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Sineportella forbesi, a new victorellid bryozoan from Illinois (Ectoprocta:Ctenostomata)

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Abstract. A previously unknown species of ctenostome bryozoan occurs in the Little Wabash River at Carmi, White County, Illinois. Unseen in the field, the tiny colonies were discovered by microscopic examination of rock chips collected at the site. Zooids form a network of delicate, uniserial, branching lines across the substrate. Each zooid is attached to the previous one by an elongated, proximal tubular region resembling a stolon. The small zooid size and highly retractable peristome are suggestive of the Family Arachnidiidae, but the campylonemidan lophophore and its 8 tentacles argue for Victorellidae. The absence of a sphincter beyond the esophagus is suggested in the generic name, *Sineportella*. Conditions at the time of collection included turbulent water with pH 7.8 and conductivity 420 μmhos.

Key words: *Sineportella forbesi*, new species, Ctenostomata, Gymnolaemata, Ectoprocta, bryozoan, taxonomy.

The freshwater ectoproct bryozoans of North America comprise about 25 known species, divided unequally between 2 classes: Phylactolaemata and Gymnolaemata. Only the phylactolaemates occur exclusively in freshwater habitats. Colony zooids are robust, the lophophores typically U-shaped (with exception of Fredericellidae), and they produce dormant buds (statoblasts) which can serve as free disseminules. By contrast, the gymnolaemates are mostly marine bryozoans, including the Order Ctenostoma which has the only freshwater species. Zooids in this group are relatively small and delicate, with lophophores circular in outline, the colonies lacking free dormant buds.

The freshwater ctenostomes represent only a small fraction of the more than 240 known species in the group. *Paludicella articulata* occurs in rivers and lakes worldwide, *Hislopia* species are common in tropical fresh waters, *Pottsiella erecta* occurs spottily in North America, and *Arachnoidea ray lankesteri* is known only from the depths of Lake Tanganyika. All other ctenostomes are either strictly marine or limited to the vicinity of brackish waters.

We were therefore surprised to encounter an unfamiliar ctenostome species from the inland waters of Illinois during a statewide bryozoan survey. The tiny zooids were not actually seen in the field but were found subsequently growing on chips of rock brought to the laboratory. Colonies have continued to thrive for over 3 y of laboratory culture.

All bryozoans are modular organisms composed of many repeating units, or zooids. Each feeding zooid bears a lophophore of ciliated tentacles which draws suspended particles towards the central mouth. Below the lophophore is a complete digestive tract and a nerve ganglion. Together these structures constitute the polypide, and they move as a unit when the lophophore is retracted or extended. An outward tubular extension of the body through which the lophophore can protrude is known as a peristome. A pleated collar supported by stiff setae occurs sometimes at the base of the lophophore. Good summaries of ctenostome morphology appear in Hayward (1985), Ryland (1970), and Hyman (1959).

Methods

Pieces of rock of 1–2 cm^2 were chipped from boulders near the base of a low dam crossing the Little Wabash River at Carmi, Illinois. The site is in the southeastern quarter of Illinois, approximately 56 km WNW of Evansville, Indiana. In the laboratory, the rock chips were fastened with rubber bands to glass microscope slides and placed in a small invertebrate rearing

apparatus (Wood 1996). Branches of the bryozoan colony eventually grew onto the glass slides where they could be examined in detail with a compound microscope. Similarly, we enabled colonies to grow from rock chips onto the inside of glass petri dishes in which 4-mm diameter glass rods were held with silicone adhesive. The dishes were inverted in a rearing tank (Wood 1989) with an airstone generating water turbulence. As branches of the colony grew over the rods it was possible to observe zooids from the side, thus confirming the positions of internal organs and the height of the peristome.

A colony grown in the laboratory from the original collection is deposited as the holotype at the Illinois Natural History Survey (INHS), Champaign, Illinois. We treated the specimen by narcotizing with methol, fixing in hot alcoholic Bouin's solution, then washing and preserving in 70% ethyl alcohol with 3% glycerol. The specimen remains attached to the glass microscope slide on which it was grown.

Sineportella, new genus

Type species: *S. forbesi*, present designation.

Diagnosis

The campylonemidan lophophore with its 8 tentacles gives *Sineportella forbesi* the appearance of a miniature victorellid bryozoan. The family Victorellidae currently includes about a dozen species. Most occur in brackish water, and some can also be found in coastal freshwater habitats (d'Hondt 1983). However, *Sineportella* zooids are much smaller than any known victorellid zooids, and they lack the typical sphincter between the esophagus and the prominent caecum (Jebram 1982). Nevertheless, they share a similar budding pattern (2 lateral and 1 distal), with no anastomosing cross connections and no specialized heterozooids. It is not known whether the Illinois ctenostome, like other victorellids, broods its embryos internally.

