

Figure 2. Temporal changes in mean shell height and dry weight of soft tissues of small and large oyster cohorts held at 2 stocking densities in Oyster Bay, NY. Error bars as in Fig. 1 (pooled data from 2 replicate experimental groups, n for samples collected through July 11 = 46-50; n for remaining samples = 94100). Asterisks indicate dates when significant ($p < 0.05$) differences were observed between density treatments.

The "late cohort," which was the last cohort produced at the Flower Co. in 1991, suffered heavy mortalities 2 to 3 weeks later than the main experimental groups. Cumulative losses increased from 7-13% on August 9 to 75% on August 23, a period during which temperatures remained constant at about 23°C.

On July 4, live, gaping and dead oysters from non-experimental groups, which were experiencing heavy mortalities at the growout site, were examined microscopically for the presence of predatory flatworms, *Stylochus* sp. These were not observed in any of the samples, and thus were eliminated as a potential cause of oyster mortalities. These results were independently corroborated by M. Castagna, who examined live oysters at this site on July 9 (VIMS, pers. comm.). Mud blisters were commonly observed in shells of September 20 samples, and were prevalent in October 3 samples from both cohorts, but were not observed on earlier sampling dates.

Phytoplankton

Analysis of phytoplankton samples revealed that a bloom of the unarmored dinoflagellate *Gymnodinium sanguineum* (cell length 43 to 50 μm , width 31 to 43 μm) occurred in July, at the time when the two main experimental cohorts suffered high mortalities, and again in September. Cell densities of *G. sanguineum* peaked

at 5.1×10^5 cells l^{-1} on July 20, declined rapidly by July 26 and remained at relatively high levels, 5.0 to 7.1×10^5 cells l^{-1} , throughout early August (Fig. 3). Cell densities of this species peaked again at 3.5×10^5 cells l^{-1} on September 20, when the small and large cohorts had attained 52.9 and 58.4 mm in shell height respectively. The dominant diatom species was *Skeletonema costatum*, and flagellates were mostly composed of cryptomonads (Fig. 3). During the bloom period, *G. sanguineum* was not necessarily the numerically dominant phytoplankton species. However, if we consider the size difference between a *G. sanguineum* cell and a *S. costatum* cell (5 to 8 μm), the former species was definitively the major contributor of phytoplankton biomass. Starting on July 20, a certain percentage of *G. sanguineum* cells observed were partially degraded or covered by fungus-like hairs. The cell counts reported were determined from surface water samples, and may not be representative of the entire water column, since *Gymnodinium* spp. are motile and positively phototactic, and may not be homogeneously distributed in depth even in shallow estuaries (Fiedler 1982, Chang and Carpenter 1985).

Growth Patterns

Differences in mean height or soft tissue weight between replicates at each sampling date were tested using paired t-tests, ad-

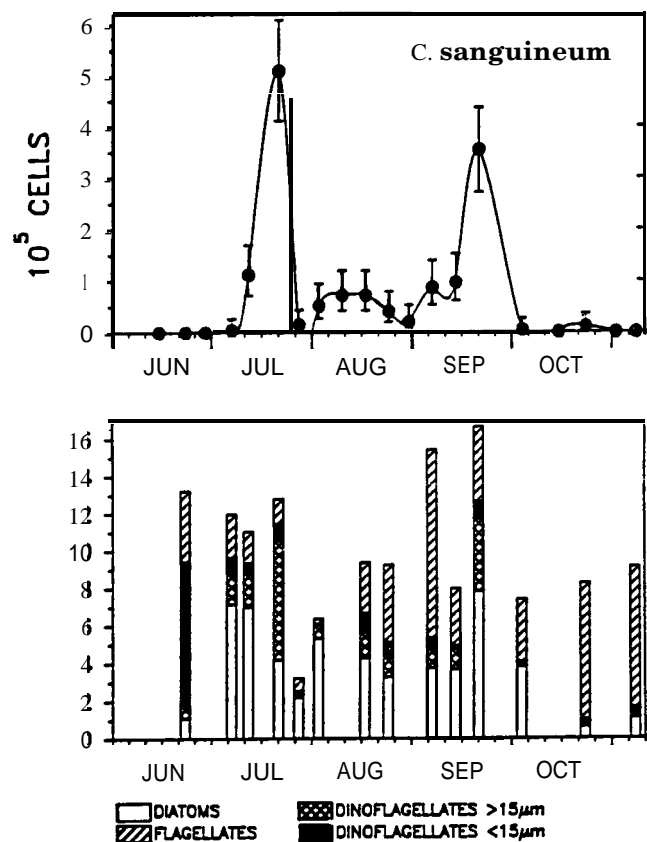


Figure 3. Phytoplankton composition in Oyster Bay surface water samples during the study period. Top graph: population density (mean and 95% confidence interval) of the dinoflagellate *Gymnodinium sanguineum*. Lower graph: abundance of various phytoplankton groups [*G. sanguineum* is included in the large dinoflagellate (> 15 μm) group].