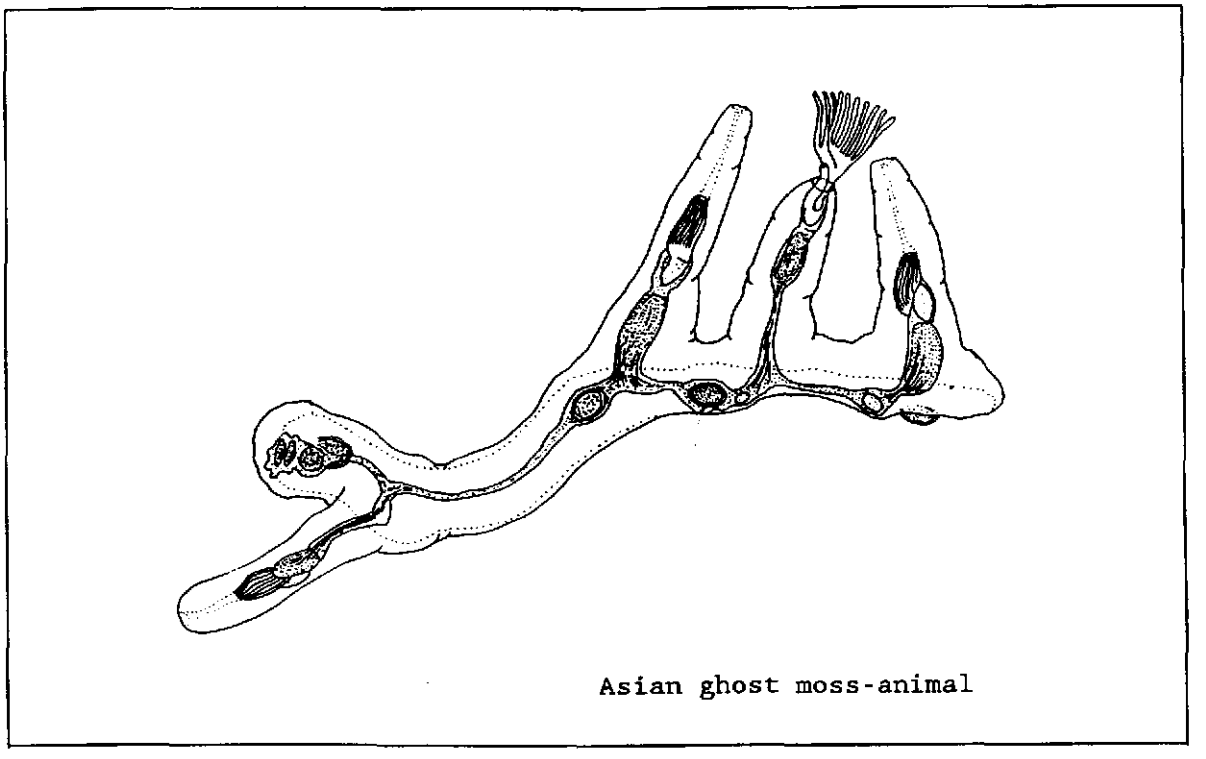
SELECTED FRESHWATER MACROINVERTEBRATES PROPOSED FOR SPECIAL CONCERN STATUS IN MASSACHUSETTS



Asian ghost moss-animal

PART III (Porifera, Platyhelminthes, Ectoprocta and Mollusca)

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Susan F. Tierney, Secretary

Massachusetts Department of Environmental Protection
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Division of Water Pollution Control
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SELECTED FRESHWATER MACROINVERTEBRATES PROPOSED FOR SPECIAL CONCERN STATUS IN MASSACHUSETTS (PORIFERA, PLATYHELMINTHES, ECTOPROCTA AND MOLLUSCA)

PART III

(Report MS-Q-10)

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INTRODUCTION

In 1984, the second of two documents was prepared (Smith, 1981, 1984) dealing with Massachusetts freshwater macroinvertebrates that were rare or declining throughout their range in the state. All species discussed in the two reports have since been listed in Massachusetts as Endangered, Threatened or Special Concern although all were originally proposed for Special Concern status. One, Alasmidonta heterodon, the dwarf wedge mussel, has also been listed as Endangered by the U. S. Fish and Wildlife Service; two others, Alasmidonta varicosa, the brook floater, and Lampsilis cariosa, the yellow lampmussel, have been proposed for federal listing and are currently in the Category 2 status (under review). Additionally, several of the originally proposed species (Smith, 1981, 1984) have been subsequently state listed or proposed for state listing elsewhere in New England.

