lake Drummond (Murray, 1952). Common in Beaverdam Swamp, nests not found except for two in imported Spanish moss.

Dendroica dominica. Yellow-throated Warbler. Found in loblolly pine stands, and in bald cypress swamps; 11 breeding pairs per 100 acres in "second-growth river swamp" in Worcester Co., 1948; a swamp which lacked conifers (Springer and Stewart, 1948). Migration: Pocomoke R., Worcester Co., 5-V-51, 25 J.W. Terborgh (Stewart and Robbins, 1958). Stevens and Scott found 67 along the Chickahominy R. on 12 & 13-VI-48; seems scarce in Dismal Swamp (Murray, 1952).

Dendroica virens waynei. Black-throated Green Warbler. Coastal race of this species. Breeds commonly in the Dismal Swamp (Meanley, 1969). P.W. Sykes recorded 23, 1-VI-66, on the east side of the swamp.

Dendroica discolor. Prairie Warbler. Peterson (1947) records this warbler from mangroves in Florida but otherwise from dry areas. Murray (1952) reports it as a common to abundant summer resident all over the state but has no nest records east of Richmond. Thus Meanley's (1969) report of this species breeding in heavy swamp forests along Jericho Ditch in the Dismal Swamp from 1966 to 1969 is most interesting.

Dendroica coronata. Myrtle Warbler. Winters locally in flood-plain and swamp forests where poison-ivy is common and in tide-water areas with bayberries. CBC's: Dorchester Co., 6,500 (53); Ocean City, 4,001 (54). Md. migration peaks in early May and late October (Stewart and Robbins, 1958). Spring peak in April at Gloucester; spring food mainly midges.

- Setophaga ruticilla. American Redstart. Breeds in swamps along the Pocomoke and upper Nanticoke rivers. Breeding densities (pairs/100 acres): 12 in shrub swamp and 51 in well drained flood-plain forest, Prince Georges Co., 91 in "second-growth river swamp", Worcester Co., Md. (Stewart and Robbins, 1958). Breeds in Dismal Swamp (Murray, 1952).
- Selurus noveboracensis. Northern Waterthrush. Scarce transient on the coastal plain. Murray lists two V & four IX records for Cape Henry; also a specimen from the Dismal Swamp, 21-V-02. Both waterthrushes prefer stream-sides in wooded swamps.
- Selurus motacilla. Louisiana Waterthrush. Common summer resident in Beaverdam Swamp and probably all coastal swamps, although Murray's definite site records are from Appomattox west. Destruction of bottomland forest by beavers affects this species adversely.
- Helmitheros swainsonii. Swainson's Warbler. Locally common summer resident in the Dismal Swamp, with a few occurring in the Pocomoke Swamp in Md. Dismal Swamp: Nests with eggs, 1-V to 29-VI; 11 nests found (Meanley, 1969). This rare denizen of canebrake swamps will likely decrease as its habitat does.
- Protonotaria citrea. Prothonotary Warbler. Common summer resident in Tidewater and southeastern swamps. Cape Henry, 4-IV to 14-IX; nests 22-IV to 18-V, feeding young 8-VIII (Murray, 1952). Erection of bird houses in appropriate swamps would favor this beautiful warbler.
- Geothlypis trichas. Yellowthroat. Common to abundant in summer, rare in winter on coast. Seems to prefer shrubby marshes and shores; less common in swamps.
- Oporornis formosus. Kentucky Warbler. Murray gave no nesting records east of Richmond, but said that more study of the bird's range was needed. Meanley (1969) saw only one, 23-V-69, in the Dismal Swamp during four years of breeding season studies. The species has been seen at Gloucester in Beaverdam Swamp in summer occasionally, but not until 1971 was a pair found carrying food and greatly agitated.
- Wilsonia citrina. Hooded Warbler. In Va. seems largely confined to swamps on the coastal plain. Murray's only Tidewater nesting records were from Stumpy Lake and the Indian River. Meanley (1969) mentions it from Dismal Swamp as an associate of Swainson's Warbler.
- Wilsonia canadensis. Canada Warbler. Transient in flood-plain and swamp forests; Patuxent Refuge, 11-V-50, 72 (Stewart and Robbins, 1958).
- Family Icteridae
- Dolichonyx oryzivorus. Bobolink. Transient on the coastal plain, seen in abandoned fields near water in spring. Stewart and Robbins (1958) report it as concentrating in fresh and brackish marshes in fall, especially those with wild rice, along some of the larger tributaries to the upper bay. Maximum counts: Snows Marsh, Baltimore Co., 12-IX-1899, 20,000, C.F.C. Kirkwood; Pocomoke R., Worcester Co., 16-IX-50, 2,000, J.H. Buckalew; Anne Arundel Co., 8-V-54, 431, PAD.
- Sturnella magna. Eastern Meadowlark. Breeds in hayfields and overgrown pastures; also in tidal marshes with salt meadow hay, black grass, switchgrass and American three-square. Somerset Co. had breeding densities (pairs/100 acres) of 5 in switchgrass and 7 in saltmeadow hay. Ocean City had a CBC of 4,167 in '55.
- Agelaius phoeniceus. Red-winged Blackbird. One of the first birds noticed at Jamestown, the "redwing" is probably more abundant now. Murray (1952) reported it as abundant from Richmond east, with eggs by 10-IV. It is often the most abundant species in CBC's. A count of 10,000,000 occurred at Norfolk in 1960; lowest of 7 years there being 1,500,000 in 1957. No count of the 10 perused missed this species, although only 5 appeared at Hopewell in '64. More stable than most ducks, red-wing stability seems exemplified by Newport News, 106('64)-2,804('66), and Back Bay 599('51)-1,290,000('67). Virginia CBC's scarcely indicate any recent increase in abundance.
- Xanthocephalus xanthocephalus. Yellow-headed Blackbird. Rare straggler from the west. Murray gives a 29-VIII-12 record of two at Wallops I. Norfolk, 18-I-69, 1, GAG. Chincoteague, 6-IX-69, 1, RWT.