Despite their similarity, none of the described victorellid genera accommodates the Illinois material. *Victorella* and *Tanganella* zooids are too large and have their own characteristic arrangement of the digestive tract. Zooids of *Bulbella* bear a superficial resemblance to the Illinois ctenostome, with the small, elongated, stolon-like region and bulbous base. However, *Bulbella* is distinguished by a conspicuous cardiac gizzard, and it tends to occur in rotting wood (Braem 1951, Jebram 1969). Placing the Illinois ctenostome with the Victorellidae requires erecting a new genus, *Sineportella*.

We had previously considered the possibility of classifying the new ctenostome in the Family Arachnidiidae. Zooids in this group typically form an encrusting tracery of delicate lines across the substrate. Each zooid attaches directly to the previous one by a tapered elongation of the proximal zone (Hayward 1985). Because of their small size and diffuse growth form, arachnidiid colonies are seldom noticed and tend to be encountered only accidentally. Distribution records are sketchy, and many species are known only from a single collection. In addition to its small size, the Illinois ctenostome shares with several arachnidiid species a highly retractible peristome and a bulbous zooid base which encloses the caecum and pylorus even when the lophophore is extended. On the other hand, arachnidiids have no setigerous collar, and the tentacle number, in species where it is known, generally exceeds 8. All but 1 species are fully marine, the exception being *Arachnoidea ray lankesteri*, known only from the depths of Lake Tanganyika (Moore 1903).

Finally, we should mention Paludicellidae as the only major ctenostome family entirely restricted to freshwater habitats. The current definitions of paludicellids include a median dorsoventral muscle in the proximal end of the zooid (Jebram 1973a) and the absence of a collar below the lophophore (Hayward 1985). It is clear that neither of these features applies to the new species.

On balance, Victorellidae seems the most appropriate match for the new Illinois ctenostome. Even though lophophore features are normally given little taxonomic value among ctenostomes, the morphological consistency of the 8-tentacle victorellid lophophore is striking. Also, the typical occurrence of victorellids in brackish and freshwater habitats cannot be ignored. Finally, the arachnidiid ctenostomes as a group are too poorly known to be assigned a new species based only on the general features described.

Description

Colony small and indistinct. Outer cuticle smooth, shiny, lacking ornamentation; zooids in

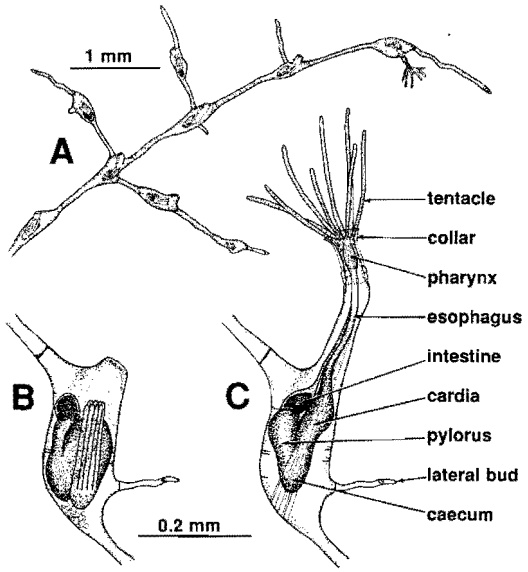

FIG. 1. A.—Branch of a larger colony of *Sineportella forbesi* growing on a glass microscope slide in laboratory culture. B.—Zooid with retracted polypide. C.—Same zooid extended in feeding position; the anus and terminal section of the rectum are hidden by the esophagus. All drawings are made from photographs of living specimens.

randomly directed, uniserial lines, each zooid bearing campylonemidan lophophore with 8 tentacles above setigerous collar. Gut caecum lacking gizzard; sphincter absent in cardia and between cardia and caecum. Zooid buds include 2 lateral and 1 frontal; no anastomosis among zooids.

Etymology

The generic epithet refers to the absence of a sphincter between the esophagus and pylorus.

Sineportella* (*S.*) *forbesi, new species
Figs. 1, 2

Diagnosis

A small zooid length (<1.5 mm) and the presence of setigerous collar distinguish this species from *Paludicella* and *Pottsiella*, until now the only known ctenostomes from North American fresh waters. The other truly freshwater ctenostomes, *Hislopia* spp., occur in tropical regions and feature a prominent gizzard, which is lacking in *Sineportella*.

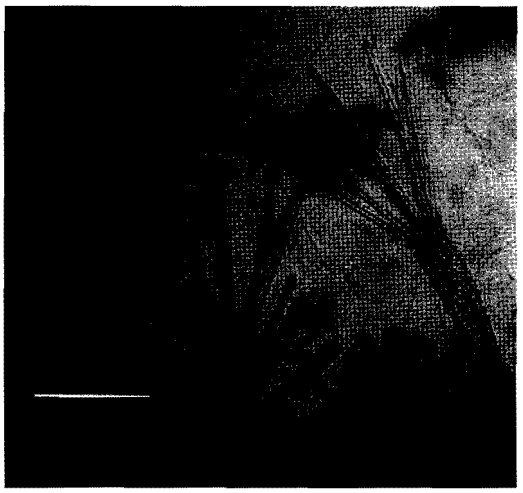

FIG. 2. Zooids of *Sineportella forbesi* growing on a rock chip. Scale bar = 0.15 mm.

