

appears only in the Zygophyllaceae, Euphorbiaceae (*Chamaesyce*), Loganiaceae, and Rubiaceae. I was also influenced in part by the cytological studies of Bruce A. Perry (1943), who found haploid chromosome numbers of 6, 7, 8, 9, and 10 in *Euphorbia* in the broad sense. One of his statements particularly deserves quoting (*italics are mine*): "Chromosome number, chromosome size and certain morphological differences, *especially vegetative specialization*, suggests that the *Euphorbia* complex could be broken up into several genera" (*op.cit.*, p. 541).

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An Ecological Study of *Cladophora glomerata* (Chlorophyceae) near Dallas

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Cladophora glomerata, a green alga of the order Ulotrichales, family Cladophoraceae, is characterized by dichotomous branching, with ramuli ending in dense terminal fascicles. Its filaments range from 75 to 100 micra in diameter; its ramuli are not tapered but rounded at the ends; and its thalli (which may reach a length of 40 cm.) are dark green, strong, and rough to the touch. Fruiting bodies are terminal or sub-terminal.

Between October, 1949 and July, 1950, we collected this species in the Dallas area from Elm Fork of the Trinity River, and Bachman's, White Rock, and Ten Mile creeks. With the exception of the Elm Fork habitat, those streams in which the species is found are typically clear, with rocky beds and banks, and swift, shallow riffles alternating with quiet pools.

In our studies, we sought this species (but unsuccessfully) in the West Fork of the Trinity River, and in Denton, Mountain, and Hackberry creeks. These streams all have a high turbidity, sluggish flow, muddy banks and bottoms, and

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usually depths of more than four feet; and are located in the geological formations of Taylor Marl and/or Eagle Ford shale. Along with these two formations, the Dallas area is also transected by Austin Chalk, whose formation now stands as a long higher ridge more resistant to erosion than the two other formations. Minor streams of the Austin Chalk differ from those of the Taylor and Eagle Ford formations by being swifter, shallower, clearer, and with rocky substrates. Except for two artificial habitats on the Elm Fork of the Trinity River (Carrollton Dam and the effluent from Lake Dallas, both of which lie in the Eagle Ford shale) *C. glomerata* was found only in streams of the Austin Chalk (White Rock, Bachman's, Five Mile, and Ten Mile creeks.)

Seasonal Occurrence of Cladophora glomerata.— (1) Artificial habitats: The vegetative form of this species appeared at Carrollton Dam and at the effluent from Lake Dallas in the first week of October, 1949. Strands were of normal green color, but had a length of not more than 10 cm. A month later there was an abundance of *C. glomerata*, many strands of which were as much as 40 cm. long. Intermittent rises in the river washed away a large portion of the plant but its reestablishment was rapid after the stream flow returned to normal. The peak of abundance was reached in late January and early February of 1950. Subsequently there was a gradual decline until in July only a few short, pale-green strands remained at the effluent from Lake Dallas. At this time, we could not find the vegetative form at Carrollton Dam. The effluent from Lake Dallas was the only place in this area at which *C. glomerata* could be found during summer. Water entering the stream from the lake never exceeded 74°F in temperature. (2) Natural habitats in limestone-bedded streams: The species began to appear in the limestone-bedded creeks of the Austin Formation early in November, 1949. As at Carrollton Dam, the strands were of a normal dark green color, but not over 10 cm. in length. Sparse growth and limited occurrence continued through the winter months and until the middle of March, 1950, when there began a rapid increase in both size and quantity. By April the dense growth of *C. glomerata* impeded the water flow in some rapids with exposed bedrock. Floods resulting from a 2-inch rain removed this profuse growth; and further rains in April prevented reestablishment in its former abundance.

Occasional strands persisted through May, after which we could not find the vegetative form.

Associated Algae. — A great number of species of algae were found floating freely among the densely interwoven thalli of the *Cladophora*. The following genera were noted:

Bacillariae	Cymbella
Centrales	Amphora
Melosira	Chlorophyceae
Pennales	Ulotrichales
Tabellaria	Coleochaete
Fragilaria	Zygnematales
Synedra	Zygnema
Navicula	Spirogyra
Caloneis	Closterium
Gyrosigma	Cosmarium
Gomphonema	Hyalotheca

Gomphonema was the only form found growing epiphytically. Most abundant genera were *Navicula*, *Gomphonema*, and *Melosira*.

A quantitative study of associated algae was made by the following method. Sections one centimeter long were taken from roughly cylindrical bundles of thalli with a diameter of one centimeter and placed in a test tube containing 10 ml. of 4% formaldehyde. The tubes were shaken gently and allowed to stand for a day. One ml. of the liquid was examined in a Sedgewick-Rafter counting cell and results were computed for the original sample taken.

Great variation was found in the number of forms. In 12 collections made at the effluent from Lake Dallas the count varied from 750 to 73,200, with an average of 19,013 organisms per sample.

CONCLUSIONS

(1) High selectivity of habitat was found for *Cladophora glomerata*. Except for two artificial habitats at Lake Dallas and Carrollton Dam, it was found only in the limestone-bedded streams of the Austin Chalk in the Dallas area. It occurred abundantly only in shallow, rapid water with rocky substrate or exposed bedrock, and showed definite preference for zones of high aeration and maximum light intensity.

(2) The species showed definite seasonal variation, being most abundant during the colder months and disappearing during the summer months. Since it prefers maximum light intensity, its disappearance in summer indicates lack of tolerance to higher temperatures (75 degrees F. and above in this area). Persistence of the species during summer only at the entrance of cool water from Lake Dallas substantiates this view.

(3) A great number of algal forms (at least 16 genera) were found in free-floating association with *Cladophora glomerata*.