

A Preliminary Review of the Life Histories and Ecology of Some  
of the More Common Benthic Amphipods of the  
Middle Atlantic Bight and Georges Bank

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## Introduction

Amphipod crustaceans, as a group, are among the major components of benthic macrofaunal communities in the marine and estuarine waters of the Northwest Atlantic continental shelf and coast. They play a major role in providing high energy food for juvenile and some adult valuable ground fish. They can also be an important factor in community development because some species build nests or tubes that can stabilize sediments and create micro-habitats for other species. Within the Northeast Monitoring Program (NEMP), amphipods are being used in several ways to monitor the health of the marine environments. These monitoring methods presently include benthic community structure analysis and pathology, and plans are being developed for mutagenic studies of amphipod eggs and for population dynamics studies of select species. Recently, there have been several requests for background information on amphipod life histories and ecology to assist in the interpretation of data from current studies or to assist in the development of new monitoring studies. This preliminary review is intended to make available, to researchers who are interested in amphipods, some basic life history and ecological information on the more common species occurring in the NEMP monitoring area. In order to begin to satisfy these requests, all of the information presented comes from literature reviews, however, the authors are presently developing a task that will examine and monitor the population dynamics of selected species, and better or more complete information should be forthcoming. The review is presented in two sections, one for life history summaries and the second for examining roles in fish food webs. A bibliography of some of the more informative amphipod work is also presented.

## Life Histories

The summarized life histories of 15 of the more common species of benthic amphipods occurring on the continental shelf are presented below.

1. Ampelisca agassizi - Bousfield (1973) reports that this species occurs along the entire east coast of North America. It occurs across the entire shelf in northern areas and is found only in deeper and colder areas to the south. Dickinson et al. (1980) report it to be the most abundant species in the Middle Atlantic Bight with a mean density of 910/m<sup>2</sup>, occurring most frequently in sandy to sand and silt sediments. This species constructs tubes in the sediment with one end open at the surface and feeds by using its antennae to filter organic matter from the water or sediment surface. It is considered an annual species breeding generally in the summer, brooding its eggs and young (Bousfield 1973). Where it occurs, it most frequently forms dense colonies or patches of individuals.
2. Ampelisca vadorum - The distribution of this species is similar to that of A. agassizi (Bousfield 1973) as are most other known elements of its life history. However, Dickinson et al. (1980) report it to occur in sandier sediments and to be less abundant, with a mean density of 70/m<sup>2</sup>; they also note that this species occurred much less frequently in the New York Bight area, suggesting a very low tolerance of the pollution concentrations known there. Its reproductive pattern includes a dual breeding season, usually in the spring and early summer and again in late summer, with two generations per year. Mills (1967) reports the mean number of eggs produced to be 32 per brood.

3. Byblis serrata - Bousfield (1973) reports the distribution of the species to be from Cape Cod to Cape Hatteras. Our benthic group has also collected it on southern Georges Bank. Dickinson et al. (1980) report this species was collected from 10-201 m and that it is most common on sandy sediments. This species is an infaunal tube-dweller that sometimes is reported in plankton samples (Kunkel 1918). Biernbaum (1979) considers it a suspension/surface deposit feeder. Bousfield (1973) reports it to be an annual species that breeds in the warmer months.
4. Corophium crassicorne - Dickinson et al. (1980) report this species to be distributed from Arctic-boreal regions of North America to Virginia. It is found across the entire shelf and is most common on sandy sediments. Biernbaum (1979) reports that this species is a suspension/surface deposit feeder that builds infaunal or epifaunal tubes to live in. It is an annual species that may have multiple broods, based on habits of another species of the genus C. acherusicum (Nelson 1980).
5. Leptocheirus pinguis - The species occurs from Cape Hatteras north to Labrador. Dickinson et al. (1980) report a mean density of 300/m<sup>2</sup>, decreasing to the south. They report it to be more common in sand/sand-silt sediments and depths of less than 70 m where it builds infaunal tubes and feeds on suspended matter. Bousfield (1973) suggests that it lives for two years and produces young in the summer; Smith (1950) reports a mean number of eggs per brood to be about 20. Kunkel (1918) reports that it is occasionally collected in plankton tows.
6. Unciola inermis - Dickinson et al. (1980) report this species to be distributed from the Bay of Fundy to the mouth of Chesapeake Bay, occurring in deeper and cooler waters to the south. It is relatively abundant within this range with a mean density of 560/m<sup>2</sup> and is most commonly found in sand/gravelly sand sediments. This species is an infaunal or epifaunal tube dweller, however, it may not build its own tubes, using previously constructed polychaete or amphipod tubes instead. It is considered a surface or sub-surface deposit feeder and is an annual species with ovigerous females present from April-June (Bousfield 1973).
7. Unciola irrorata - This species is more widespread in distribution than U. inermis and Dickinson et al. (1980) consider it ubiquitous in the Middle Atlantic Bight. The life history of U. irrorata is very similar to that of U. inermis. Bousfield (1973) reports that this species also has only one brood per year.
8. Casco bigelowi - This large amphipod is a cold water species most common northeast of Long Island (Dickinson et al. 1980); it does range, however, into deeper water off Maryland. It is found in a wide range of sediment types from rocks to silt. This species is often pelagic and thus may be a suspension feeder. Nothing else appears to be known about this species.

