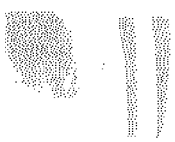
A Guide to the Sea Grasses of Florida, the Gulf of Mexico, and the Caribbean Region.

Roger Hanlon
Gilbert Voss

Photographs by Roger Hanlon
Drawings by Susan Suarez



UNIVERSITY OF MIAMI SEA GRANT PROGRAM

Sea Grant Field Guide Series
Number 4
July, 1975

Sea Grant Field Guide Series

Guide to the Sea Grasses of Florida, the Gulf of Mexico and the Caribbean Region.

Roger Hanlon
Gilbert Voss

Photographs by Roger Hanlon
Drawings by Susan Suarez

University of Miami Sea Grant Program (NOAA Sea Grant No. 04-5-158-14)
Miami, Florida 1975

Miami's Sea Grant Program is a part of the National Sea
which is administered by the National Oceanic and
inistration of the U.S. Department of Commerce.

ss Card Catalog Number: 75-19512

mi Sea Grant Program

rida 33124

Foreword

The University of Miami Sea Grant Field Guide Series is published to make available to the commercial and sports fishermen, the general public, and fisheries and conservation personnel easily usable, non-technical, well-illustrated guides for the identification of the marine life of the area. Every means has been used to avoid technical terms where possible. When these must be used to avoid confusion, they are carefully explained and often illustrated. Glossaries are included when necessary.

But the guides go further than just identification. Where such knowledge is available, information is given on geographical distribution, depth distribution, abundance, time of spawning, present utilization, means of harvesting, and mariculture methods, besides other useful information.

The format is uniform in the series for greater ease of use. Actual photographs are used where possible but when greater clarity is required, drawings are used. In general we have attempted to illustrate each species, but, in cases where two or more species are very similar, this is noted, a single illustration is used, and distinguishing characters are given in the text.

The principle used in selection of species has been not whether the species are now commercially exploited, but whether the animal or plant is of sufficient size and occurs in large enough numbers to make it potentially capable of exploitation. In some cases, species are included that are known to be harmful or poisonous. This is done to draw attention to their presence and to avoid their mistaken use as food.

The Sea Grant office, University of Miami, will appreciate comments from users of this series for the betterment of the guides, for the inclusion in future printings of species possibly overlooked by the compilers, and especially for suggestions concerning other groups of organisms for which guides are desired. Your comments are solicited.

To Users of the Guide Series

The purpose of field guides is to make possible identification of animals or plants in the field without the need for other reference works, dictionaries, microscopes, or dissecting equipment. Most field guides fall short of these objectives mainly because of the use of unexplained technical terms and references to characters not discernible to the naked eye.

In this guide we have attempted to use terms in general use; where a technical word is necessary, it is explained at its first use and is illustrated in the introduction. Characters are used that are visible to anyone having normal vision, or in special cases, by use of a simple hand lens or magnifying glass.

We suggest that users first read the introduction in order to find the scope of the guide-area covered, kind of species included, characters used, and to familiarize themselves with the words used in the descriptions and keys.

There are two ways to use this guide. One is to simply thumb through the pages looking at the illustrations until one is found that matches the specimen in front of the reader. When this or a series of species illustrations is found, the descriptions should then be read in search of further identifying remarks paying attention to the notes on distribution, depth of capture, and type of bottom. If all of these fit reasonably well, it is likely that your specimen belongs to that species.

The second method is to use the key first, and when a reasonable match is found, turn to the page number given in the key and follow the procedure as described in the paragraph above. In using the key, one must be aware that species not covered in this guide may apparently be identified by the key. This is why it is essential that, when a specimen is identified by the key, the illustrations and descriptions must be used also. If the name given in the key does not correspond to the species illustration and description, either your use of the key was wrong and another alternative is correct or the species is not considered to be potentially valuable and is not included in this guide. If key, illustration, and description agree, you may reasonably expect that your identification is correct.

When using the keys, always be sure to read both alternatives and choose the one most fitting your specimen before going to the next set of choices. In closely related species, each choice will be somewhat fitting to your specimen, but only one will fit it correctly.

Finally, do not expect your specimen to be exactly like the illustration, especially as to position of bands, ridges, shape, and other characteristics. No two human beings are exactly alike; marine species have similar ranges of differences between individuals.

If at last you are unable to identify your specimen from this guide, but you are certain that it belongs to the group included in it, your final recourse is to bring or send it to a specialist for identification.