Quiscalus mexicanus. Boat-tailed Grackle. Murray (1952) reported it as a summer resident of the E. Shore, wintering only in mild seasons. Although reporting it as much less common than when Bailey wrote in 1913, he recorded an examination of 27 nests by Handley in Northampton Co., 17-V-34. If indeed it had decreased, an irruption must have occurred by the time 3330 were estimated at Chincoteague Causeway, 13-IX-55, by Scott and Steirly. Grandview, Hampton, IV, V-62, "in some numbers", JAP et al. Nesting: Chincoteague, 12-V-62, 3 nests with young, FRS. It now nests in Gloucester Co. and perhaps at other places along the lower Bay.

Euphagus carolinus. Rusty Blackbird. Uncommon transient, scarce to plentiful in winter, esp. in swamps. CBC's: Back Bay, 0(6 years)-1600('60). Ft. Belvoir, 5('69)-476('58). Usually absent at Hopewell and Newport News. Seems tied to swamps with sizeable trees, probably not increasing.

Euphagus cyanocephalus. Brewer's Blackbird. Rare winter straggler from the prairies, not listed by Murray. Perhaps more common than reports indicate. Princess Anne C.H., 26, XI-56, 50, PSD. Hampton, 28-V-61, 3, CWH, WPS. CBC's: Norfolk, 3('60), 1('61). Back Bay, 1('70).

#### Family Fringillidae

Carduelis tristis. American Goldfinch. Often concentrates in winter and spring in flood-plain and swamp forests (Stewart and Robbins, 1958). In Beaverdam Swamp, Gloucester Co., Va., it feeds on seeds of alder, sweet gum and sycamore in winter, on elm seeds in spring.

Ammodramus sandwichensis. Savannah Sparrow. Characteristic of weedy fields, high saltmarsh meadows and beach grass of barrier islands. Breeds on Assateague I. Max. CBC: Ocean City, 471 in '54 (Stewart and Robbins, 1958). Murray (1952) didn't record it as breeding in Virginia.

