

# ASTEROCYSTIS SMARAGDINA (REINSCH) FORTI (RHODOPHYCEAE): A NEW ALGAL RECORD FOR ILLINOIS

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## ABSTRACT

The freshwater red alga, *Asterocystis smaragdina* (Reinsch) Forti, is reported for the first time from several locations in Illinois along the western shore of Lake Michigan. Common associates of this epiphytic alga are *Cladophora glomerata* and *Bangia atropurpurea*. A description and figures of Illinois material are provided including locations of collecting sites.

Key index words: *Asterocystis smaragdina*; Illinois; new distribution record; Lake Michigan; Rhodophyceae.

## INTRODUCTION

The red alga, *Asterocystis smaragdina* (Reinsch) Forti, recently has been discovered at several locations along the western shore of Lake Michigan in northeastern Illinois (Lake County). This small, epiphytic alga was first observed by the author among algal samples retrieved from the lake at Lake Forest, Illinois, in late 1978. It was collected again, in October, 1979, and September, 1980. More thorough sampling during 1980 suggested that the alga was generally established along the entire shoreline of Lake County; additional specimens subsequently were collected at Highland Park, Lake Bluff, and Illinois Beach State Park.

At all stations *Asterocystis* was a minor component of an algal association dominated by *Cladophora glomerata* (L.) Kütz. and *Bangia atropurpurea* (Roth) C. Ag. As reported earlier by the author (Weik, 1977), the dominant species of this association develop in broad horizontal bands on the firm surfaces of rock, concrete, wood, and steel located in the supralittoral zone. This association becomes particularly prominent during the period from mid- to late summer, but it persists well into late autumn at this location.

## DESCRIPTION OF ILLINOIS MATERIAL

Illinois specimens of *A. smaragdina* agree in size, appearance, and habitat preference attributed to the taxon by Pascher and Schiller (1925), Smith (1950), and

Prescott (1962, 1968, 1970). Voucher specimens collected in 1980 are on deposit in the Elizabeth Teter Lunn Herbarium of Lake Forest College. Description of Illinois material:

Thallus attached, filamentous, simple at first but becoming increasingly branched with age, the branches originating by dislocation of certain cells of the filaments in a fashion similar to the habit of "false-branching" common among certain filamentous cyanophytes; individual cells of the filaments globose or oblong to cylindrical, closely to widely spaced in a well-developed, hyaline sheath, 8.2 to 16.5  $\mu\text{m}$  long, 8.2 to 9.9  $\mu\text{m}$  in diameter (excluding sheath); chloroplasts solitary, stellate and central in each cell, bright bluish-green with a single, usually prominent pyrenoid; plants commonly epiphytic on attached, macroscopic algae such as *Cladophora* and *Bangia* in the supralittoral zone.

As a rule *Asterocystis* was associated chiefly with *Cladophora* at all sampling stations (Figures 1 and 2). Its establishment on *Bangia* was less frequent (Figure 3). The small size of the epiphyte renders it easily overlooked on the branching thallus of a host plant such as *Cladophora*. Once discovered, its bright bluish-green pigmentation and apparent habit of false branching lure one to assume, however, incorrectly, that it is a cyanophyte belonging to the Scytonemataceae (Cyanophyceae). But the recognition that in each cell there is a single, large chloroplast and central pyrenoid quickly suggests a eukaryotic organization (Figure 4).

Affinities of *Asterocystis* with other rhodophycean taxa are found in the subclass Bangiophycidae. These plants generally lack pit connections and any means of sexual reproduction. Individual cells of most genera contain a solitary, stellate chloroplast with a single pyrenoid. Multiplication occurs via monospores, cell division, or fragmentation. According to Prescott (1968), *Asterocystis* is the freshwater counterpart of the marine genus, *Goniotrichum* Kütz. Both genera typically develop as epiphytes.

## DISCUSSION

Normally, the discovery of a single alga representing a new distribution record would arouse little attention. But in the case of freshwater red algae, new findings are usually greeted with more than passing interest. Such is the case here. It is true that Prescott (1962) reported several locations for *A. smaragdina* in nearby Wisconsin, but all are in small inland lakes generally unassociated with Lake Michigan.