Frederick M. Bayer

Gilbert L. Voss

Guide to the

Sea Grasses

of

Florida, the Gulf of Mexico

and the Caribbean Region

Table of Contents

Foreword 3

To Users of the Guide Series 4

Introduction 8

Key for Identification 10

The Sea Grasses 12

Selected Bibliography 29

Introduction

This manual is a field guide to the sea grasses of Florida, the Gulf of Mexico, and the Caribbean Sea. The sea grasses are marine angiosperms, which are the flowering plants occuring in the marine environment. They cover large areas of the world's shallow coastal bottoms, and form communities of the sea grass itself, associated epiphytes, and a large assemblage of animal life. More species of marine flowering plants are found in the Gulf of Mexico and Caribbean Sea than anywhere else in the Western Hemisphere (Thorne, 1954). They include the turtle grass, Thalassia testudinum; shoal grass, Halodule wrightii; manatee grass, Syringodium filiforme; widgeon grass, Ruppia maritima; and Halophila baillonis and Halophila engelmanni. A seventh species, the eel grass, Zostera marina, is included in order to distinguish it from the native species; however, it is a temperate species occurring as far south as North Carolina with a few records of occurrence in Florida (den Hartog, 1970). It should not be confused with turtle grass or shoal grass and the distinguishing characters of each are given in the text.

The important roles played by sea grasses in shallow coastal waters are only recently being recognized and appreciated. Sea grasses spread vegetatively by the production of long runners or rhizomes, in some cases on the surface of the substrate and, in others, below it. These rhizomes produce roots which may penetrate deep into the bottom and leaves which form marine meadows. Both roots and leaves usually arise from nodes, joint-like swellings at intervals along the rhizomes. The rhizomes and roots form dense networks in the substrate which effectually bind the bottom muds and sands together and thus prohibit or greatly reduce erosion from waves or tidal currents. The leaves trap sediments and detritus and greatly increase the amount of surface available for the attachment of sessile plants and animals. The leaves support an amazing diversity. Humm (1964) cited 113 species of algae living as epiphytes* on turtle grass and Moore (personal communication) found as many as 25,000 minute mollusks of a single species in one square yard of the same grass in Biscayne Bay. The leaves themselves, the attached animals and plants, and the detrital material afford refuge and provide a natural nursery ground for innumerable important commercial and sport fish and invertebrates including pompano, snapper, snook, shrimp, spiny lobster, and many others. So great is the importance of these grasses to the welfare of the fisheries that, in many areas, the turtle grass beds are now being protected from destruction by waterfront developers and dredgers.

---

* epiphyte, a plant growing on another plant but deriving no nutrition from it.

Wetzel (1964) and Jones (1968) found that the benthic plants normally contribute more to inshore productivity than do the planktonic plants. Odum (1957); Odum, Burkholder, and Rivero (1959), Phillips (1960), and Jones (1968) have demonstrated the high productivity of the sea grass habitat and the prominent role of the grass itself. Few animals feed directly upon marine grasses, the more important ones being sea turtles, manatees, a few fishes, and certain sea urchins.

With the destruction of sea grass communities by thermal pollution, dredging, and other causes, scientists have turned to the possibility of replanting devastated areas either by transplanting or seeding. Thorhaug (1974) has demonstrated the feasibility of both methods, particularly the latter, and large scale restoration of new or denuded areas is now only a matter of time and money.

Key for Identification

1. Leaves long, flat, ribbon-like (Key Fig. 1) 2
1. Leaves long and round in cross-section (Key Fig. 2), or short, flat, and widest at or near the middle (Key Fig. 3) 5