During the eight years since the appearance of the 1984 report data has accumulated on a host of additional freshwater macroinvertebrate species showing a restricted or limited distribution in Massachusetts. Some of these species have only recently been discovered in the state and in a few cases these records represent the only known occurrence in North America. The majority of these species are currently listed, with annotations regarding their distribution, in the Massachusetts Natural Heritage and Endangered Species Program's "Watch List," a dynamic listing that tracks species that show declining trends in population size, historical rarity (in the state) or have been recently discovered (or described) in Massachusetts. The development of the watch list has been encouraged by recent changes in state laws and regulations affording protection for animal and plant species. These include amendments to the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37 and 10.59, 1987) that provide protection for rare wildlife in wetlands and the passage of the Massachusetts Endangered Species Act, Chapter 408 of the Acts of 1990.

SPECIES PROPOSED FOR SPECIAL CONCERN STATUS

The four species proposed for Special Concern status are listed below, with the common name following the scientific name. Each has been taken from the Massachusetts Natural Heritage and Endangered Species Program's "Watch List." All four species proposed in this report conform to criteria outlined in 321 CMR 10.03 (5) and (6) (c) and are somewhat extraordinary in that they are not only rare in Massachusetts but are extremely rare species in terms of their global distribution. To the right of each species is the numerical designation derived from the Nature Conservancy's ranking system of "elements" (i.e., species conservation priority value). "S" refers to state element occurrence and "G" refers to global element occurrence. The numbers represent rarest occurrence (1, typically thought to be less than five populations) to common (5, widespread and abundant). Rankings such as 2-3 indicate a range of uncertainty from known occurrence (2) to estimated potential occurrence (3).

	S	G
PORIFERA		
Spongilla aspinosa Potts, 1880 (smooth branched sponge)	1	2-3
PLATYHELMINTHES		
Polycelis remota Smith, 1988 (Sunderland spring planarian)	1	1
ECTOPROCTA		
Stephanella hina Oka, 1908 (Asian ghost moss-animal)	1	1-2
MOLLUSCA		
Cincinnatia winkleyi (Pilsbry, 1912) (New England siltsnail)	1	2-3

SPECIES ACCOUNTS

Porifera

Spongilla aspinosa smooth branched sponge

This species belongs to the large exclusively freshwater family Spongillidae. Freshwater sponges are found throughout the world and although the majority of species are in the Spongillidae, at least two other families containing freshwater representatives are known. Freshwater sponges in the Spongillidae are ubiquitous members of the sessile benthic community. The family is well represented in Massachusetts, there being 15 species known (Smith, 1991). Species typically form masses on all sorts of substrates. The "growing" or "vegetative" season for all but a very few Massachusetts species is almost always during the summer months. All species produce round gemmules (Fig. 2), sclerotized capsules containing germ cells that carry the population through winter or other periods of adversity.

Spongilla aspinosa (Fig. 1) is one of the rarest and least known freshwater sponge species occurring in North America. Originally described by Potts in 1880 from ponds in New Jersey, S. aspinosa has since been recorded in only seven other states (Penney, 1960), besides Massachusetts, and eastern Canada (Ricciardi, ms). In Massachusetts, S. aspinosa is known only from two ponds (Smith, 1991). The species forms large "colonies" which are attached to substrate on the pond bottom. The sponge "colony" is usually green due to the presence of symbiotic zoochlorellae (chlorophyl containg protozoans) and forms vertically erect finger-like processes up to 4" (100 mm) long. The most detailed study of this species was done by Jewell and Brown (1929) who studied a Michigan population and found that the species occupied naturally acidic waters with a pH value of 5.0. The total range of pH in which S. aspinosa has been reported is 4.0 to 5.5. Spongilla aspinosa prefers lentic situations, typically ponds and lakes, with much organic input from surrounding forests but with little sustained productivity. Water in such habitats is typically clear to slightly colored (brownish).

Taxonomically, this species is most similar to Spongilla lacustris, a very common species known throughout the Northern Hemisphere (Penney and Racek, 1968). When growing in acidic environments, especially those with artifically increased acidity, S. lacustris approaches S. aspinosa in certain characteristics of the spicules (Fig. 3), secreted siliceous structures that form the sponge "skeleton" and comprise most of the important taxonomic characters used to differentiate species of freshwater sponges. Opinion has been expressed that the two species are synonymous (under S.

lacustris), however, all published studies have maintained the two as separate species. Spongilla aspinosa can be distinguished from S. lacustris, which is common in Massachusetts, by the absence of a distinct class of spicule, the gemmosclere, a spicule used to reinforce the gemmule, and the distribution of gemmules within the mature sponge. In S. lacustris, the gemmules tend to be concentrated at the base of the sponge in a single layer while in S. aspinosa they are distributed throughout the sponge in clusters. Because of its rarity, there are no ongoing studies of this species. A graduate study recently completed in Canada (Ricciardi, ms) has verified taxonomic differences between this species and S. lacustris.

