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A Continuation of Base-Line Studies for Environmentally Monitoring Space Transportation Systems at John F. Kennedy Space Center

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Terrestrial Community Analysis

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OF THE
FINAL REPORT
TO THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER

A CONTINUATION OF BASE-LINE STUDIES FOR ENVIRONMENTALLY MONITORING SPACE TRANSPORTATION SYSTEMS (STS) AT JOHN F. KENNEDY SPACE CENTER

CONTRACT NO. NAS 10-8986

VOLUME I OF IV: TERRESTRIAL COMMUNITY ANALYSIS

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PREFACE

This document is part of a University of Central Florida contract report, "A Continuation of Base-Line Studies for Environmentally Monitoring Space Transportation Systems at John F. Kennedy Space Center."

The entire report consists of four volumes and an executive summary, all identified as KSC TR 51-2; NASA CR 163122:

Volume I: Terrestrial Community Analysis

Volume II: Chemical Studies of Rainfall and Soil Analysis

Volume III: Part I--Ichthyological Studies, Ichthyological Survey of Lagoonal Waters; Part II--Ichthyological Studies, Sailfin Molly Reproduction Study

Volume IV: Part I--Threatened and Endangered Species of the Kennedy Space Center: Marine Turtle Studies; Part II--Threatened and Endangered Species of the Kennedy Space Center: Threatened and Endangered Birds and Other Threatened and Endangered Forms

Executive Summary

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TERRESTRIAL COMMUNITY ANALYSIS

The general objectives of this contract were as follows:

(1) to characterize and quantify selected components of the environment;

(2) to select from among the components studied those which would be appropriate for the detection and assessment of possible perturbations induced by future NASA operations;

(3) to develop baseline data sufficient to define normal variation (i.e., changes not associated with NASA activities) in those selected environmental components; and

(4) to determine the kinds and amounts of measurements required to detect and document environmental perturbations that might be caused by future NASA activities.

Two major field studies of terrestrial ecosystems on or adjacent to Merritt Island were conducted and are reported herein. The first program continued and elaborated on analysis of the vegetative mosaic of the island reported by Sweet, 1976; Sweet et al., in press. Results of the plant studies are designed to be complementary with chemical studies of soil, rainfall, and the small mammal monitoring program. The ultimate objective of the plant work was to develop a plant community monitoring program to operate in concert with other environmental studies in support of the space shuttle program of the 1980's.

A second program continued studies of small mammal populations initiated by Ehrhart (1976). This investigation was conducted in four areas that were also included in the plant community analysis. Information derived from this work will ultimately permit the dynamics of these small mammals to be better understood, and natural variations in their abundance to be discerned from those resulting from man's activities.

PLANT COMMUNITY ANALYSIS

Introduction

A community analysis was necessary for development of a data base with which base-line studies might be compared in future years. Field work was begun in June 1976. Wetlands in the Merritt Island complex were rejected for a plant community monitoring program because water management programs such as mosquito control, and natural variations in rainfall, contribute to great physical variation in these systems, magnifying the biotic variation relative to upland, well-drained sites. Accordingly, the plant community analysis was limited to upland sites.

Initially, 30 study areas were designated for sampling on or adjacent to Merritt Island, anticipating that some areas as far west as Orlando would be included in the study to foster an understanding of the successional and community similarities and differences among island and mainland sites. Study areas were operationally plant communities relatively free of logging, grazing and clearing operations within the last 15 years.

The vegetation analysis was designed to yield a quantitative description and ecological explanation of the major types of upland vegetation found on or near Merritt Island. Subsequent changes in the vegetation could be evaluated with the benefit of the temporally established data base.

Casual examination of the landscape revealed a complex interdigitation of obviously different types of plant communities. Field observation suggested that many of these areas were relatively stable; whereas, a small proportion of the stands were undergoing rapid successional change. Succession is unidirectional change in the plant community whereby species are replaced. Two or more temporary communities may exist in the same space but at different times in the course of the communities reaching a relative steady-state (near climax condition). Differences in communities nearing climax reflect differences in environmental conditions. The plant community is perhaps the best indicator of the potential of the environment to support biotic activity (Daubenmire 1968:32-33). It is important here to realize that each different community type possesses a unique and still undefined tolerance or susceptibility to perturbation by aerospace operations.