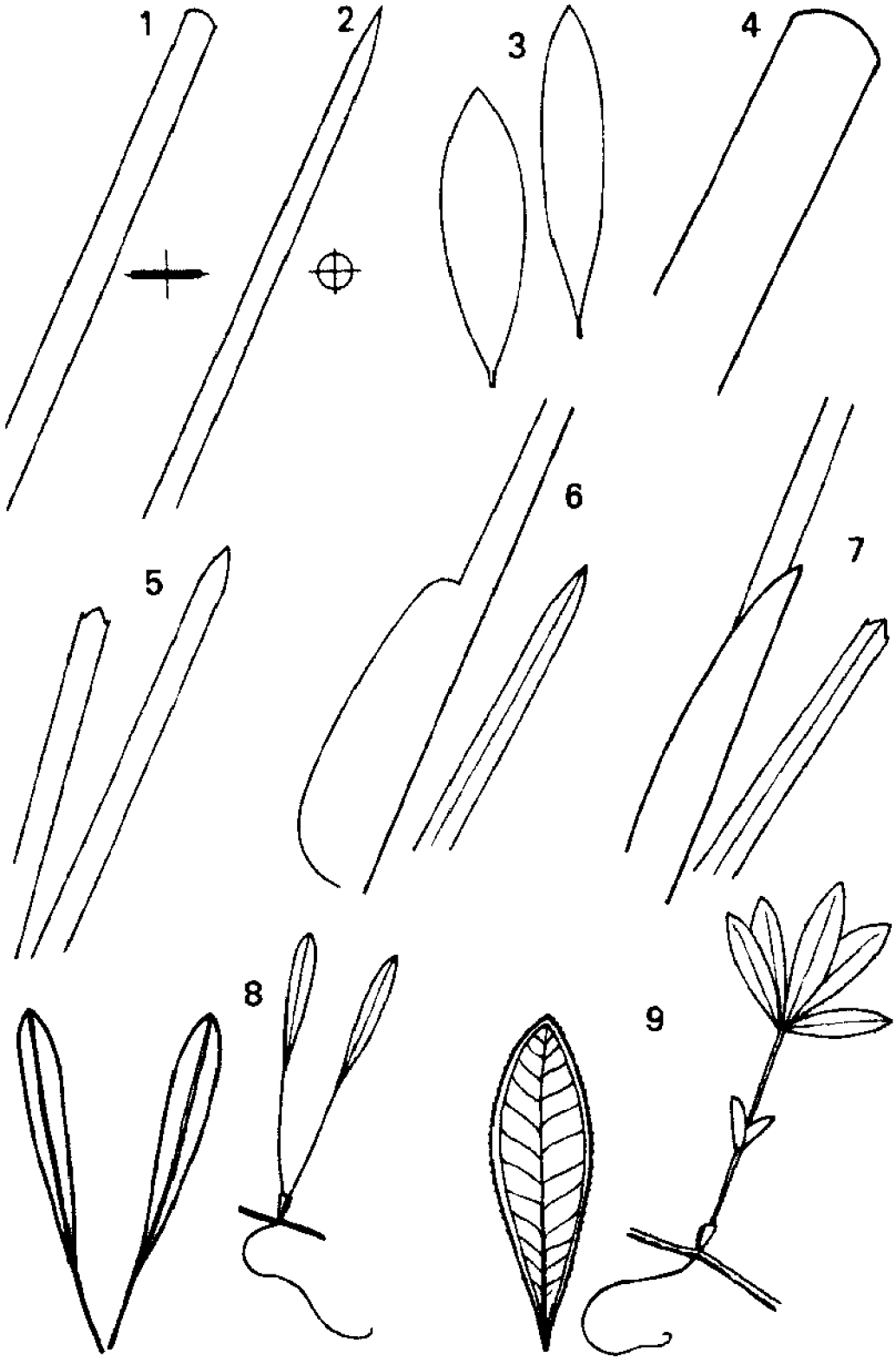
2. Leaves 3/16" to 1/2" wide, tips blunt (Key Fig. 4) 3
2. Leaves under 3/16" wide, tip with 1 to 3 points (Key Fig. 5) 4

3. Leaves 3-12" long; South Florida to South America, including Gulf of Mexico . . . . *Thalassia testudinum*
3. Leaves 2-4' long, North Carolina to Greenland, occasionally in northern Florida . . . . . *Zostera marina*

4. Leaves narrow, under 3/16", with an expansion at the base and tip with a single point (Key Fig. 6); stem usually upright . . . . . *Ruppia maritima*
4. Leaves narrow, under 3/16", with tongue-like sheath and 2-3 points at tip (Key Fig. 7); stems usually horizontal . . . . . *Halodule wrightii*

5. Leaves round in cross-section, about 1/16" in diameter (Key Fig. 2) . . . . . *Syringodium filiforme*
5. Leaves flat, short, widest near the middle (Key Fig. 3) 6

6. Leaves in pairs (Key Fig. 8) . . . . . *Halophila baillonis*
6. Leaves in whorls of 4-8 on tip of erect stem (Key Fig. 9) . . . . . *Halophila engelmanni*



Key Figures 1-9

Thalassia testudinum König and Sims

Turtle Grass

Figures 1 and 8

Recognition Features - Leaves ribbon-like, blunt at apex, 3 inches to 1 foot long and 3/16 to 1/2 inch wide. Two to five leaves from each stem which arises from a node on the rhizome.

Geographical Range - Occurs from San Sebastian, Florida to Gulf of Mexico, the Caribbean Sea, northern South America, and Bermuda (Phillips, 1960; Moore, 1963).

Habitat and Depth Range - It forms extensive submarine meadows from just below the low tide mark to about 40 feet. It occurs on soft sand and mud, coral sand, and rocky areas (den Hartog, 1970; Phillips, 1960). Optimum salinity ranges from 25°/oo to 38°/oo; it can tolerate extremes of 11°/oo and 48°/oo at least temporarily (Phillips, 1960).

Reproduction - Vegetative and sexual reproduction occur. Flowers are solitary and 3-petalled; fruit is globose, pointed, stalked, containing from 1 to 6, but usually 2 to 3 seeds. Vegetative reproduction occurs when new leaf tips form at rhizome apex; this occurs about nine months of the year.

Growth - Initial seedling energy goes into rhizome development which is completed in 4 to 6 months. At one month the leaves are about 3 inches long. They grow steadily and reach full length in about nine months, growing year round. Optimum growth temperatures are 68° to 86°F (Phillips, 1960). Leaf growth is greatest in early summer and least in winter. Leaf kill occurs at both extremes of late summer and late winter.