Spongilla aspinosa is proposed for Special Concern status in Massachusetts because of its extreme rarity, both within Massachusetts and throughout its entire range. Only two populations are known from the state (Chockalog Pond in Uxbridge and Harlocks Pond, Chilmark) (Fig. 4). Both ponds are small, unproductive, shallow and apparently naturally acidic and are in areas with little or no surrounding development. Naturally acidic waters in Massachusetts are apparently common in the eastern and southeastern parts of the state yet S. aspinosa has been found in only a few of the many surveyed waterbodies (some of which contain S. lacustris). This suggests that there may be other subtle ecological factors involved with the successful development of permanent populations.

Platyhelminthes

Polycelis remota Sunderland spring planarian

Polycelis remota is a flatworm, a group of small free-living worms also known as "planarians." Like all planarians, P. remota (Fig. 5) is unsegmented and soft-bodied, and the principal organ of feeding, the pharynx, is located in the mid-ventral region of the body. Polycelis remota is easily differentiated from all other Massachusetts species of flatworms by the several small eyes arranged tightly along the anterior region of the body (Fig. 6). The animal is darkly pigmented and reaches about 3/8" (9 mm) in length. Flatworms reproduce using both asexual and sexual methods though all species produce sexual organs at some point during their life span. As far as known, P. remota reproduces exclusively by sexual methods involving cross fertilization (all flatworm species are hermaphroditic), and the production of a cocoon which contains several young worms. This species is known only from a single large spring system in Sunderland, Massachusetts (Fig. 9).

The only published investigation on this species is by Smith (1988a) in which the species was described. Polycelis remota apparently requires spring habitats in which the water

remains quite cool (8.5-9.0°C) throughout the year. Other common species of planarians in association with P. remota have broader temperature tolerances with higher maximum temperatures in which they can live. In his description, Smith (1988a) overlooked the occurrence of a similar species, Polycelis schmidti, which is found in northeastern Asia (Fig. 10) [see Kawakatsu (1964) for a discussion of P. schmidti]. The species P. remota therefore is properly placed in the subgenus Seidlia. Its apparent closest relative, P. schmidti, along with other less similar forms, are found in western North America and eastern Asia. Polycelis remota is disjunct from these other species and is known only from its type locality. No ongoing study of this species exists; however, it is hoped that a monthly survey will commence soon by D. G. Smith to observe reproductive behavior and cocoon formation.

Polycelis remota is proposed for Special Concern because of its extreme rarity. The spring habitat is currently on state owned property (a fish hatchery) and is the source of water for fish culturing pens. Although apparently secure from potential impacts, the aquifer supplying the spring is susceptible to pollution from development and gravel excavation operations outside of the property. Furthermore, treatment of the water to eliminate fish pathogens within the narrow habitat of this species should be avoided.

Ectoprocta

Stephanella hina Asian ghost moss-animal

The freshwater ectoprocts are common inhabitants of aquatic habitats and they seem to be absent only from environments characterized by high current. Several species occur in Massachusetts of which four or five are moderately to very rare. A few others need additional taxonomic study. Among the Massachusetts species, Lophopodella carteri is currently listed as Special Concern as it is uncommon throughout its range and in Massachusetts is known only from the Connecticut River.

The colonies of S. hina (Fig. 7) are highly transparent, probably the most transparent among the known species of freshwater ectoprocts and though macroscopic, are hard to detect with the naked eye. Nonetheless, this species, in the few areas where it occurs, produces extensive colonies which can cover several square centimeters of substrate. Individual zooids, which collectively make up the colony, are about 2 mm long.

Freshwater phylactolaemate ectoprocts form brushy, ramose or thickly massive colonies (depending upon the species) during the warmer months of the year; colder seasons they exist largely as compacted germ cells enclosed in hardened

capsules. The entire capsular structure is called a statoblast and can exhibit up to three different morphologies depending upon the species. Most species, including S. hina, have two types, a floatoblast and a sessoblast (Fig. 8), each formed for different purposes. Floatoblasts and sessoblasts (somewhat analogous to sponge gemmules) exhibit species-specific characters and in most cases will permit accurate identification of species.