Identification, classification and description of plant communities are the subjects of a vast literature in many languages. Perhaps the most useful summary may be found in a recent handbook edited by Whittaker (1973).

Two major schools of thought exist with reference to communities. The "continuum" school views the definition of communities and their boundaries as arbitrary, contending that communities are continuous (not discrete) (Curtis 1959; McIntosh 1967; Gleason 1926). Daubenmire (1966, 1968), in contrast, argues for the recognition of discrete communities in natural landscapes. Daubenmire as well as Langford and Buell (1969) represent the "association" school. Beals (1969) has offered evidence that either discrete or continuous vegetational units may be manifested under different environmental conditions.

The viewpoint assumed in this work was that vegetation exists as a continuum. For practical purposes, however, the plant mosaic was recognized as existing in somewhat discrete units repeating themselves in space (live oak hammocks, e.g., occur as discrete units) and time (succession which follows a disturbance will yield another similar community).

Objectives

The objectives of this study were:

1. To map the existing plant communities on KSC property.

2. To delimit approximately 30 relatively undisturbed stands representative of six plant community types as reference points to interpret the upland vegetation complex of Merritt Island and vicinity.

3. To develop a quantitative data base for the significant plants of the stands under study. More specifically, to estimate density, frequency and basal area for tree species; to estimate coverage, frequency and density for shrub species; and to estimate coverage and frequency for herbaceous plants.

4. To prepare dominance-diversity curves for tree and shrub components, based on density, basal area, and importance values, to evaluate future changes in the vegetation.

5. To select 10 "reference" stands for continuing study from among the approximately 30 areas delimited in fulfillment of objective 1.

6. To establish a series of permanent line transects in the 10 designated reference stands from which to document condition and trend of the vegetation.

Literature Review

Numerous studies on the plant ecology of Florida have been published. The focus of this brief review will be the community types identified to be of major concern on upland sites of Merritt Island and east central Florida: hammocks, pine flatwoods, sand pine scrub, coastal scrub, coastal strand and coastal dunes.

Hammocks

Hammock has for many years referred to certain hardwood forests of the Southeast and Florida (Harper 1905; 1914). Laessle (1942) and Monk (1965) restricted the term hammock to forests composed of evergreen (predominately) and deciduous hardwoods growing on sites that are not seasonally or periodically flooded. The middle Florida hammock belt was one of Harper's (1914) geographic divisions. According to his data, from 66 to 74 percent of the species were evergreen in habit. In describing the vegetation of central Florida, Harper (1921) mentioned low hammocks, sandy hammocks, and hammocks on shell mounds (tropical hammocks). Low hammocks, tropical hammocks, Cape Sable Hammocks and Key Hammocks were cited as present in south Florida (Harper 1927). Hammock formation on old dune lines was discussed by Kurtz (1942). He referred to "spruce-pine hammocks" (spruce pine = sand pine) in his description of Daytona Beach. Elsewhere in his monograph, Kurtz refers to magnolia and magnolia-beech climax forests. Laessle (1942) presented species lists and some descriptive data from xeric, mesic and hydric hammocks of the Welaka area near Gainesville. The relationship between hammock tree species and pH was studied by DeVall (1943).

Alexander (1955) presented evidence that low hammocks of southern Florida probably develop on sites previously vegetated by red mangrove. He also suggested that low hammocks develop into high, tropical hammocks. High hammocks in the Miami and Pinecrest areas were shown to be primarily subtropical with regard to plant species affinity (Alexander 1958a). Alexander (1958b) presented a species list and transect data to support classification of the Pompano Beach hammock as a subtropical coastal hammock. He indicated that some of the hammock occurred on old dunes. Laessle (1958b) returned to the area of his previous studies and established permanent quadrants in 1951. In discussing communities, he presented data based on samples from a xeric live-oak hammock. He observed that in the absence of fire, hammock tree species spread into surrounding flatwoods. A mesic hammock and an adjacent sandhill community were studied by Monk (1960). He gave data on soil properties and plant distribution along a transect across the two community types. Monk suggested that hammocks can resist fires and maintain themselves themselves. Laessle and Monk (1961) sampled eight live-oak (Quercus virginiana) hammocks in north-east Florida. They provided data on density and basal area of tree species and concluded that succession in the area leads to a mesic hammock.