9. Protohaustorius wigleyi - This species is reported to occur from Maine to North Carolina by Bousfield (1973). It occurs within this range from intertidal to 150 m and is most common on sand/sand-shell sediments. This species burrows directly into the sediment and is considered a suspension and/or deposit feeder (Biernbaum 1979). It has an annual life cycle and probably multiple broods per year, with a small number of eggs per brood, as does the closely related species P. deichmannae (Sameoto 1969).
10. Erichthonius rubricornis - Bousfield (1973) and Dickinson et al. (1980) report this species to occur from Canada to Cape Hatteras; it is most common at mid-shelf depths and in sandy sediments. It is an epifaunal tube dweller and is probably a suspension feeder. Erichthonius is an annual species and has one brood of eggs per year.
11. Hippomedon serratus - Bousfield (1973) reports this species to occur from Canada to North Carolina, usually in depths of less than 80 m and sandy sediments. Biernbaum (1979) reports this species to be a surface deposit feeder/scavenger that both burrows in the sediment and can be found free swimming. Very little else is known of this species.
12. Monoculodes edwardsi - This species occurs along the entire east coast of North America and in the Gulf of Mexico. It is most common at depths less than 80 m and on sandy/sand-silt sediments. It is reported to be a surface burrower, but was also one of the more common macroplankton crustacean species on Georges Bank (Whitely 1948). This pelagic aspect of its life also has a diurnal component with vertical migrations, however, it is considered a deposit feeder (Biernbaum 1979). Bousfield (1973) reports it to be an annual species with several broods per year.
13. Harpinia propinqua - This species occurs from Canada to Cape Hatteras. It is a eurybathic species found at depths between 15 and 1515 m, being most common on sand to silt-clay sediment (Dickinson 1980) and in deeper, colder water in the southern part of its range. Very little else is known of its life history.
14. Rhepoxynius epistomus (Paraphoxus epistomus) - This species is also reported to occur from Canada to Cape Hatteras, over most of the continental shelf (Dickinson et al. 1980). It is considered a burrowing species and a deposit feeder (Biernbaum 1979) that is most common on sand/sand-shell sediments, although males are reported in plankton collections (Kunkel 1918). Bousfield (1973) reports it to be an annual species with ovigerous females present in the warmer months.
15. Phoxocephalus holbolli - This species occurs from the mouth of Chesapeake Bay north to the Arctic, preferring colder waters and sand/gravelly sand sediments. It is considered a burrowing species and a deposit feeder (Biernbaum 1979) with an annual life cycle producing one brood per year (Bousfield 1973).

### Utilization by Fish

Based on the reports by Maurer and Bowman (1975), Bowman et al. (1976), Langton and Bowman (1980) and Langton and Bowman (in press), amphipods are commonly preyed upon by at least seventeen common species of fish in the marine waters of the northeastern United States (Table 1). The degree of utilization by adults, however, is generally low, with a few notable exceptions: little skate, Raja erinacea, haddock, Melanogrammus aeglefinus, Gulf Stream flounder, Citharichthys arctifrons, American plaice, Hippoglossoides platessoides and yellowtail flounder, Limanda ferruginea. The young of these species as well as those of many other demersal species are known to include amphipods in their diet to a much higher degree than they do as adults. There also appear to be regional differences in utilization, with amphipods being more important in the diets of fish of the southern New England region than they are in those of the Middle Atlantic or Georges Bank, perhaps by a factor of two or three.