Stephanella hina is usually associated with a widely distributed and common form, Fredericella indica. Typically, several other invertebrate groups are represented, including sponges, hydras, rotifers, and other ectoprocts. Stephanella hina was originally discovered in the Swift River in Ware (Smith, 1988b) and later found in the Agawam River in Wareham (Fig. 9). Both streams are of high quality and the sites for this species are in either state owned (Swift River Wildlife Management Area) or municipally protected sections (Agawam River fishway) of the respective river systems. The Swift River population occurs in a watershed management area within the Quabbin Reservoir reservation and is well known for its trout fishery. The Agawam River is recognized as an important anadromous fish waterway and the drainage originates in the Myles Standish State Forest. Both areas, however, are not immune to impacts. Land use practices change and certain activities within each watershed, if permitted or continued, could impact the species. Of chief concern in each drainage is alteration of substrate characteristics, most importantly, disturbance and destruction of substrate.

Stephanella hina is proposed for Special Concern status because of its rarity. Besides the two localities in Massachusetts, it is known only from Japan (where it is reported to be declining) and the Korean Peninsula (Fig. 10). Ongoing research on this species involves culturing of colonies in a laboratory environment to determine growth characteristics, periodicity of growth and effects of local water chemistry. Also, the possibilty that North American populations are distinct from Asian populations is being investigated by Timothy Wood of Wright State University.

Mollusca

Cincinnatia winkleyi New England siltsnail

Cincinnatia winkleyi (Fig. 11) is a snail in the gastropod order Mesogastropoda, a group characterized by the possession of an operculum and at least one gill in the pallial cavity. Following its original description, based on shells collected in Saco, Maine, C. winkleyi fell into malacological obscurity and was not studied again until Davis and Mazurkiewicz (1985) redescribed the species in detail and, based on features of the reproductive anatomy,

placed it in the genus Cincinnatia. The shell of C. winkleyi reaches 4 mm in length. Individuals probably live for one or two years. Other than its reproductive anatomy (Fig. 12), nothing is known of its reproductive biology. Since Davis and Mazurkiewicz's (1985) study the species has been observed and verified in only five localities in Massachusetts: the lower Merrimack River and Artichoke River in West Newbury, the Egypt River in Ipswich, a drainage ditch in Rowley, and the Mill River in Newbury (Fig. 13). All of these stations are in a relatively confined area of the North Shore. This species generally occurs in oligohaline waters (0.5 to 3.0 o/oo salinity) but commonly ranges into lower salinities (fresh water). Very few organisms, including C. winkleyi, and another gastropod, Littoridinops tenuipes which is currently listed as Special Concern in Massachusetts, are specifically adapted to oligohaline waters.

Though the life zone in which the species lives is small (about 20 to 40 m in the Egypt and Mill rivers), the populations in these areas are dense. The principal threat to these populations comes from unregulated development of areas adjacent to the drainage systems containing this species. For these reasons and the fact that the species is rare and apparently endemic to New England (it is also known from Maine), it is proposed for Special Concern status in the state. It is recommended that future land use management practices in riverine areas harboring C. winkleyi take into consideration the continued, healthy existence of the species.

LITERATURE CITED

Davis, G. M. and M. Mazurkiewicz. 1985. Systematics of Cincinnatia winkleyi (Gastropoda: Hydrobiidae). Proceedings Academy Natural Sciences, Philadelphia, 137: 28-47.

Jewell, M. E. and H. W. Brown. 1929. Studies on northern bog lakes. Ecology, 10: 427-475.

Kawakatsu, M. 1964. Studies on the taxonomy and morphology of the Japanese freshwater planarian, Polycelis schmidti (Zabusov). Annotationes Zoologicae Japonensis, 37: 174-184.

Penney, J. T. 1960. Distribution and bibliography (1892-1957) of the fresh-water sponges. University South Carolina Publications, Series III, 3: 1-97.

Penney, J. T. and A. A. Racek. 1968. Comprehensive revision of a worldwide collection of freshwater sponges (Porifera: Spongillidae). Bulletin United States National Museum, Bull. 272. 184 pp.

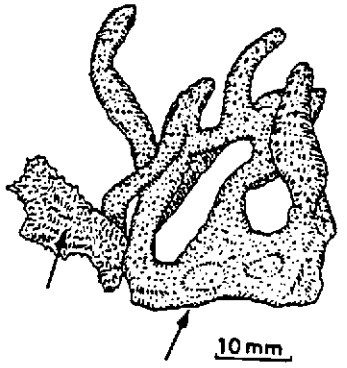
Smith, D. G. 1981. Selected freshwater macroinvertebrates proposed for Special Concern status in Massachusetts. Massachusetts Department Environmental Quality Engineering, Division Water Pollution Control. Westborough, Massachusetts. 26 pp.

Smith, D. G. 1984. Selected freshwater macroinvertebrates proposed for Special Concern status in Massachusetts Part II. Massachusetts Department Environmental Quality Engineering, Division Water Pollution Control. Westborough, Massachusetts. 24 pp.

