HARVEST AND REGROWTH OF TURTLE GRASS (*THALASSIA TESTUDINUM*) IN TAMPA BAY, FLORIDA[1]

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ABSTRACT

A comparison of leaf growth and new leaf production in plots of cut and uncut turtle grass, *Thalassia testudinum*, indicated that plants suffered no damage when harvested twice during a 6-month growing season in Boca Ciega Bay (Tampa Bay), Fla. In deeper or warmer waters where the growing season is protracted, three or more cuttings per year may prove practical.

One of the environmental catastrophes to occur in the past 30 years is the destruction of vast beds of turtle grass through dredge-fill operations, other types of coastal engineering, and pollution in its many forms (McNulty, 1961; Taylor and Saloman, 1968; McNulty, Lindall, and Sykes, in press). The most recent development that may affect turtle grass is the possibility of its harvest for use as a food supplement for livestock.

Interest in the nutrient content of turtle grass was first stimulated by Burkholder, Burkholder, and Rivero (1959), who showed that turtle grass leaves contain about 13% protein. Their analysis was substantiated by Bauersfeld et al. (1969), who further found that turtle grass in pellet form significantly increased the weight gain and feed utilization of experimental sheep over that of control animals when added to normal rations as a replacement for alfalfa at a level of about 10%. One of the many questions raised by the success of these feeding trials is whether or not beds of turtle grass can survive and regrow after harvest. This report presents results of a study in which leaves in an experimental plot of turtle grass were repeatedly cut, measured, and compared with those taken from a control area between August 1968 and November 1969.

In the Gulf of Mexico and Caribbean Sea, the dominant sea grass is turtle grass, *Thalassia testudinum* Koenig and Sims. Generally, it flourishes in estuaries and coastal waters from the level of low water to depths of 10 m or more depending on water clarity. Throughout its range in the central, western Atlantic, turtle grass meadows attain maximum development in muddy sands where average salinity is between 25 and 39‰ (Phillips, 1960; Hartog, 1970). Morphological features of turtle grass have been reported by Tomlinson and Vargo (1966) and Tomlinson (1969a, b), who showed that new grass beds are established from seeds, which mature during spring and summer months, or vegetatively by rhizome fragments that are broken off and relocated by storm action and currents. Kelly, Fuss, and Hall (1971) demonstrated that the normally slow and uncertain spread of turtle grass can be accelerated by transplanting and securing sprigs treated with naphthelene acetic acid. This procedure may prove useful in establishing and replacing turtle grass in unvegetated areas—especially through the northern part of its range where apparently there is little or no seed production (Phillips, 1960).

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Ecologists have shown that the turtle grass community exhibits great biological diversity and forms the basis of an extremely stable and productive ecosystem (Margelef, 1962; Odum, 1967). Its roots and rhizomes penetrate the bottom down to 25 cm or more in a matlike network that effectively binds and holds sediments and detritus against erosion, and provides a unique habitat for many benthic invertebrates (Bernatowicz, 1952; Voss and Voss, 1955; Ginsburg and Lowenstam, 1958; Phillips, 1960; Strawn, 1961; Thomas, Moore, and Work, 1961; O'Gower and Wacasey, 1967; Hartog, 1970). The broad, elongate leaves of turtle grass have a surface area of about 18 m^2 for each square meter of sediment they occupy, and usually represent a standing crop in excess of 1 metric ton (dry weight) per acre (Phillips, 1960; Gessner, 1971). Furthermore, leaves of turtle grass moderate water movements, offer attachment sites for various algae and sessile invertebrates, and serve as a feeding ground, shelter, and nesting area for many fishes and motile invertebrates (Humm, 1964; Stephens, 1966). The rich microbial biota that reduces and recycles much of the organic production from turtle grass beds has been recently described by Fenchel (1970).

PROCEDURE

Turtle grass leaves were harvested in August and October 1968 and in July and September 1969. The cutting was done within a 30 m^2 experimental plot in lower Boca Ciega Bay (Tampa Bay), Fla., where the standing crop of turtle grass on a dry, whole weight basis was 1,198 g/m^2 (Taylor and Saloman, 1968). The harvesting machine was designed and constructed by personnel at the Fisheries Service laboratory in College Park, Md., and consisted of an adjustable, motor-driven sickle bar mounted on a small, styrofoam barge. The cutting head was set about 10 cm above the bay bottom, and the barge was directed by hand as water depth was little more than 1 m at high tide.

Between harvests, weekly samples of at least 100 leaves were picked from plants dug by shovel within the experimental plot and from uncut plants that served as controls in the surrounding area. The point of leaf removal was at the leaf node. Leaf length was measured from both sample sets, and as an additional measurement of plant vigor, the number of new shoots per leaf cluster was also recorded from each set.