Ammodramus princeps. Ipswich Sparrow. "Scarce winter visitor on the coast" (Murray, 1952). A specimen collected by Scott at Seaford, York Co., 2-XII-49, seems to be the only record away from the coast. In the last 6 CBC's, it has appeared in nos. of 1-6 at Cape Charles, 0-6 at Chincoteague, 0-2 at Little Creek, and 0-3 at Back Bay except 21! in '70. Not considered distinct from A. sandwichensis by Mayr and Short (1970).

Ammodramus henslowi. Henslow's Sparrow. Chiefly in broomsedge fields and weedy sedge-meadows; two breeding pairs in 30 acres of switch-grass meadowmarsh in Somerset Co., MD., 1948 (Springer and Stewart, 1948). Common summer resident from Virginia Beach to Sandbridge (Murray, 1952).

Ammospiza caudacuta. Sharp-tailed Sparrow. Breeding from Wallops I. north with a "populous colony at Chincoteague (Murray, 1952). He also referred to Bailey's statement that this species bred more commonly in salt marshes on the western side of the Bay than on the E. Shore. Murray gave Cobb I. as the northernmost wintering record, but this no longer holds, as evidenced by CBC's: Cape Charles, 7('68)-55('70). Chincoteague, 5('64)-49('65). Little Creek, 5('55)-108('67). Species is dependent on retention of salt marsh habitat, especially high marsh.

Ammospiza maritima. Seaside Sparrow. Saltmarsh sparrow breeding on the Eastern Shore and in larger marshes along the western shore of lower Chesapeake Bay. It nests in the upper salt marsh and breeds abundantly in Mathews Co. (F. R. Scott, pers. comm.). On the York R. it is common at Terrapin Pt. marsh in New Kent Co. CBC's: Cape Charles, 7('66)-42('70). Chincoteague, 1('64, '66) - 17('65). Little Creek, 0('57) - 79('64). This sparrow is apparently the most common nesting bird in the high salt marsh. Studies should be made of the local ecology, since high marsh is generally considered of little value and is apt to be sacrificed in many places.

Passerella lincolni lincolni. Lincoln's Sparrow. Rare transient and winter resident. Murray gave no "records east of the upper Piedmont". The last 6 years of the 4 coastal CBC's give 3 records each for Cape Charles, and Back Bay and 2 for Little Creek, where 3 appeared in '69. Lincoln's "melodious skulker" breeds in bogs and tamarack swamps. Wet areas with heavy grass and herbaceous growth likely favor it in winter.

Passerella georgiana. Swamp Sparrow. Winter visitor frequent in swamps, often abundant along shrubby shores. Shyness seems to keep it from feeders. CBC's ('65-70): Chincoteague, 120-334. Cape Charles, 199-444. Back Bay, 93-811. Little Creek, 71-153. At Back Bay it outnumbered the Song Sparrow 4 times, but never has at Chincoteague or Cape Charles. Breeds in northern marshes. Recent high counts likely reflect better habitat coverage.

Passerella melodia. Song Sparrow. Frequent to abundant in winter along shrubby shores. Frequent in open swamps. Murray listed specimens collected at Jamestown I, 10-V-51; Onemo, Mathews Co., 8-V-51; and Little Creek, 22-V-40; but gave no nest records. This is the only bird resident at VIMS, frequenting a hillside briar patch. CBC's (6 yrs): Back Bay, 122('65)-948('70). Little Creek, 88('67)-325('68). Cape Charles, 259('65)-1210('67).

Plectrophenax nivalis. Snow Bunting. Barrier beach sand dunes and sandy shores of Chesapeake Bay in winter; Ocean City, 29-I-06, 150, F.C. Kirkwood; CBC (55), 146; Gibson I, Anne Arundel Co., 28-XI-52, 25, Mrs. W. L. Henderson and Mrs. G. Tappon. Regular winter visitor although uncommon on the coast (Murray, 1952).