Smith, D. G. 1988a. A new, disjunct species of triclad flatworm (Turbellaria: Tricladida) from a spring in southern New England. Biological Bulletin, 175: 246-252.

Smith, D. G. 1988b. Stephanella hina (Ectoprocta: Phylactolaemata) in North America, with notes on its morphology and systematics. Journal North American Benthological Society, 7: 253-259.

Smith, D. G. 1991. Keys to the freshwater macroinvertebrates of Massachusetts. Privately published. Douglas G. Smith, Department Biology, University of Massachusetts, Amherst, Massachusetts. 236 pp.



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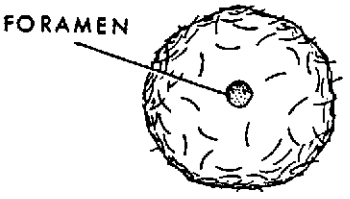

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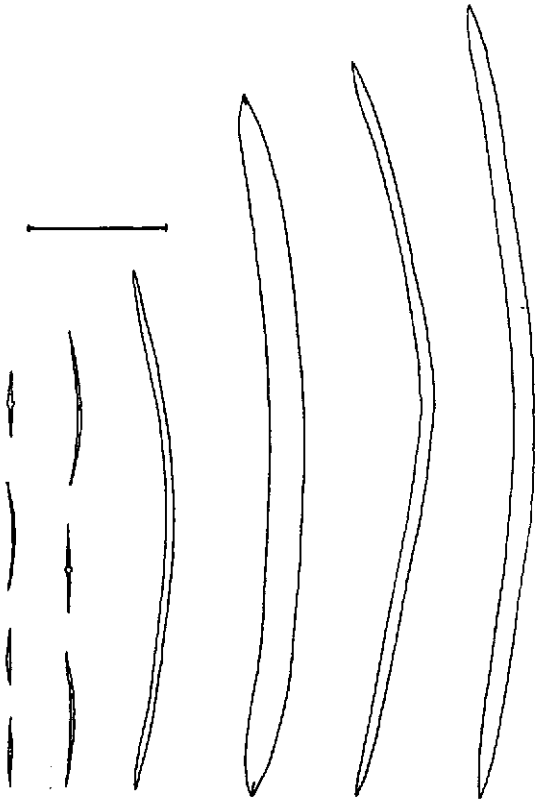

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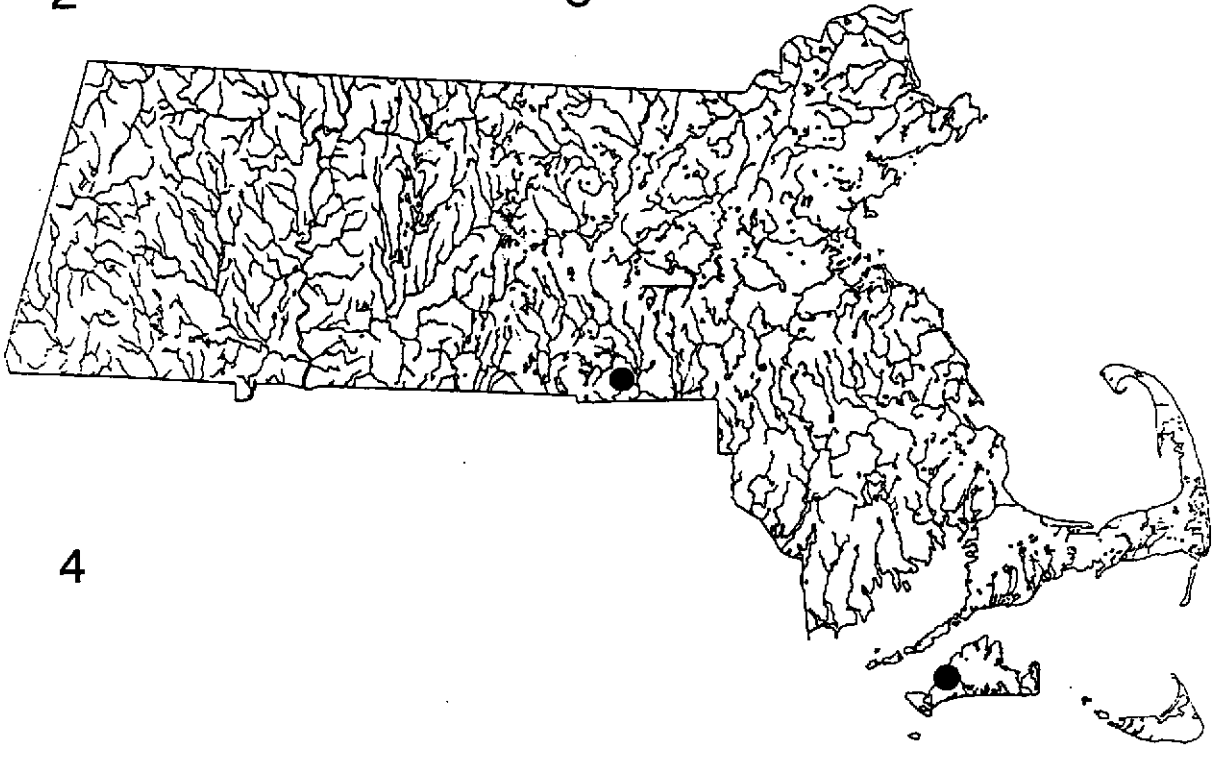