From the above mentioned reports, the amphipods which were most commonly preyed upon came generally from three families: Corophiidae (Erichthonius spp.), Aoridae (Unciola spp. and Leptocheirus pinguis) and Ampeliscidae (Ampelisca spp. and Byblis serrata). Although the term "gammarid" appears frequently on prey lists, it is not clear if the reference is to the suborder or to the family, so it is possible that this family is also important. It is interesting to note that these three clearly defined prey families have similar habits: they are mostly epi- or infaunal tube dwellers, forming dense concentrations or aggregations, especially the ampeliscids. This habit of forming dense aggregations probably accounts for their level of utilization over other common amphipod species, although the relatively large size of Leptocheirus is probably an important factor, as well.

The apparent or probable selective predation on the species that occur in aggregations is a factor to consider in studying benthic community structure changes, where these amphipod species are key members of the community. The chance occurrence of a school or concentration of predators could potentially do great damage to an amphipod aggregation and perhaps alter the entire community structure significantly. This is highly possible because aggregations of tube building organisms, amphipods or polychaetes, can alter the sediment environment, stabilizing it and assisting in the localized buildup of finer organic matter, so that the total species composition is altered by the creation of this new microhabitat. Thus, in an environmental monitoring program, an attempt should be made to assess the relative abundance of potential amphipod predators at monitoring sites before final judgment is made on the health of the community.

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Table 1. Major fish predators of amphipods (>1% diet), regional levels of predation and specific prey, if known, presented as a percent of the total diet by weight.

Predator	Prey	REGIONS			
		Middle Atlantic Bight	Southern New England	Georges Bank	Mean Value for Northeast Region
<u>Raja erinacea</u>	All amphipods	7.5	15.8	10.1	11.1
	Corophiidae				3.0
	Photidae				3.7
<u>Alosa pseudoharengus</u>	Gammarid (?)		0.5	2.0	<1.0
<u>Gadus morhua</u>	All amphipods	+	1.6	0.7	<1.0
<u>Merluccius bilinearis</u>	All amphipods	1.0	1.3	0.1	<1.0
<u>Urophycis chuss</u>	All amphipods	5.5	9.6	4.3	6.1
<u>Urophycis regius</u>	All amphipods	8.0	6.2	2.9	5.7
<u>Melanogrammus aeglefinus</u>	All amphipods	0.6	75.3	7.1	27.7
<u>Macrozoarces americanus</u>	All amphipods	0.2	13.1	0.7	4.6
	Unciola		1.0		
	Leptocheirus		1.2		
<u>Stenotomus chrysops</u>	All amphipods				7.9
	Amplisca spp.				3.2
	Aoridae				0.9
<u>Myoxocephalus octodecimspinosus</u>	All amphipods				8.4
	Leptocheirus				0.4
	Corophidiidae				0.7
<u>Citharichthys arctifrons</u>	All amphipods	16.3	21.9	41.4	24.2
	Leptocheirus				4.9
	Erichthonius	1.4		22.1	4.4
	Casco			4.4	3.0
	Unciola spp.	3.7	3.9		3.1
	Amplisca spp.		1.3	3.0	3.3
	Byblis	6.1			1.1
	Stenopleustes				1.0
<u>Paralichthys oblongus</u>	All amphipods	0.1	1.3	+	<1.0
<u>Scophthalmus aquosus</u>	All amphipods	0.6	3.0	0.8	2.1
	Leptocheirus				1.4
<u>Glyptocephalus cynoglossus</u>	All amphipods	+	2.8	3.5	2.9
<u>Hippoglossoides platessoides</u>	All amphipods	NP	38.4	0.2	19.3
	Tubes only		26.6		
<u>Limanda ferruginea</u>	All amphipods	21.4	41.1	28.0	33.1
	Tubes only	7.9	20.3	18.6	
<u>Pseudopleuronectes americanus</u>	All amphipods	1.3	3.6	2.0	2.3