Description

Colonies forming diffuse, branching, uniserial chains of zooids (Fig. 1A), mostly attached to substrate, but with some branches occasionally becoming free. Zooid size uniform, but shape irregular, roughly fusiform, triangular or rectangular in outline. Each zooid consisting of narrow, stolon-like tubule growing from parental zooid, then expanding to bulbous form containing polypide; anastomosing cross connections lacking between zooids even under crowded conditions; 1 distal and 2 lateral buds may extend from basal region, but no budding at peristome. Zooid surface entirely smooth, devoid of appendages or ornamentation. No specialized heterozooids.

Lophophore with 8 tentacles (Figs. 1C, 2); 2 adjacent tentacles slightly more outwardly bent than others, hence "campylonemidan" (Hincks 1880, Winston 1978); lophophore projecting slightly above setigerous collar at end of narrow peristome. Peristome of fully retracted polypide shortens to small mound (Fig. 1b); orifice of retracted zooid usually with distinct quadrangular shape, but lacking cuticular thickening.

Muscular esophagus leads to long cardia, enlarging in basal region to form sac-like caecum (Fig. 1ç); no sphincter in cardia to impede reflux of food; no gizzard.

New zooids narrow, stolon-like tubes extending from parent zooid, carrying embryonic material at their apices; tubes typically encrusting, extending over or around other parts of the colony, sometimes becoming free and spanning gaps in substrate. Embryonic material develops into polypide and occupies newly expanded distal end of tubule. No sexual reproduction observed; no asexual hibernacula (at least in laboratory reared colonies).

Standard measurements: lophophore diameter 0.25 mm; zooid length 0.70–1.15 mm; maximum zooid width 0.05 mm (stolon-like region), 0.13–0.25 mm (expanded region).

Remarks

Ctenostome bryozoans are notoriously difficult to classify. Diagnostic characters traditionally include presence or absence of specialized zooids or brooded embryos, the nature and arrangement of buds, musculature, tentacles, regions of the gut, and other features. Such important structures as dormant buds or an intertentacular organ may appear only seasonally. Jebram and Everitt (1982) suggested that certain diagnostic features are properly recognized only in living material. However, the foods available to colonies under laboratory conditions may sometimes produce atypical morphogenic effects (Jebram 1973b, 1978). The zooids in the Illinois material are too small to be observed in detail unless they are growing on a transparent substrate, and thus we have been able to study only specimens cultured in the laboratory under conditions which may or may not be optimal.

Material examined

Holotype.—**USA. Illinois**: White Co., Little Wabash River at Carmi, 38°05′53″N, 88°09′42″W, 28 August 1993, T. S. Wood & T. G. Marsh, reared in laboratory on single glass microscope slide by asexual propagation (INHS).

Etymology

The specific epithet is given in honor of Stephen A. Forbes (1844–1930), founder and first Chief of the Illinois Natural History Survey.

Habitat

Sineportella forbesi was collected at the base of a 2-m dam across the Little Wabash River at Carmi, Illinois. Rock chips were knocked from sandstone boulders in turbulent water. The pH was 7.8, water temperature 29°C, and conductivity 420 μmhos. According to records of the US Geological Survey (e.g., Maurer et al. 1994) the Little Wabash River floods frequently, and water depth at the collection site has a typical annual range of 0.5 to 4 m. Dissolved oxygen is always above 6 ppm and is often greater than 10 ppm.

During the 1940s, petroleum extraction upstream of the site resulted in the long-term release of brine into the river. Over the past decade the annual range of sodium and chloride ions has averaged 7–40 mg/L and 14–59 mg/L respectively. Even at its maximum, the salinity is equivalent to only 0.2% seawater and is still an order of magnitude less than the lowest values recorded for such brackish ctenostomes as *Victorella pavida* (Everitt 1975) or *Tangenella mulleri* (Jebram and Everitt 1982). In our laboratory culture the sodium and chloride levels are held at about 5 and 12 mg/L respectively. It would be interesting to determine the salt tolerance of *S. forbesi*, but so far we have not had sufficient living material to test.

Certainly none of the other species found with *S. forbesi* suggests an unusually saline habitat. These species include the ctenostome bryozoan *Pottsiella erecta* (another victorellid, according to d'Hondt 1983); the phylactolaemate bryozoan *Plumatella emarginata*; and the entoproct *Urnatella gracilis*. All tolerate a wide range of water chemistry, but none could be considered brackish species. This association with other freshwater species and absence of brackish species tends to support our assumption that *S. forbesi* is a fully freshwater bryozoan.

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