Economic Importance - Its greatest importance is as a substrate stabilizer and a nursery ground for many commercial species of marine animals. The community is highly productive; it is often shared with other grasses and at least 113 species of algae are known to grow on the leaves (Humm, 1964). Its role as a primary producer is important as it and the mangroves are responsible for a great proportion of the coastal production of our tropical waters.

Figure 1: Turtle Grass

Zostera marina Linnaeus

Eel Grass

Figure 2

Recognition Features - Leaves ribbon-like, blunt at apex, 2 to 4 feet long and 3/16 to 1/2 inch wide. Slender, branched stems arise from creeping rhizome 1/8 to 1/4 inch thick. Seeds, when present, ridged.

Geographical Range - Western Atlantic from Greenland to North Carolina, occasionally to Florida (den Hartog, 1970). Absent from Gulf of Mexico and the Caribbean Sea.

Habitat and Depth Range - Shallow water in bays and along the coast to a depth of 90 feet (den Hartog, 1970). On soft mud or sand, it tolerates wide salinity variations.

Reproduction - Vegetative reproduction is common. Sexual reproduction occurs during summer months. Flowers are about 3 inches long. Fruit is oblong, 1/8 inch long and beaked. Seeds produced in summer usually do not germinate until following spring.

Growth - Growth occurs at temperatures above 50°F; vegetative growth occurs between 50° and 59°F, while generative shoots are produced between 59° and 68°F. Above 68°F, the plant loses vitality and older leaves begin to die. With winter drop in temperature, plant growth ceases (Setchell, 1929).

Economic Importance - It was formerly used as insulation and preservation in house walls, as packing material and stuffing for mattresses and pillows. It is an important food for ducks (Martin and Uhler, 1951). Its greatest importance is as a nursery ground for young fish and invertebrates. The extensive damage to this grass in the 1920's as a result of the wasting disease had a noticeable effect upon the coastal fisheries.