A definitive study of southern mixed hardwood forests of north central Florida was reported by Monk (1965). He defined these forests as being mixed deciduous and evergreen on sites not flooded periodically. These forests stands achieved best development where limestone and phosphatic deposits outcrop. Other sites long protected from fire also supported the mixed hardwood forests. Monk regarded these forests to be the climatic climax of the region. Among the data presented in support of his conclusions were species lists, average importance values, and species occurrence with reference to position on the moisture gradient. Included in the study were trees, shrubs and herbs. Monk (1968) further defined the southern mixed hardwoods by demonstrating that deciduous trees predominated on mesic and wet sites, and that evergreen trees were most prominent on dry, sterile sites.

Alexander (1967) reported on a re-analysis of a hammock near Miami. Data on frequency, density and basal area of trees from samples taken in 1940 and 1964 were compared. It was concluded that this tropical hammock remained relatively unchanged over the period of study. In contrast, a surrounding pineland had undergone succession and evolved toward the tropical hammock. Long (1974) mentioned hammocks in the everglades region as dense forests in small areas. He listed the important plant species. Likewise, Mohlenbrock (1976) listed the dominant plants in hammocks of the Ocala National Forest. An extremely important re-analysis of Laessle's permanent plots on the Welaka area has been reported by Veno (1976). She studied the mesic and xeric hammocks and described changes over the past twenty years (1951 to 1972). No new species had become established in either the mesic or xeric hammocks. However, the xeric hammock was changing toward a more mesic form. She used changes in importance values of species between 1951 and 1972 to quantify stand dynamics.

Sweet (1976) gives a species list and quantitative data from Happy Hammock on Merritt Island. Richardson (1977) has reviewed the literature on hammock vegetation of south Florida and cited references beginning in 1773. He discussed species composition and successional relationships of low and tropical hammocks of Palm Beach County. Austin et al. (1977) discussed historic changes in hammocks on barrier islands and interior sites near Boca Raton. Recently, Delcourt and Delcourt (1977) have presented evidence on the nature of presettlement mesic hammock forests in north Florida based on data from the General Land Office Survey records of 1824-1825. They argued that contemporary examples of southern mixed hardwoods (sense of Monk 1965) were indeed climax vegetation for that region. However, these forests were not directly comparable to the presettlement mesic hammocks. Rather, contemporary southern mixed hardwoods are the result of post-settlement modification by selective cutting and fire preventation. Genelle and Fleming (1978) provided a floristic survey of "The Hammock" at Dunedin (Latitude 28° N).

Pine Flatwoods

Bartram (1791) probably coined the term flatwoods in his reference to pine communities maintained by recurrent fires. Contemporary usage includes flatwoods or pine flatwoods. Harper (1914) described flatwoods as open forests of longleaf pine, saw palmetto, gallberry, and wiregrass. One of his geographic divisions was middle Florida flatwoods. Pine flatwoods were noted to be dominated by a species of pine, either longleaf, slash or pond pine (Gano 1917). With reference to central Florida, Harper (1921) distinguished among open flatwoods, palmetto flatwoods and high pine land. He observed that Merritt Island had large areas of flatwoods similar to Osceola County; however, only slash pine occurred there. In south Florida, Harper (1927) reported on high pine land, flatwoods and Miami pinelands. Pessin (1933) discussed the pine forests of the lower Gulf Coastal Plain with some emphasis on the role of soil conditions in the determination of species composition and successional relations. Pinelands of the Welaka area were divided into three main types: longleaf pine flatwoods, pond pine and fetter bush flatwoods and slash pine flatwoods (Laessle 1942).

Edmisten (1963) reviewed the historical data on pine flatwoods and confirmed the role of soil and drainage factors in favoring the establishment of either longleaf, slash or pond pine flatwoods. Unfortunately, his quantitative data were limited to species presence (%) tabulations. Monk (1968) divided the flatwoods complex into three phases: longleaf, slash and pond pine. Long (1974) divided south Florida flatwoods as dry pinelands and wet pinelands. Quantitative data on an old-growth stand of slash pine were given by Hebb and Clewell (1976). Mohlenbrock (1976) listed the plant species from pine flatwoods of the Ocala National Forest. Richardson (1977) found "regular" flatwoods, scrubby flatwoods and low flatwoods to be present in Palm Beach County.