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Fig. 1. Adult "colony" of Spongilla aspinosa, arrows denote point of attachment. Fig. 2. Gemmule of S. aspinosa. Fig. 3. Spicules of S. aspinosa, scale equals 40 um. Fig. 4. Distribution of S. aspinosa in Massachusetts.

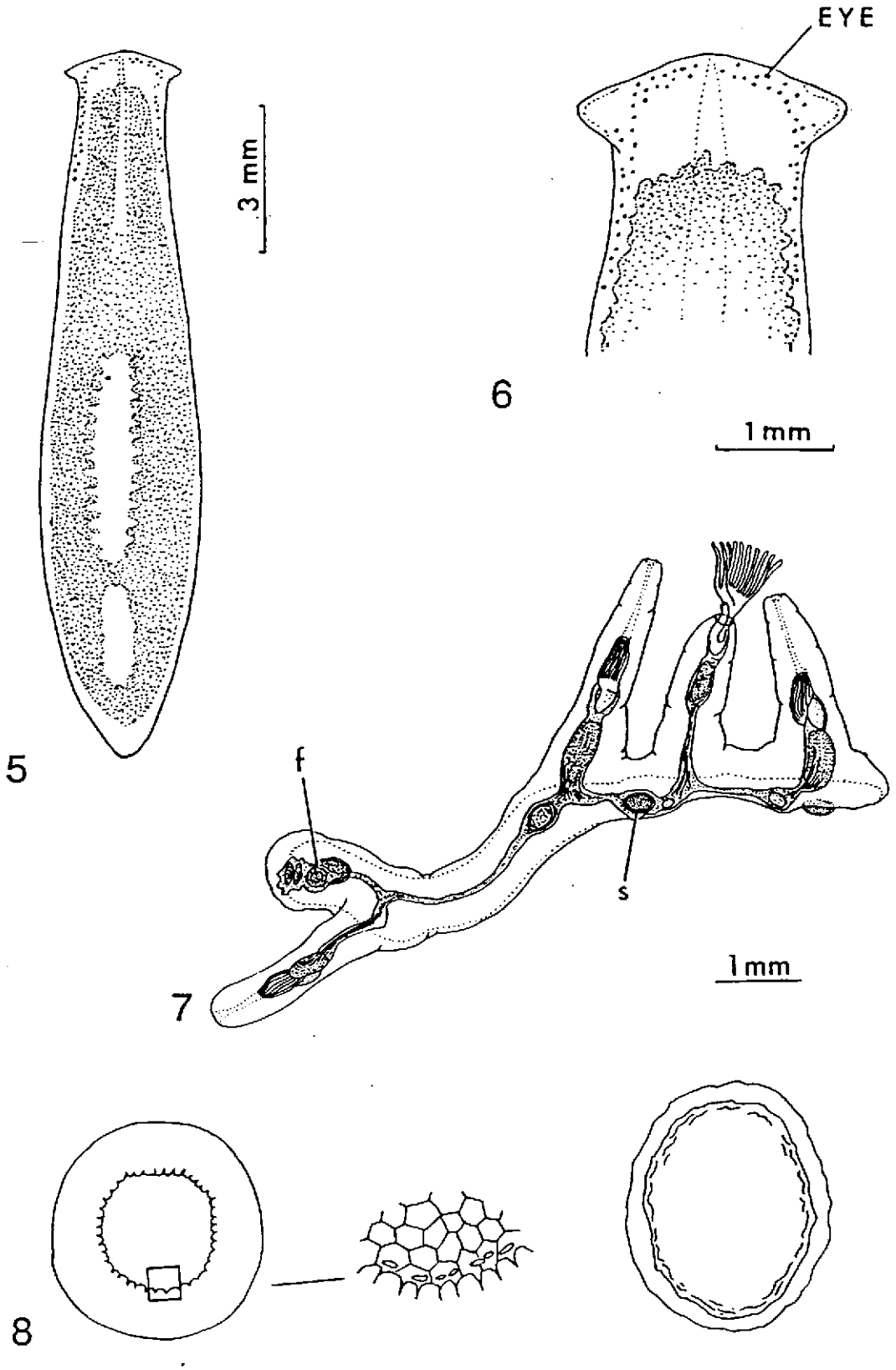

Fig. 5. Polycelis remota. Fig. 6. Anterior region of Polycelis remota showing arrangement of eyes. Fig. 7. Stephanella hina colony, f = floatoblast, s = sessoblast. Fig. 8. Statoblasts of S. hina, enlarged; left, floatoblast; right, sessoblast.