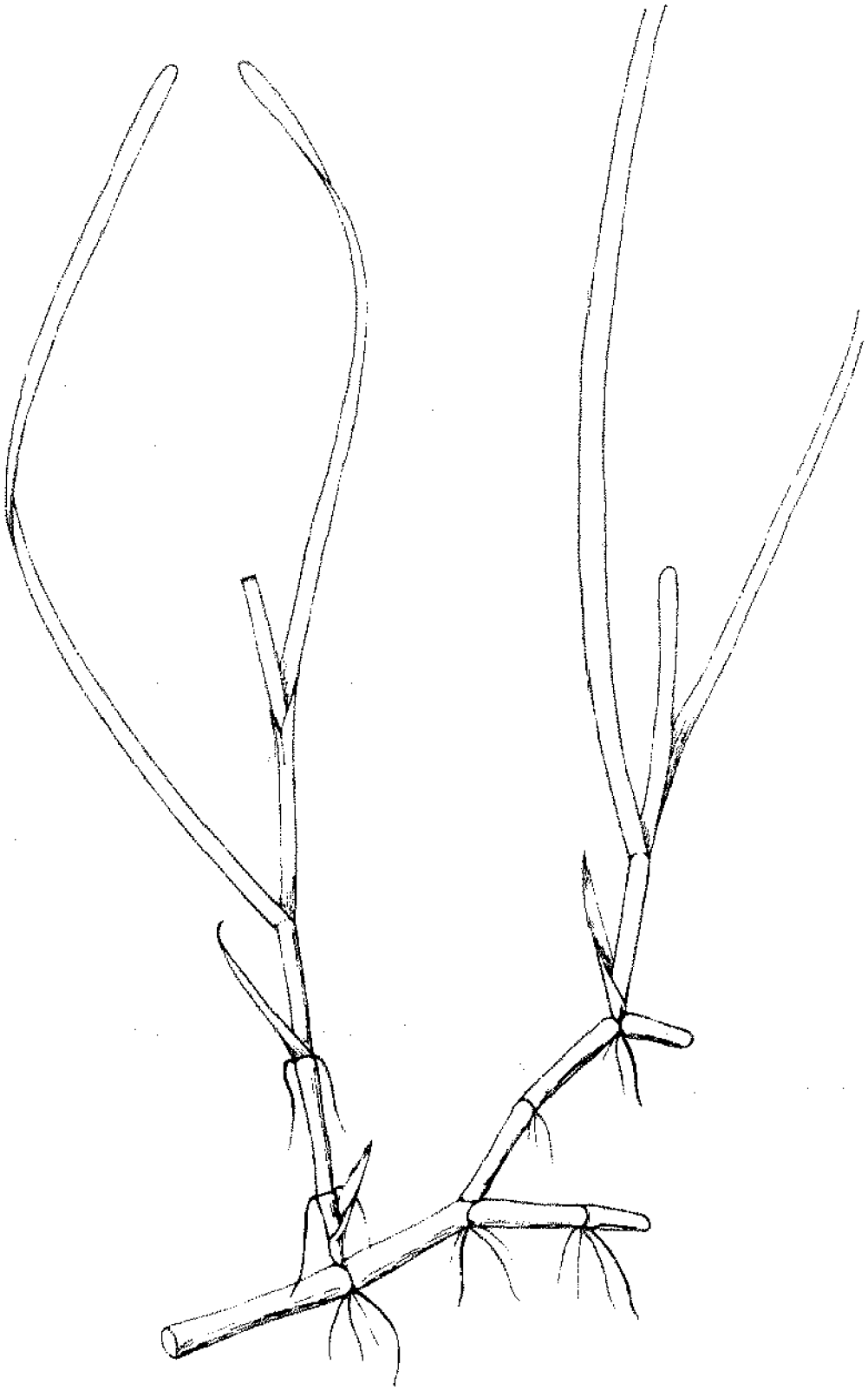


Figure 2: Eel Grass

Ruppia maritima Linnaeus

Widgeon Grass

Figure 3

Recognition Features - Leaves ribbon-like, expanded at base and with a single point at tip; 1 to 8 inches long and very narrow, 1/16 to 1/8 inch wide. Two to four leaves per sheath, rising directly from rhizome.

Geographical Range - In western Atlantic, it occurs from Newfoundland to Florida. In Florida, it has been reported statewide but is rarely found along the southern tip. In the Gulf of Mexico, it has been reported as far west as Texas (Phillips, 1960).

Habitat and Depth Range - Ruppia is found from fresh water to sea water of 33°/oo, but prefers salinities below 25°/oo. It is found in estuaries, bays, and coastal waters from the intertidal zone to 10-foot depth. It prefers substrates of varying degrees of mud and sand (Phillips, 1960).

Reproduction - Sexual and vegetative reproduction both occur. Neither seems to predominate. Vegetative growth, flowering, and fruiting occur during spring temperature rises and end during highest summer temperatures. Fruit are thought to lie dormant until the following spring (Phillips, 1960).

Growth - Growth is greatest during the flowering period and in water with a salinity less than 25°/oo. Leaf length is greatest in areas not exposed at low tide and in the months of May through August. In mixed beds, Ruppia predominates during the cooler water temperatures of spring (Phillips, 1960).

Economic Importance - This sea grass aids in silt and detritus trapping and is effective in binding the substrate and preventing erosion. Like the other seagrasses, it is an important habitat and nursery ground for valuable commercial animals.