Sand Pine Scrub

The literature on sand pine scrub extends back to Harper's (1914) account of the west Florida coast strip. In his subsequent treatment of central Florida vegetation (Harper 1921), he discussed scrub with sand pine on Pleistocene sands near Mims. Harper (1927) included plant species lists, photographs and discussion of scrub (= sand pine scrub) in his work dealing with vegetation of south Florida. Mulvania (1931) studies a transect which extended through a stand of sandpine scrub to a lake margin. He concluded that water relations were important in determining the distribution of the scrub. Webber (1935) referred to sand pine scrub as "scrub" or the "Florida scrub". He discussed the response of scrubs to fires, features of their soils and their microclimate. Scrub communities on the Welaka Area were described by Laessle (1942). He offered some hypotheses regarding the successional relationships of scrub to other community types. The correlation of coastal stands of sand pine scrub with old dune lines was extremely well documented by Kurtz (1942).

Laessle (1958a) presented the definitive treatment of sand pine scrub in Florida. He concluded that sand pine scrub is a fire-maintained community and, in the absence of fire, succession procedes in the direction of a xeric hammock dominated by scrub oaks. Laessle (1967) concluded that sand pine scrubs that were protected from fire may lose their sand pine after 70-100 years, because the pine regenerates poorly in the absence of fire. However, Laessle pointed out succession toward hammock conditions does not always follow. Monk (1968) treated sand pine scrub as a fire-maintained successional community. A list of plants from the Big Scrub near Ocala was provided by Mohlenbrock (1976). Veno (1976) tested Laessle's hypothesis of successional convergence of sand pine scrub toward a mesophytic hardwood forest. She concluded the scrub had not converged toward a mesophytic hardwood forest in the 20 years since Laessle had taken measurements. Richardson (1977) noted that coastal sandpine scrub which sustained annual or multi-annual burns shifted to an oak-palmetto scrub.

Coastal Scrub

Coastal scrub was included in Harper's (1914) geographical divisions: west Florida coast strip and east Florida coast strip. He listed the typical plant species found on old dunes away from the beach. Harper (1921) described coastal scrub on dunes near the ocean as vast thickets of saw palmetto. No reference was made to coastal scrub in Harper's (1927) discussion of the vegetation of south Florida. Kurtz (1942) listed the plants common to the palmetto zone near Jupiter Island. The coastal scrub and coastal strand were not treated as separate community types. However, coastal scrub was clearly identified at Crescent Beach. Richardson (1977) included coastal scrub with sand pine scrub.

Coastal Strand

Coastal strand vegetation was not treated as a community type by Harper (1914; 1921; 1927). Although not well defined, he does single out cactus thickets (Harper 1927:98) as distinct from dune vegetation and the scrub or sand pine scrub of the coastal zone. Kurtz (1942:27) described coastal strand vegetation at Cape Canaveral, but did not refer to it as coastal strand. With reference to Crescent Beach, Kurtz (1942:48) described the sheared or hedged appearance of coastal strand. He listed the species encountered in coastal strand vegetation along seven coastal beaches of Florida. Oosting (1954) discussed the maritime strand vegetation of the Southeastern United States. He, perhaps for the first time in literature, separated the coastal dune (treeless) vegetation from the adjacent thicket and woodland strand vegetation. His thicket and thicket woodland community types best describe the coastal strand. A profile of Pompano Beach showed the coastal strand as "scrub thicket" (Alexander 1958b). Long (1974) referred to the Coastal Dune and Strand Formation as one of the most distinctive plant communities in southern Florida. Richardson (1977) indicated that most studies of coastal vegetation lumped strand communities with the beach areas. He suggested the species composition was sufficiently distinct to warrant a distinct status. Richardson noted, as had Harper (1921), that saw palmetto (*Sereno repens*) was a dominant species. Strand vegetation was mapped for several coastal Florida sites by Austin et al. (1977).

