

31

DARLEY, W. MARSHALL and DAVID E. WHITNEY. University of Georgia, Athens and Marine Institute, Sapelo Island. - Benthic algal productivity in a Georgia salt marsh.

The productivity of the edaphic algal community in the salt marshes near Sapelo Island, Georgia, is being measured under low tide conditions with  $^{14}\text{C}$ . Intact sediment cores are incubated with  $^{14}\text{CO}_2$  in a controlled environment chamber, exposed to HCl fumes and dried. The fixed carbon is then oxidized to  $\text{CO}_2$ , which is recovered in ethanolamine and counted by liquid scintillation. This procedure allows for a great deal of experimental versatility especially with respect to light intensity and temperature. Measured photosynthetic rates vary from less than 20 to more than 200  $\text{mgC/m}^2/\text{hr}$ . There is no evidence of significant inhibition of productivity at light intensities up to full sunlight or by the ultraviolet component of sunlight. Significant differences in photosynthetic rates have been correlated with tidal migratory rhythms of the community. Excretion of organic carbon by the community is generally less than 3% of total carbon fixed.

32

Brinkhuis, B.H. State University of New York, Stony Brook. - Seasonal variations in macroalgae productivity in a temperate salt marsh.

Photosynthesis experiments in water of *Ascophyllum*, *Fucus*, and *Ulva* were investigated at various times in the laboratory during a 15 month study. Photosynthetic response patterns of these algal species exhibited interspecific differences but generally exhibited the greatest photosynthetic potential during the spring months and minimal potential during the late summer and winter months. Interspecific differences in photosynthetic response to light intensity at different times of the year were also noted. Variations in photosynthetic potential measured in the laboratory were correlated with variations in standing crop biomass measured in the field. Productivity on a square meter basis was predicted for these three algae in the marsh by a simulation model incorporating photosynthesis data, *in situ* light intensity and biomass data. Results of this model indicated that these three species account for a macroalgal productivity of 325  $\text{g C/m}^2/\text{year}$ . Daily productivity ( $\text{g C/m}^2/\text{da}$ ) obtained from this model correlated well with productivity calculated from *in situ* growth measurements but was considerably greater than that calculated from biomass changes in the field. A considerable turnover of algal biomass occurred in relatively short periods of time.

33

YARISH, CHARLES and PETER EDWARDS. Department of Botany, Rutgers University, New Brunswick, New Jersey. - The effects of environmental factors on the growth and reproduction of two estuarine red algae from New Jersey.

Growth and reproduction of 2 species of estuarine Rhodophyta, *Caloglossa leprariei* (Montagne) J. Agardh and *Bostrychia radicans* Montagne, were examined periodically through a full year along a salinity gradient in the Great Bay Estuary System, New Jersey. Populations of mature *Bostrychia* plants reach a maximum at the mouth of the estuary and populations of *Caloglossa* reach a maximum further up the Mullica River. These warm water eurythermal species have optimal growth and reproduction at 24 to 29 C and exhibit little or no growth below 17 C or above 30 C. Both species are euryhaline with optimal growth and reproduction for *Caloglossa* occurring at 15‰ and for *Bostrychia* at 25‰. Four day old cultures of tetraspore germlings of *Caloglossa* and *Bostrychia* obtained maximum growth at 200 and 400 ppm potassium respectively, at the optimal salinity. Growth remained the same up to 500 ppm potassium for both. These studies also indicate that calcium is essential for appreciable growth of both species over a broad range of salinities (5-35‰). The local distribution and abundance of both species can be accounted for by their responses to salinity, temperature, potassium and calcium levels.

34

MURRAY, STEVEN N. AND MARK M. LITTLER. California State University, Fullerton and University of California, Irvine. An experimental analysis of sewage-impact on a macrophyte-dominated rocky intertidal community.

A previous study (Littler and Murray, 1975; Marine Biology, 30, 277-291) of the effects of a low-volume domestic sewage outfall near Wilson Cove, San Clemente Island, California revealed quantitative differences in the distribution, abundance and community structure of rocky intertidal macro-organisms. Cover in the mid-intertidal zone of the sewage-affected area was dominated by taxa (e.g., blue-green algae, *Gelidium pusillum*, *Ulva californica*) commonly considered to be among the first organisms to colonize freshly denuded intertidal surfaces. These data led to the development of the hypothesis that an early disclimax successional stage was being maintained near the site of sewage discharge. The hypothesis was tested by determining for both sewage-affected and "unpolluted" areas, the patterns of community development in the mid-intertidal zone. The composition of successional stages was compared with standing-stock data obtained from undisturbed control plots in order to determine the time of recovery. A minimum of four 0.15m<sup>2</sup> surfaces were manually cleared of biota and burned until sterile with portable propane torches in both sewage-affected and "unpolluted" areas. Abundances of macro-epibiota for all plots were determined by a photogrammetric method described in the previous study. The results supported the hypothesis. Organisms characteristic of the outfall

area (blue-green algae, *Ulva californica*, *Pseudolithoderma nigra* and a brown, filamentous assemblage including *Ectocarpus confervoides* var. *parvus* and epiphytic diatoms) dominated the early successional stages of experimental plots. Sewage-affected surfaces had essentially recovered after six weeks, while community development was still proceeding towards equilibrium in the "unpolluted" area after one year.