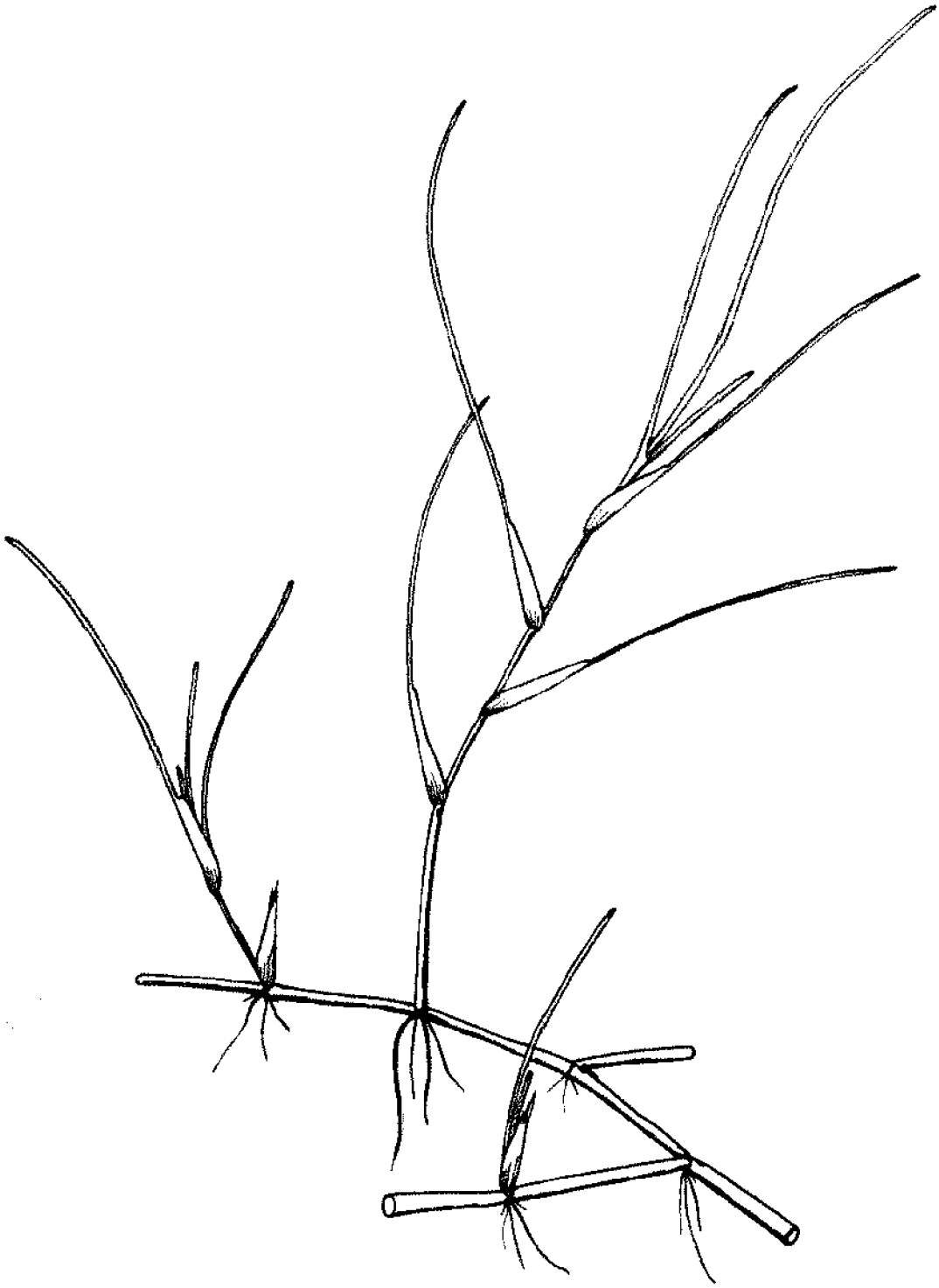


Figure 3: Widgeon Grass

Halodule wrightii Ascherson

Shoal Grass, Cuban Shoal Grass

Figure 4

Recognition Features - Leaves flat, 1/16 to 1/8 inch wide, 2 to 7 inches long, with 2 to 3 points on the tip. Leaves borne on erect branching stalks. Two to four leaves arise from each sheath. Stems usually horizontal.

Geographical Range - Distribution information is incomplete. It has been reported from North Carolina and from all around Florida (Phillips, 1960). It is believed to occur throughout the Gulf of Mexico, the Caribbean Sea, and to Bermuda. There is no record of occurrence along continental South America.

Habitat and Depth Range - Halodule occurs in the intertidal zone where it is often extensive to as deep as 30 feet. Although it thrives from 68° to 86°F, it tolerates a wide range of temperatures (Phillips, 1960). It also tolerates a wide range of salinities from 1°/oo to 60°/oo for short periods of time (Simmons, 1957). It grows on mud, coral sand, and rocky substrates.

Reproduction - Sexual reproduction is rare and has seldom been observed. Vegetative growth activities by the rhizome account for the maintenance and dispersal of the species. The fruit, when present, is globose and only 1/8 inch in diameter.

Growth - Halodule growth and spread depends largely upon the local concentrations of Thalassia, Syringodium and Ruppia. All three are dominant to Halodule which only forms dense growths in their absence or sparsity. It seems to do well in the higher salinity intertidal zones. Leaves were found to be shortest and most compact in areas exposed at low water.

Economic Importance - It is important in erosion control and silt and detritus trapping. It is indirectly important to commercial and sport fisheries by offering a habitat and nursery ground for fish, shrimp, and spiny lobster.

Other Names - Diplanthera wrightii Ascherson is the same.