Coastal Dunes

Coastal dune communities have long been recognized as distinct (Harper 1913; 1921; 1927). Kurtz, (1942) described the zonations of plant species at seven sites on the east coast of Florida and two sites on the Gulf coast. Cape Canaveral was included among his studies. Coastal dune vegetation of Florida and the southeastern United States was discussed by Oosting (1954). Boyce (1954) documented the impact of salt spray on the coastal dune community. According to Long (1974), the species composition of the coastal dune communities are remarkably uniform and generally similar in the Caribbean basin. In Palm Beach County, Richardson (1977) noted the coastal dune community might be described in terms of zones which coincide with the fore, middle and upper dunes. Austin et al. (1977) presented descriptive data on coastal dune communities near Boca Raton.

Methods and Materials

Vegetation Mapping

A combination of ground truth observations and of interpretation of recent aerial photography was used to develop a map of the vegetation of Merritt Island. Previously published low resolution maps of the plant communities of Merritt Island were studied (Küchler 1964; Davis 1967). In addition, the detailed map of plant communities in the vicinity of the Shuttle Runway was consulted (Sweet 1976). An intensive ground reconnaissance of the island was conducted from 1976 to 1979. Finally, the distribution of plant communities as revealed by color infrared imagery was determined. This imagery resulted from flights over Merritt Island in August and September, 1978.

The classification of plant community types divided the landscape of Merritt Island into these broad categories: upland communities, citrus groves, undifferentiated wetlands dominated by woody plants and undifferentiated wetlands dominated by non-woody plants. Upland communities were further sub-divided primarily on the basis of growth-form or physiognomy. These communities were: hammock (forests dominated by broadleafed evergreen species), pine flatwoods, coastal scrub, coastal strand and coastal dunes. Another upland community included in the vegetation analysis, sand pine scrub, occurred on Merritt Island at two locations. Neither of these stands was large enough to sample or to indicate on the vegetation map.

The final map was prepared at a scale of 1:60,000. Community types were designated in contrasting colors.

Plant Community Analysis

Selection of Study Area

From those community types identified on the vegetation map, hammocks, pine flatwoods, coastal scrub, coastal strand and coastal dunes were designated for more detailed community analysis. An additional community type, sand pine scrub, was selected for study because of its wide-spread occurrence immediately west of the Indian River in Brevard County. Several disturbed stands of sand pine scrub do, in fact, exist on Merritt Island and Cape Canaveral.

Field trips were made to potential study areas within the known distribution of the community types to identify suitable stands. Thirty-one stands were subjectively selected for study. The distribution of the stands among the community types was: hammocks (9), pine flatwoods (5), sand pine scrub (6), coastal scrub (6), coastal strand (2) and coastal dunes (3). Most of the stands occupied several acres of relatively homogeneous landscape in terms of relief, soils and drainage. Plant distribution and abundance were examined to ensure relative uniformity among the ground, shrub and tree layers. Areas with evidence of recent disturbances, e.g., grazing, selective cutting of trees, and fire, were not sampled.

Sampling Methods

Sample points within stands were objectively selected. As a matter of convenience, in some very uniform stands, systematic sampling was done. Regardless of the procedure, the overall objectivity of the sampling process seemed to justify treatment of the data as random samples from which sample means and measures of variation may be calculated.

Trees were sampled in all stands by the point-centered quarter method (Cottom and Curtis 1956). Points were located along compass bearings. At each sample point, four quarters were identified and the distance was measured from the point to the nearest tree in each quarter (Appendix Figure 1). Thus, four observations were made at each point and each observation incuded the nearest tree species, the distance to it and the diameter (at 4 1/2 feet) breast high (dbh). Trees were defined as species capable of reaching the subcanopy or canopy and of 2.5 centimeters or greater dbh.

Data reduction of the sample results was carried out as described in Cottam and Curtis (1956) and Mueller-Dombois and Ellenberg (1974:111-120). Preliminary samples indicated that 30 sample points gave statistically reliable data.