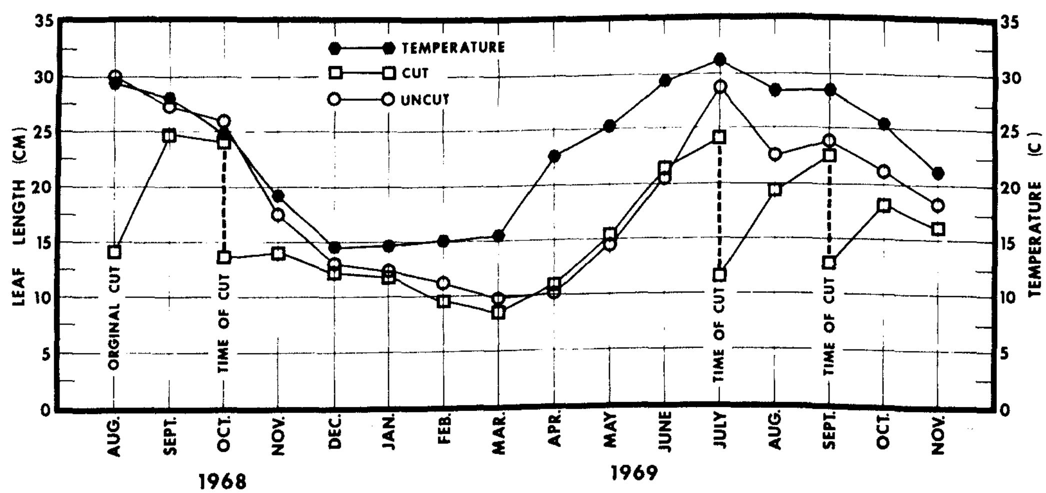

FIGURE 1.—Average monthly length of turtle grass leaves from cut and uncut plants, and related water temperatures in Boca Ciega Bay (Tampa Bay), Fla., between August 1968 and November 1969.

LEAF GROWTH AND REGROWTH AFTER HARVEST

Growth of turtle grass foliage and ultimate leaf length are largely controlled by water temperature and depth (Phillips, 1960; Strawn, 1961). In Tampa Bay, turtle grass normally exhibits a seasonal growth cycle in which leaves elongate rapidly from April to July and die back to short stubble between October and March. During the period of maximum leaf growth, blades develop at a rate of 5 cm per month or more and reach a total length of about 30 cm (Figure 1). Leaves harvested in the growing season had an equivalent or greater rate of regrowth and reached the height of uncut plants in about 2 months (Figure 1). Observed growth rates of both cut and uncut leaves were comparable to figures previously reported from southern Florida by Thomas et al. (1961) and Zieman (1968). Furthermore, harvesting had no apparent influence on production of new leaves. For each month, the average number of shoots produced by both cut and uncut plants was nearly the same (Figure 2).

Thus, from a comparison of leaf growth and new leaf production among cut and uncut plants, it seems likely that turtle grass in the Tampa Bay area can be harvested twice each year without adversely influencing plant vigor.

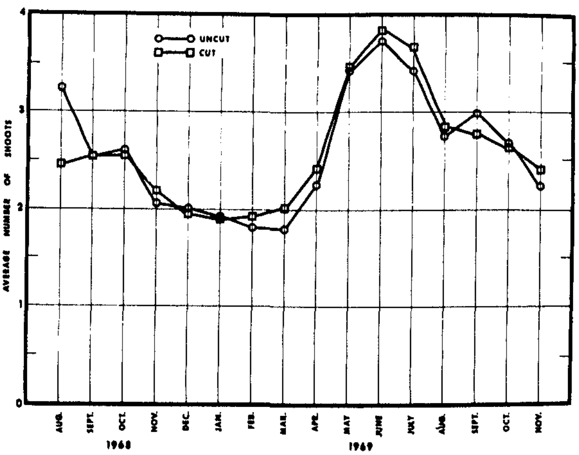

FIGURE 2.—Average monthly number of new shoots per leaf cluster for cut and uncut turtle grass plants sampled in Boca Ciega Bay (Tampa Bay), Fla., between August 1968 and November 1969.

DISCUSSION

Our findings show that turtle grass beds can sustain periodic cutting without apparent damage at intervals of about 2 months in the growing season. In deeper or warmer waters of the Gulf and Caribbean where turtle grass has a longer growing season, it may be practical to harvest leaves more than twice per year. Inherent, technical problems presented by offshore harvesting would probably be offset by the fact that turtle grass in deep water generally has longer leaves and greater biomass than plants growing in shallow areas (Burkholder et al., 1959; Phillips, 1960).

Offshore along the west coast of Florida estimates show that turtle grass grows over about 4 million acres of the sea floor, and in the Caribbean, turtle grass resources are even greater. Thus, the tonnage of turtle grass available for harvest is very large (Bauersfeld et al., 1969). However, from the standpoint of resource management, there are a number of questions that must be resolved before the harvest of turtle grass can be seriously considered by commercial enterprises. Principal queries include: (1) can turtle grass leaves regrow normally after more than two seasons of harvesting; (2) how are other plant and animal members of the turtle grass community influenced by harvesting operations; (3) what would be the consequences of removing vast amounts of primary production from the food webs in coastal waters; (4) would removal of foliage cause serious erosion of sediments in and around turtle grass beds; and (5) how would harvesting methods alter water clarity, and thereby influence populations of phytoplankton and pelagic fishes, and water recreation?

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