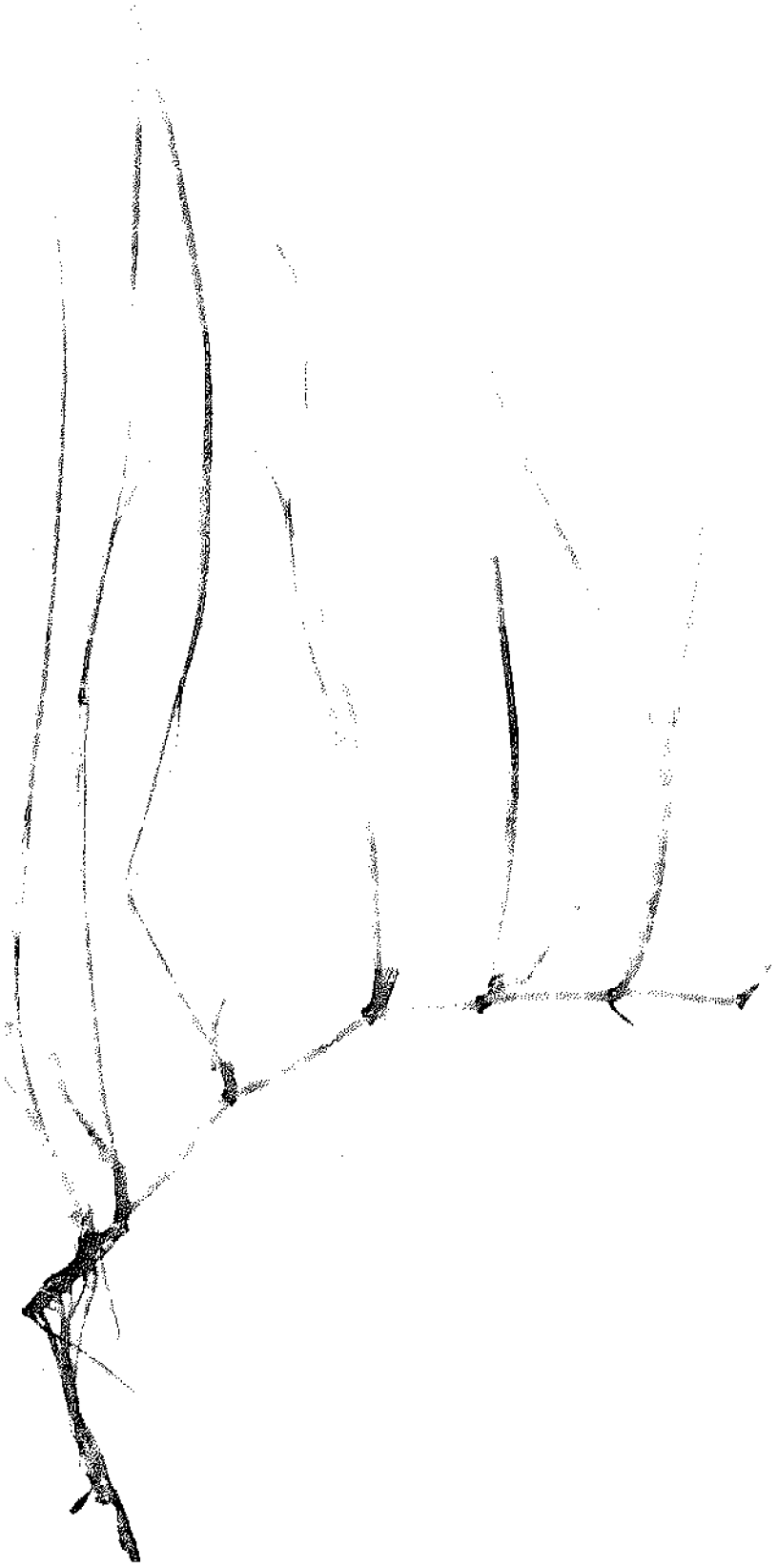


Figure 4: Shoal Grass

Syringodium filiforme Kützing

Manatee Grass

Figures 5 and 9

Recognition Features - Leaves round in cross-section, brittle, 4 to 12 inches long and 1/16 to 1/8 inch wide. Two to four leaves arise from each sheath. Commonly branched rhizome 1 to 2 inches underground with regularly spaced nodes which give rise to roots and erect leaf-bearing branches.

Geographical Range - This species occurs in southern Florida from Cape Canaveral around to the west coast and continuously along the Gulf coast (Phillips, 1960). It occurs throughout the Gulf of Mexico, the Caribbean Sea, and Bermuda. Although present along the islands off South America, it appears to be absent from the continent itself (den Hartog, 1970).

Habitat and Depth Range - Syringodium grows on a variety of substrates from below the intertidal zone down to 70 feet in clear water. It prefers water temperatures above 68°F. It does not tolerate very low salinities and is primarily found in waters of 20°/oo to 34°/oo salinity (Phillips, 1960).

Reproduction - Sexual reproduction seems rare. Vegetative reproduction is through rhizome elongation and by new leaf or branch production. New shoot production is abundant throughout the year.

Growth - Leaf length is longer in water 2 to 10 feet deep. Syringodium grows in association with the other seagrasses, but is sparse in areas of thick Ruppia and Thalassia growth. It predominates when mixed with Halodule. Growth seems to be depressed by low or high salinities and appears greatest in salinities of around 25°/oo (Phillips, 1960).

Economic Importance - This species is important to erosion control and trapping of silt and detritus. It provides a suitable habitat and nursery for commercial and sport fishes, lobsters, and shrimp.

Other Names - Cymodocea manatorum Ascherson is the same.

Figure 5: Manatee Grass

Halophila baillonis Ascherson

Figures 6 and 10

Recognition Features - Leaves in pairs at each node, rigid, oblong, or elliptical, 2 to 9 inches long and 1/8 to 1/4 inch wide. Rhizome thin, fragile, with one root at each node.

Geographical Range - Distributed in Florida from Jupiter on the east coast continuously around to western Florida. It occurs throughout the Gulf of Mexico and the Caribbean Sea (Phillips, 1960). It has been found as far south as Brazil in South America (den Hartog, 1970).