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## CHAPTER: IX

## MAMMALS OF WATER, WETLANDS, AND BARRIER ISLANDS

## Order Insectivora

## Family Talpidae

Condylura cristata (L) Star-nosed Mole. Damp meadows, marshes and swamps; swims among cattails and under ice. Dismal Swamp, and Richmond and Northumberland Cos. (Handley & Patton, 1947).

## Family Soricidae

Sorex longirostris fisheri Merriam. Southeastern Shrew. Swampy thickets. Known only from the Dismal Swamp, where it is seemingly common (Bailey, 1946).

Blarina telmalestes Merriam. Dismal Swamp Shrew. Most common in dense undergrowth and cane brakes; known only from the Dismal Swamp (Handley & Patton, 1947).

Cryptotis parva (Say) Least Shrew. Abundant in marshes (Paradiso & Handley, 1965). Most common in salt marshes (Handley and Patton, 1946).

## Order Lagomorpha

## Family Leporidae

Sylvilagus palustris (Bachman) Marsh Rabbit. Swamp and freshwater marshes. Known in Virginia only from Nansemond, Norfolk and Princess Anne Cos. (Handley & Patton, 1947).

## Order Rodentia

## Family Sciuridae

Sciurus niger L. Fox Squirrel. Last reported from Cape Charles and the Dismal Swamp in 1895, the fox squirrel has probably been extinct on the coastal plain of Virginia since the 19th century.

## Family Castoridae

Castor canadensis Kuhl. Beaver. Extirpated from Virginia in 1911 and reintroduced in 1932, the beaver soon became a nuisance on much of the coastal plain. Its full ecological effect would be difficult to assess, but it obviously has destroyed at least hundreds of acres of flood plain hardwoods by flooding them. Sweet gum is a preferred food in Va. It girdles large trees and cuts those under 8-12 in. The trees usually "hang up" so that little food is obtained from them. Pine and red cedar are even more relished, altho generally scarcer. Beavers have benefited wood ducks by pond-building, but in the long run are probably detrimental by killing large nest trees.

Beaver pelt take in Va. was 4,184 in '66-67; 785 of those coming from Caroline Co. Habitat destruction by the beavers themselves and by man may be expected to decrease the Va. population, regardless of fur prices. A specimen killed on the Parkway in York Co. weighed 48 lbs, one from Gloucester Co. 42 lbs. It would be interesting to know if the subspecies carolinesis native to Va. had the habit of making winter food caches as does the introduced canadensis. These poles and limbs stored underwater seem to be rarely, if ever eaten, thus making the beaver far more destructive than it might originally have been in the state.

## Family Cricetidae

Oryzomys palustris (Harlan) Marsh Rice Rat. Paradiso & Handley (1965) found rice rats in the wetter portions of marshes on Assateague Island in abundance. Bailey (1946) reported it from Westmoreland, Richmond, and New Kent Cos. as well as the coast.

Peromyscus leucopus (Rafinesque) White-footed Mouse. Uplands, cane brake and marshes. "Undoubtedly the most abundant and most frequently encountered of all the wild mammals in Virginia" (Handley & Patton, 1947). On Assateague I, in all habitats except salt marshes and dense pine (Paradiso & Handley, 1965).

Peromyscus gossypinus (LeConte) Cotton Mouse. Known in Va. only from the Dismal Swamp, altho records since 1895, when it was numerous in or near cane, seem to be lacking (Handley & Patton, 1947).

Peromyscus nuttalli (Harlan) Golden Mouse. The type was described from "Norfolk" in 1832. In Coastal Va. it is known only from the Dismal Swamp, where it likely is scarce or rare, nesting above ground in tangles.

Microtus pennsylvanicus Ord. Meadow Vole. Bailey (1946) believed this species to be "the most common mammal found in the United States east of the Mississippi River". Paradiso and Handley (1965) said, "this is undoubtedly the most numerous mammal on Assateague Island". In 1956 they took 60 from a line of 100 traps in one night. The habitat was tall grass and myrtle at a pond edge. In the summer of 1969 I found them so abundant on Cedar and Parramore Islands that large patches were nearly denuded of beach grass behind the dunes.