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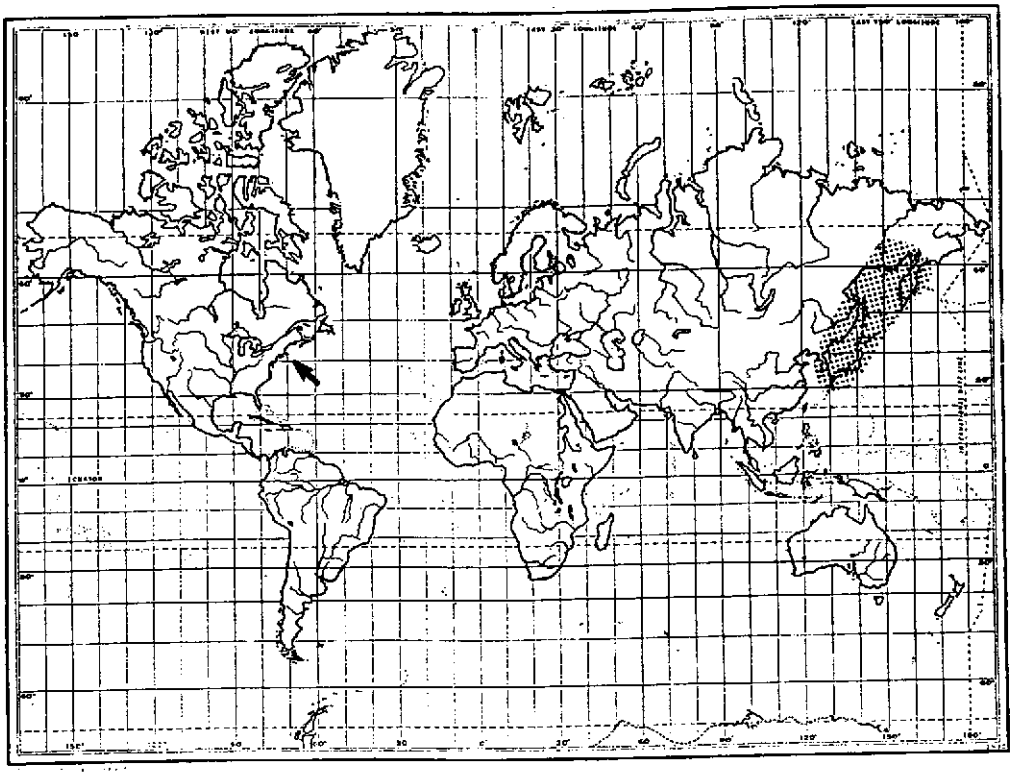

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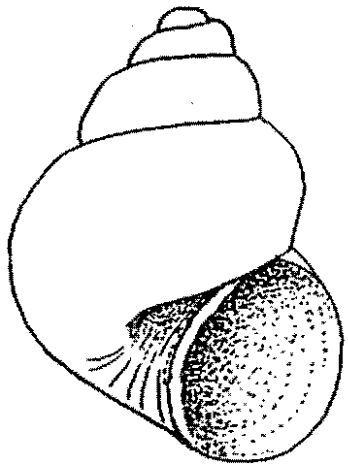
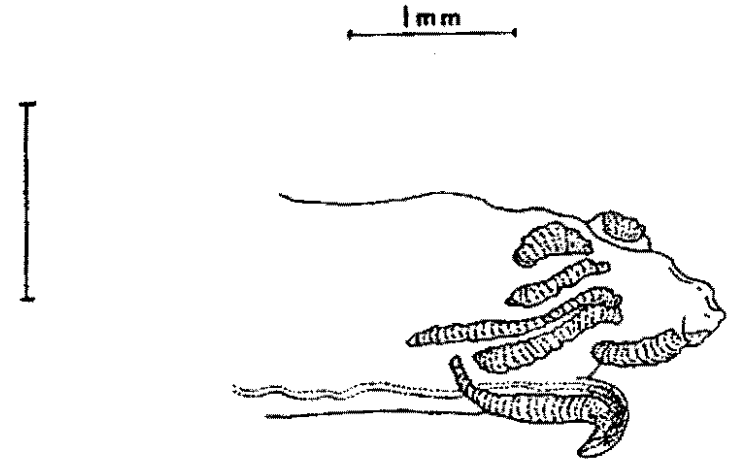
Fig. 9. Known distribution of Polycelis remota (circle) and Stephanella hina (squares) in Massachusetts. Fig. 10. World map showing Asian distribution (stipled area) of S. hina and Polycelis schmidti, the closest relative of P. remota. Massachusetts at tip of arrow.