## 35

LITTLER, MARK M. and STEVEN N. MURRAY. University of California, Irvine and California State University Fullerton. - Seasonal Variations in Primary Productivity of Seaweeds with Different Morphological Forms  
Seasonal production rates were determined in the field by the oxygen electrode technique for the dominant producers on leeward San Clemente Island, Southern California. The forms with highest thallus surface area/volume ratios were more productive than other forms. Community productivity varied over the year as a result of specific populational fluctuations. There was no correlation between the productivity rates and the divisional status of the algal species measured in this study.

## 36

JOSSelyn, MICHAEL N. University of New Hampshire, Durham. - Field studies on the ecology of *Laurencia poitei* (Ceramiales) in a subtropical lagoon.

Seasonal changes in standing crop and growth rates were studied for *Laurencia poitei*, a filamentous alga which forms large unattached mats in coastal lagoons. During a year long study at twelve field stations established in Card Sound, Florida, quarterly surveys of the standing crop were made in conjunction with biweekly growth rate measurements of plants placed within enclosures. The algal standing crop increased gradually from late September through March and then declined during the summer months. The abundance of *Laurencia* was largely dependent upon seasonal changes in water circulation within the Sound. At stations with a depth greater than 3 m, growth rates during the late fall and spring months averaged 2 to 5 % increase in dry weight per day and during other seasons showed a 0 to 2 % growth rate. The periods of optimal growth corresponded with temperatures between 23 and 26 °C and subsurface light intensities of 275 to 325 langley's per day. At water temperatures above 30 °C, little or no growth was observed. Fragmentation, the only means of reproduction found, was greatest during periods of unfavorable growth conditions, but losses did not exceed 0.5 % of the total plant weight per day. Some fragments form secondary holdfasts and become attached to *Thalassia* blades or other exposed surfaces. A comparison is made with seasonal patterns in growth rates for other sublittoral macrophytes in Card Sound.

## 37

HANISAK, M. D. University of Rhode Island, Kingston. Field Studies of *Codium fragile* in Rhode Island Coastal Waters.

Since *Codium fragile* subsp. *tomentosoides* was first reported from Rhode Island in 1962, it has rapidly colonized local coastal waters and has become a dominant subtidal seaweed. As part of a combined laboratory-field study on the physiological ecology of this organism, three stations were established to observe natural populations of *Codium*. Growth began in late spring and increased to a maximum during late summer. Little, if any, growth occurred from late fall to late spring. Production of zoospores and C:N ratios show similar seasonal patterns. Temperature, light intensity, salinity, phosphate and various nitrogen sources were examined to determine their correlation with growth. Productivity was calculated by harvesting meter-square quadrats. The maximum net productivity was 1.77 g dry weight/m<sup>2</sup>/day.

## 38

MATHIESON, ARTHUR C., ELEANOR TVETER, MAUREEN DALY, and JOHN HOWARD. Jackson Estuarine Laboratory, University of New Hampshire. - Marine algal ecology in a New Hampshire tidal rapid.

The species composition and abundance of the benthic organisms at the Piscataqua River tidal rapid show pronounced spatial variations, depending upon the current regimes and substrate. Few benthic plants and animals are present on vertical promontories that are exposed to strong tidal currents (40 - 80 cm/sec) and pronounced shearing effects, while adjacent "back-eddy" areas with sloping substrate show a more diverse flora and fauna. A comparison of the zonation and differential tolerances to water motion of the major intertidal organisms is summarized. *Ascophyllum nodosum* was the most sensitive species to strong tidal current; it showed a conspicuous suppression of its lower distributional limits and a reduced stature in exposed habitats. In contrast, the furoid alga *Fucus vesiculosus* var. *spiralis*, the gigartinean red algae *Chondrus crispus* and *Gigartina stellata* and the barnacle *Balanus balanoides* were more tolerant to tidal currents. The algal flora at the study site is "open coastal" in character, particularly within the subtidal zone. A mixture of organisms occurs within the Piscataqua River tidal rapid. That is, organisms in the upper shore, such as *A. nodosum*, are more typical of sheltered conditions, while those on the lower shore are robust "open coastal" species such as *Laminaria digitata*.

## 39

PFIESTER, LOIS A. University of Oklahoma, Norman. - Sexual reproduction of *Peridinium gatunense* Nygaard.

*Peridinium gatunense*, isolated from a small farm pond in Norman, Oklahoma has been cultured under 4,000 lux in Carefoot's medium (1968) on a 12 hr light-12 hr dark cycle at 20C. Sexual reproduction was induced by inoculating exponentially growing cells into nitrogen-deficient medium. Under these conditions small, thecate cells, similar in appearance to vegetative cells, act as gametes fusing during the dark phase of the cycle. Zygotes resulting from the