Ondatra zibethicus (L) Muskrat. Fresh and saltwater marshes and swamps. Most common in low salinity and freshwater marshes along the Rappahannock, Piankatank, Mattaponi, Pamunkey and James Rivers. Paradiso and Handley (1965) found it "not numerous" on Assateague I. Most important furbearer in North America and certainly so in Virginia. Preferred foods are roots of Olney three-square, cattails and pickerel weed. Arrow-arum seems usually shunned. The mink is their traditional predator, but raccoons and red foxes may be more important in Virginia.

Synaptomys cooperi Southern Bog Lemming. The subspecies helaletes is confined to the Dismal Swamp. Hall & Kelson (1959) list S. c. stonoi as occurring "south along Atlantic Ocean and Chesapeake Bay and up E. side Potomac River to Maryland: Hyattsville". However, no coastal plain records for Virginia were noted, thus the subspecies are well separated.

Family Muridae

Mus musculus L. House Mouse. Abundant in all habitats except sparsely vegetated dunes at Assateague I (Paradiso & Handley, 1965).

Family Zapodidae

Zapus hudsonius (Zimmerman) Meadow Jumping Mouse. Relatively common at Assateague I. Seven specimens collected in grass bordering freshwater and behind dunes (Paradiso & Handley, 1965).

Family Capromyidae

Myocaster coypus (Molina) Nutria. Introduced and now abundant in the Back Bay area. The nutria occupies the same habitat as the muskrat but is a grazer rather than a root-feeder. It has reduced muskrat numbers in Louisiana. Prices for pelts are very low. The meat is tasty but seems mainly used as catfish food, testimony to our opulence.

Order Cetacea

Family Ziphiidae

Ziphius cavirostris G. Cuvier. Goose-beaked Whale. Specimen obtained for National Museum, 28-VIII-44, one mile north of False Cape.

Family Physeteridae

Physeter catodon L. Sperm Whale. Greenrun Inlet, Assateague I, Dec., 1891, imm. female grounded; skeleton in Nat. Museum (Paradiso & Handley).

Kogia breviceps (Blainville) Pygmy Sperm Whale. Seen four times in early spring in the vicinity of Cape Henry (Handley & Patton, 1947).

Family Delphinidae

Stenella plagiodon (Cope) Spotted Porpoise. Hypothetical. Either this species, or S. frontalis was probably the dolphin washed ashore on Assateague I, 28-IX-56 (Paradiso & Handley, 1956).

Family Stenidae

Steno bredanensis (Lesson). Rough-toothed Porpoise. The U.S. Nat. Museum has a specimen from Norfolk, taken before 1867 (Handley & Patton, 1965).

Delphinus delphis L. Atlantic Dolphin. Handley and Patton (1947) had 19th century records from Cobb's I. and Dam Neck. Jacob Valentine photographed one washed ashore on Assateague I. in 1956 (Paradiso & Handley, 1965).

Tursiops truncatus (Montague) Atlantic Bottle-nosed Dolphin. This is the only cetacean which enters the lower York R. Handley & Patton reported it from "the vicinity of Washington, D. C."

Globicephala melaena (Traill) Atlantic Blackfish. Along the coast at Cape Henry, Smith I, and Chincoteague I. (Handley & Patton, 1947, as G. ventricosa). However, Paradiso & Handley (1965) state that a specimen washed ashore on Assateague I, May 1956, represents the southernmost record in the western Atlantic.

Globicephala macrorhyncha Gray. Short-finned Blackfish. Dam Neck, Va., 1887, adult male, 15 ft. long (Handley & Patton, 1947).