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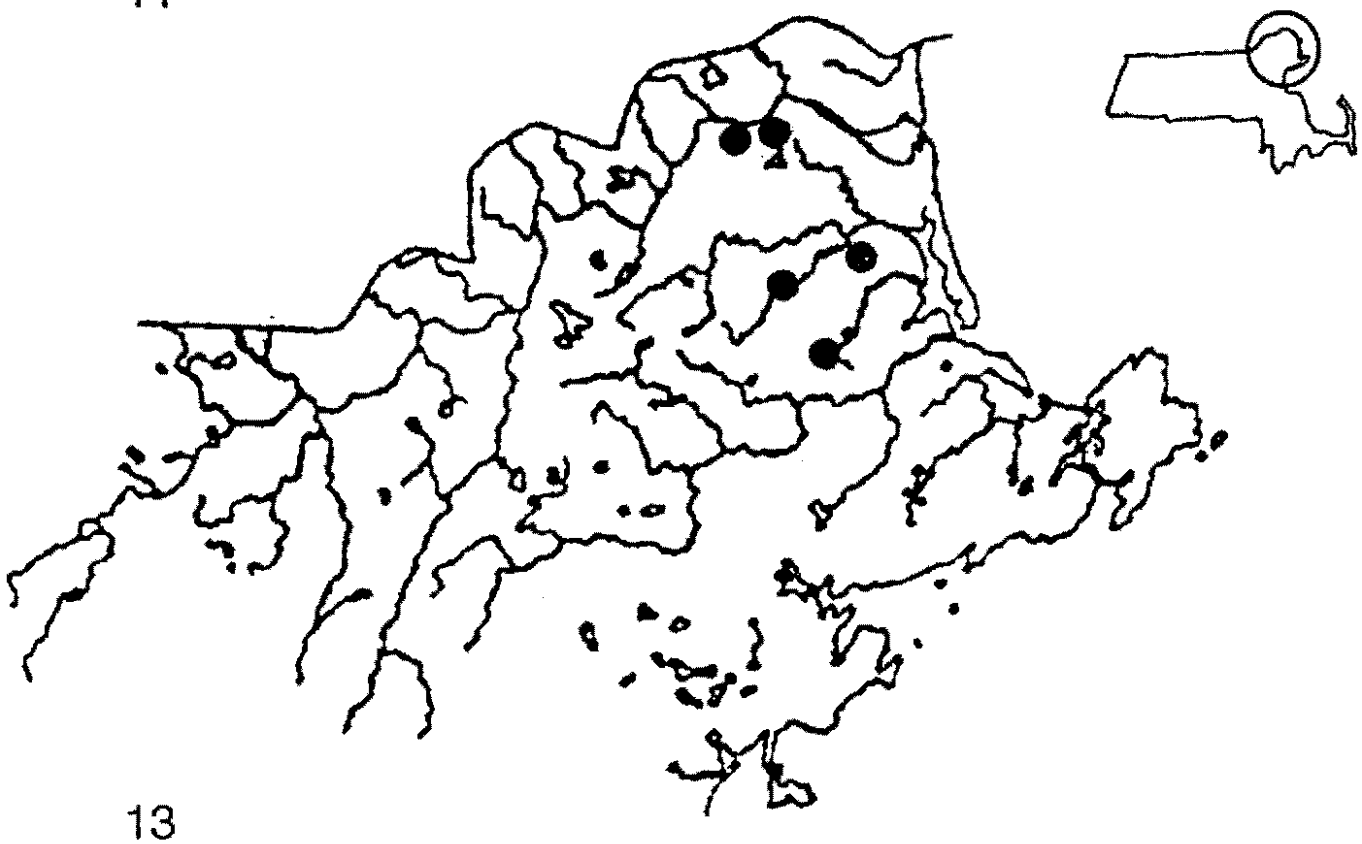

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Fig. 11. Shell of Cincinnatia winkleyi. Scale equals 2 mm.
Fig. 12. Verge or male reproductive organ of C. winkleyi.
Fig. 13. North shore region of Massachusetts (inset at right) showing distribution of C. winkleyi (circles).