Habitat and Depth Range - This species has been found in depths down to 90 feet (Taylor, 1928), but more commonly in shallower water. It roots in sand or mud (Phillips, 1960; den Hartog, 1970). It has been found in temperatures of 65° to 95°F and salinities of 21°/oo to 38°/oo (Phillips, 1960). It is found with Halodule, Syringodium, and Thalassia.

Reproduction - Vegetative and sexual reproduction are both utilized, but there is no information concerning which predominates. The rhizome system is well developed. The fruit is globular, about 1/16 inch in diameter, with 10 to 20 seeds.

Growth - No growth data are available.

Economic Importance - None known other than as a substrate stabilizer.

Figure 6: Halophila baillonis

Halophila engelmanni Ascherson

Figure 7

Recognition Features - Stems with terminal whorl of 4 to 8 leaves; leaves oblong, 4 to 12 inches long, and 1/8 to 1/4 inch wide. Rhizome thin, fragile, with usually one root at each node.

Geographical Range - This species occurs from Indian River in eastern Florida throughout the Gulf of Mexico and the Caribbean Sea (Phillips, 1960). Distribution is not well documented.

Habitat and Depth Range - This species has been dredged from about 270 feet in clear waters of the Dry Tortugas in Florida (Taylor, 1928). It is more commonly found in sheltered, shallower water in less than 30 feet, on sandy or muddy bottoms. It tolerates a wide range of temperatures, from 55° to 87°F and salinities of from 9°/oo to 35°/oo (Phillips, 1960). It is usually found in in association with Thalassia and Syringodium.

Reproduction - The plants have both vegetative and sexual reproduction. Vegetative reproduction is probably predominant since information on the fruit and seeds is not available. The rhizome system is well developed.

Growth - No growth data are available.

Economic Importance - None known other than as a substrate stabilizer.

Figure 7: Halophila engelmanni

Figure 8: Turtle Grass

Figure 9: Manatee Grass

Figure 10: Halophila baillonis

Bibliography

den Hartog, C.
1970. The sea grasses of the world. Verh. Konin. Nderl. Akad. Wetens, Natuurk., 59(1): 1-275.

Humm, H.J.
1964 Epiphytes of the sea grass, Thalassia testudinum, in Florida. Bull. Mar. Sci. Gulf & Carib., 14: 306-341.

Jones, J.
1968. Primary productivity of the tropical marine turtle grass, Thalassia testudinum. Ph.D. dissertation, University of Miami.

Martin, A.C. and F.M. Uhler
1951. Food of game ducks in the United States and Canada. Rept. Fish. Wildl. Serv., 30: 1-308.

Moore, D.R.
1963. Distribution of the sea grass, Thalassia, in the United States. Bull. Mar. Sci. Gulf & Carib., 13(2): 329-342.

Odum, H.T.
1957. Primary production measurements in eleven Florida springs and a marine turtle grass community. Limnol. Oceanogr., 2(2): 85-97.

Odum, H.T., P.R. Burkholder, and J. Rivero
1959. Measurements of productivity of turtle grass flats, reefs and the Bahia Fosforecente of southern Puerto Rico. Univ. Texas, Publ. Inst. Mar. Sci., 6: 159-170.

Phillips, R.C.
1960. Observations on the ecology and distribution of the Florida seagrasses. Prof. Pap. No. 2, Fla. St. Bd. Conserv., 72 pp.

Setchell, W.A.
1929. Morphological and phenological notes on Zostera marina L. Univ. Calif. Publ. Bot., 14: 389-452.

Simmons, E.G.
1957. An ecological survey of the upper Laguna Madre of Texas. Publ. Inst. Mar. Sci., Univ. Texas, 4(2): 156-200.

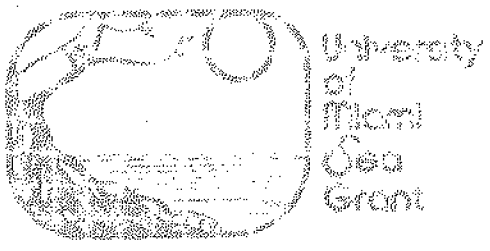
Taylor, W.R.
1928. The marine algae of Florida, with special reference to the Dry Tortugas. Carnegie Inst. Wash. Publ. 139, Paps. Tortugas. Lab., 25: 1-219.

Thorhaug, A.
1974. Transplantation of the seagrass Thalassia testudinum König. Aquaculture 4: 177-183.

Thorne, R.F.
1954. Flowering plants of the waters and shores of the Gulf of Mexico. In Gulf of Mexico: Its Origin, Waters, and Marine Life. Fish. Bull., 89: 193-202.

Wetzel, R.G.
1964. A comparative study of the primary productivity of higher aquatic plants, periphyton, and the phytoplankton in a large shallow lake. Internatl. Rev. ges. Hydrobiol., 49(1): 1-61.

Notes


University
of
Miami
Sea
Grant