1983

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light attenuation as new data become available on particle size, density and turbidity in the St. Lucie Inlet and surrounding coastal waters.

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Florida Sci. 46(3/4):145-150. 1983.

Academy Symposium

THE OCCURRENCE OF A TOXIC DINOFLAGELLATE IN THE INDIAN RIVER SYSTEM

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Abstract: *References to the toxic dinoflagellate,* Gonyaulax monilata *Howell, in the Indian and Banana rivers are compiled from published and unpublished sources. The inability of researchers to find motile cells for extended periods indicates that benthic resting cysts or hypnozygotes may be the only source for the seed population.*

Gonyaulax monilata Howell was originally described from red tides in the Banana and Indian rivers in 1951 (Howell, 1953). Howell reported that water discoloration was caused by large numbers of dinoflagellates, but no great quantity of fish were killed. *G. monilata* was taken "from all stations in the Indian and Banana Rivers" but no reference was given for specific station locations. Although there have been numerous "red tides" and fish kills in this lagoonal system over the last 30 yr, there is no published record of *G. monilata* presence. I compiled the references to this species which to date

were only in laboratory notes (C. Down, Brevard County Health Department, B.C.H.D.) or in theses (Modert, 1977; Trees, 1977; Donnelly, 1980) from Florida Institute of Technology, in addition to the paper by Howell (1953). Additional comment is made regarding the absence of this species in the estuary.

TABLE 1. Occurrence of motile *Gonyaulax monilata* in the Indian River lagoon system.

Date	Location, Comment and Source	Cells/Liter	Dissolved Oxygen (ppm)	Temp. (°C)	Sal. (‰)
Aug-Sept 1951	"Indian & Banana Rivers: (discolored water, minor fish kill). Howell, 1953	"Large Nos."	-	30-34	18-32
12 July 1977	Between Eau Gallie & Melbourne Causeways (No fish kill). Trees, 1977	8.9×10^5	-	31.5-32	32.0
27 July 1977	Melbourne Beach Pier (no fish kill). Modert, 1977	1.7×10^6*	6.0	29.5	30.5
9 Sept 1977	W-Side of I.R., Port St. John (1000's dead fish) B.C.H.D. (unpubl.)	"Bloom"	"Depleted"	-	-
6 Sept 1979	Scattered from Horse Cr. to Fisherman Point (no fish kill) Donnelly, 1980	$< 1.0 \times 10^3$	4.8-7.6	24.5-30.0	16-21

*Conservative estimate from 4 cells/chain.

Table 1 is a compilation of the published and unpublished references to *G. monilata* in the Banana and Indian rivers along with the available hydrographic data and maximum cell concentrations. Except for the station at Port St. John and the unidentified stations of Howell (1953), the locations of these records are indicated in Fig. 1. The only specific reference to fish kills were by Howell and by B.C.H.D.; however, there is not sufficient evidence to implicate *G. monilata* as the direct cause of death. The fish kill could have been due to oxygen depletion. *G. monilata* has also been associated with fish kills along Florida's west coast (Williams and Ingle, 1972), in Pensacola and Mobile bays (Perry et al., 1979) and the Galveston, Texas area (Wardle et al., 1975).

Interestingly, *G. monilata* blooms have had mixed effects in regards to fish kills. For example, Wardle et al. (1975) reported unusual numbers of dead and moribund marine organisms on Galveston Beach associated with a *G. monilata* bloom (1.88×10^6 cells $\cdot l^{-1}$, 31°C, 33‰), while no mortalities were reported by Perry et al. (1979) for Mississippi Sound (1.65×10^7 cells $\cdot l^{-1}$, 30.0-30.8°C, 24-26‰). Both blooms occurred in open waters,

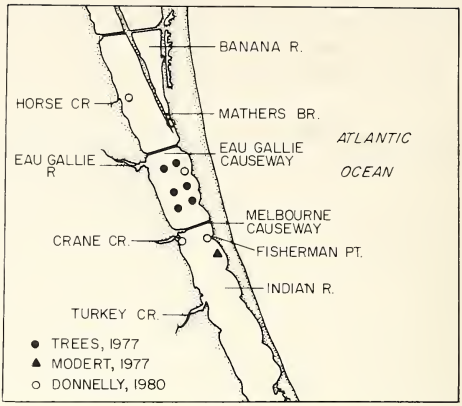

FIG. 1. Distribution of motile *Gonyaulax monilata* cells near Melbourne, Florida.

unlike the lagoonal system of the Indian River. The concentration of *G. monilata* cells (Table 1) reported by Modert (1977) would appear to be sufficient to cause a fish kill though none was reported.

After nearly a year of sampling without collecting any motile cells of *G. monilata*, Donnelly (1980) found low concentrations (Table 1) following the passage of hurricane David in early September 1979. In a 6-mo. study in the same area, David (1978) also did not find motile *G. monilata* cells. This apparent lack of motile cells for months (if not years) supports the belief that benthic resting cysts or hypnozygotes described by Walker and Steidinger (1979) are the only source for the seed population of *G. monilata* blooms in the Indian River lagoon system (Owen and Norris, 1982). Walker and Steidinger (1979) proposed that cysts in Florida waters act as seed beds to initiate *G. monilata* blooms.

The contribution and concern of the late Cherie Down for the Indian River are appreciated as are the efforts of P. J. Donnelly, C. W. Modert, and C. C. Trees. Mary Ann Nelson drafted the figure and Thelma Coughlin typed the manuscript.

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Florida Sci. 46(3/4):150-153. 1983.

Academy Symposium

SEDIMENT IN SEAGRASSES NEAR LINK PORT, INDIAN RIVER, FLORIDA

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Abstract: *Grain size analyses have been made for 34 samples of the upper 5 cm of sediment cores from seagrass beds. Sieves were used for gravel and sand; the SEDIGRAPH was used for silt and clay.* Thalassia *(13 samples),* Halodule *(3),* Syringodium *(3) and bare sand areas (15) within seagrass beds were sampled in the summers of 1979 and 1980. Generally, these sediments are sands, with small admixtures of gravel, silt and clay. The average particle size is about 0.25 mm with grain size modes at 0.3 and 0.1 mm. These sediments are poorly sorted (large standard deviation), positively skewed (excess fine particles) and are leptokurtic (excessive peakedness). Sand content is greater than 90% by weight, and is mostly quartz. Gravel consists of carbonate shells and shell fragments. Mineralogy of the silt fraction is not known, and the clay is judged to be mostly kaolinite from crystal shapes seen in transmission electron microscopy. Comparison of sediment from different species of seagrasses to bare sand areas reveals little difference in terms of grain size characteristics. There are no data available to document seasonal differences. There is a significantly higher content of silt ($\bar{X}$ = 1.33%) in* Thalassia *sediments than in nearby sandy areas ($\bar{X}$ = 1.01%). Comparison of silt grain size data (62.5 to 3.9 μm) shows that the most abundant particle sizes present in* Thalassia *sediment are between 15-30 μm. Particle size distribution of silt in nearby sandy areas shows less concentration in this range. Preliminary results from late summer sediment trap measurements give a particle flux of 10-20 g m^{-2} day^{-1} during ordinary weather, which doubled during passage of storm DENNIS. It is not known how much of this flux has come from local resuspension of sediment particles.*