## Family Balaenopteridae

- Balaenoptera physalus (L) Fin-backed Whale. A large specimen stranded at the southern tip of Assateague I. in May, 1955. Another 30 ft. in length, entered the James R., 11-IV-66, and stranded on the north shore near Brandon Pt. "Pokey" had been shot about 30 times, presumably off the coast. The incident was closely studied by Fred Biggs of VIMS.
- Balaenoptera borealis Lesson Sei Whale. Walnut Pt., Northumberland Co., imm. male washed ashore, March, 1923; 2nd N. Am. record (Handley & Patton, 1947).
- Megaptera novaeangliae (Borowski) Hump-backed Whale. Paradiso & Handley reported the finding of a vertebra of this rare whale near the southern tip of Assateague I.

## Family Balaenidae

- Balaena glacialis (Borowski) Atlantic Right Whale. Handley & Patton provide an interesting account of one which entered the North River, off Mobjack Bay in the fall of 1856, where Dr. P. A. Taliaferro dispatched it with a double-barreled shotgun; an impressive feat since the great beast was 46 ft. long and ca 20 ft. around. The only change in attitude toward marine mammals, esp. large ones, that man has made since then is to use larger weaponry.

## Order Carnivora

## Family Canidae

- Canis lupus lycaon Timber Wolf. Now extinct over most of its range, this eastern subspecies was abundant when English colonists arrived. John Smith, William Byrd and John Clayton all wrote of it (Handley & Patton 1947).
- Vulpes fulva (Desmarest) Red Fox. This favorite of genteel hunters is found mostly in upland brushy areas. In the Saxis marshes on seashore of the Eastern Shore it is said to actually live in the marsh, where it preys on muskrats to some extent (Charles Gilchrist, pers. communication). Even here its chief food would probably be meadow voles. Paradiso and Handley (1965) reported it from Assateague and Wallops islands.

## Family Ursidae

- Ursus americanus Black Bear. In eastern Virginia, confined to the Dismal Swamp where it is considerably dependent on fruits of the black gum, bears killed by hunters often being shot out of gum trees. One killed in the Dismal Swamp in 1944 was estimated to weigh ca 700 lbs. (Handley & Patton, 1946).

## Family Procyonidae

- Procyon lotor (L). Raccoon. Usually most common in swamps and along water courses. Increasing scarcity of den trees should curtail its numbers, but since it has no significant predators except man and his dog, it sometimes becomes so abundant that many die from distemper. It is said to be the chief predator of muskrats, preying on the young (Charles Gilchrist, personal communication).

## Family Mustelidae

- Mustela vison mink Peale and Beauvois. Mink. Scarce, all counties. Mice and rabbits are the usual food, but frogs, snakes, salamanders, birds, crawfish and muskrats are also taken.
- Lutra canadensis (Schreber) River Otter. Wooded stream bank and marshes. Most abundant in coastal plain swamps (Handley & Patton, 1947). Frequent in marshes, we noted scats consisting solely of blue crab skeletons in one marsh. Crayfish and minnows appear to be commonly eaten along creeks.

## Family Felidae

- Lynx rufus rufus (Schreber) Bobcat. Now gone from the coastal plain except in the Dismal Swamp. Rabbits, mice and squirrels are the usual food (Handley & Patton, 1947).

## Order Pinnipedia

## Family Phocidae

- Phoca vitulina L. Harbor Seal. Frequently seen along the coast. Handley and Patton (1965) mention four specimens from the lower James R. and Chesapeake Bay off Back R., York Co. Numerous individual seals have been shot in recent years and found wounded on beaches.

## Order Artiodactyla

## Family Cervidae

Cervus nippon Temminck. Sika Deer. This Asiatic deer had increased to about 1000 by 1965 on Assateague I. Another herd occurs on James I, Md. (Paradiso & Handley, 1965).

Odocoileus virginianus. Zimmerman. White-tailed Deer. The Virginia white-tail is abundant on Parramore I and is frequently seen on other barrier islands. It also feeds occasionally in freshwater marshes.

## Family Bovidae

Capra hircus L. Domestic Goat. Assateague I. herd numbered between 60 and 100 in 1965 (Paradiso & Handley, 1965). Herd on Watts I. has caused a browse line (Kenneth Marcellus, pers. communication).

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