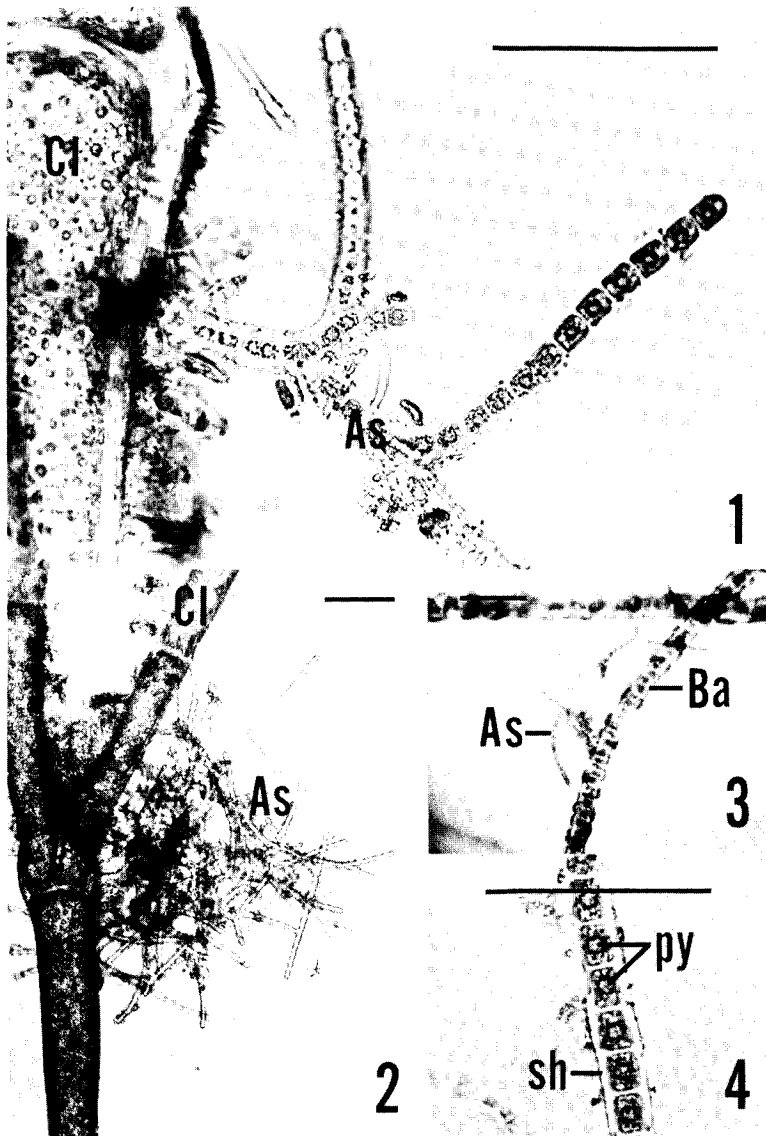
The discovery of *A. smaragdina* in Lake Michigan is especially interesting in light of the recent establishment of *Bangia atropurpurea* in the same environment. One pauses to consider which became established first. *Bangia* was collected from Lake Michigan at Chicago in 1968 (Lin and Blum, 1977; Weik, 1977) and is suspected of having entered the Great Lakes via the St. Lawrence Seaway at some earlier time. However, the minute size and epiphytic habit of *Asterocystis* may have been a contributing factor in its being overlooked before the discovery of *Bangia*. Certainly its primary host, *Cladophora*, was well established in the lake before 1968 (Britton, 1944). In any case the debut of *Asterocystis* further documents the subtle changes that have been noted over the past two decades in the mix of populations of attached algae in Lake Michigan. Likewise in this regard, it is of interest to note the recent discovery by Schloesser and Blum (1980) of *Sphaecelaria* (*S. lacustris*

Schloesser and Blum), a freshwater brown alga, in the same general area of Lake Michigan.

Finally, the discovery of *A. smaragdina* brings the total number of rhodophycean taxa reported for Illinois to five. Previously reported taxa include the aforementioned *Bangia atropurpurea* as well as *Batrachospermum boryanum* Sirod. (Transeau, 1913), *Lemanea australis* Atk. (Dillard, Weik, and Mohlenbrock, 1963), and *Thorea ramosissima* Bory (Hedgecock and Hunter, 1899).

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- Fig. 1. Epiphytic habit of young thallus of *Asterocystis smaragdina* (As) on *Cladophora glomerata* (Cl). Note false-branching habit of epiphyte. Scale bar = 50  $\mu$ m.
- Fig. 2. Older, repeatedly branched thallus on same host. Scale bar = 100  $\mu$ m.
- Fig. 3. Young thallus attached to uniseriate filament of *Bangia atropurpurea* (Ba). Scale bar = 100  $\mu$ m.
- Fig. 4. Short portion of a filament revealing the prominent, pyrenoid (py) in each cell. Note surrounding sheath (sh). Scale bar = 50  $\mu$ m.