The calculation of importance values for tree species was based on Cottam and Curtis (1956) and Whittaker (1965). Importance value (IV) is equal to the sum of the relative density, frequency, and dominance. Importance value of a species may reach a maximum of 300 if only one species is present.

$$\text{Relative Density} = \frac{\text{Density of a species}}{\text{Total Density}} \times 100$$

$$\text{Relative Frequency} = \frac{\text{Frequency of a species among all points}}{\text{Total frequency of all species}} \times 100$$

$$\text{Relative Dominance} = \frac{\text{Basal area of a species}}{\text{Total basal area of all species}} \times 100$$

Basal area is the sum of the cross-sectional area (cm^2) of a particular species. Basal area is calculated as $BA = \Pi r^2$ and is summed over all individuals of a species.

Shrubs, tree seedlings and woody vines (all less than 2.5 centimeters dbh) were sampled by plot and plotless techniques. In hammocks, these plants were sampled in 0.5 x 2.0 m plots centered on the points used to study the tree layer. Stem counts by species were completed. In contrast, shrubs, tree seedlings and woody vines (>50 cm in height and <2.54 cm centimeters dbh) were sampled by point-centered quarter in the sand pine scrub and coastal scrub. Plants less than 50 cm in height were counted in 0.5 x 1.0 m plots centered on the sample points. Plants counted in these latter plots included shrubs, tree seedlings, and herbaceous elements.

With the exception of trees, all life forms, i.e., herbs, vines, shrubs and tree seedlings, in the pine flatwoods, coastal strand and coastal dunes were sampled with line transects. Transects (normally 15 m in length) were analyzed by recording to the nearest cm the interception of each plant species. These measurements are referred to as canopy coverage and were reported as absolute coverage or relative coverage. Canopy coverage may exceed the absolute length of the transect owing to the superposition of plants along the transect.

In the hammocks, a 0.5 x 0.2 m plot was nested within the 0.5 x 2.0 m plot to sample the herb layer. Canopy coverage was estimated for each herbaceous plant whose leaves projected over the 0.5 x 0.2 m area (Daubenmire 1959). Canopy coverage in this sense refers to a two-dimensional projection of the polygon which enclosed the leaf tips of the undisturbed canopies. The following ranges were adopted:

Coverage-Class	Range of Coverage	Midpoint of Range
1	0 - 5%	2.5%
2	5 - 25%	15.0%
3	25 - 50%	37.5%
4	50 - 75%	62.5%
5	75 - 95%	85.0%
6	95 - 100%	97.5%

Owing to overlap of canopies, total canopy coverage may exceed 100 percent.

Sampling methods used in the various community types are summarized in Table 1.

Importance values for shrubs, tree seedlings, vines and herbaceous plants were based on the sums of relative density and relative frequency or relative coverage and relative frequency. Maximum values were 200.

Jaccard community coefficients were calculated according to Mueller-Dombois and Ellenberg (1974:213):

$$\text{Coefficient} = \frac{c}{a + b + c} \times 100$$

Where c = no. of common species
a = no. of species unique to stand 1
b = no. of species unique to stand 2

Reference Stands

Early in the course of the present study, a series of ecosystems were selected for long-term study. The ultimate objective was use of these sites as "bench marks" or reference points, for judging the extent and nature of change in these systems as they are influenced by natural and, at least

Table 1. Summary of sampling methods utilized in the plant community analysis.

Life Form	Method	Data Type*	Community Type: Hammock	Pine Flatwoods	Sand Pine Scrub	Coastal Scrub	Coastal Strand	Coastal Dunes
Trees (>2.5 cm dbh)	Point-centered Quarter (n=30)	D,F, BA	X	X	X	X		
Shrubs (>50 cm tall <2.5 cm dbh)	Point-centered Quarter (n=30)	D,F			X	X		
Shrubs and Herbs (<50 cm tall)	Plot, 0.5 x 1.0 m (n=30)	D,F			X	X		
Shrubs, Tree seedlings (<2.5 cm dbh)	Plot, 0.5 x 2.0 m (n=30)	D,F	X					
Herbs	Plot 0.5 x 0.2 m (n=30)	C,F	X					
Herbs, Shrubs & Vines	Line Transect (n=6-15)	C,F		X			X	X

*D = density; F = frequency; BA = Basal Area; C = Canopy Coverage.

potentially, man-related perturbations. These sites have been referred to as "reference stands" (Appendix Table 1, Figure 1). Three of these stands are hammocks, three are flatwoods, three are coastal scrub, and one contains both coastal dune and coastal strand communities. These areas represent the mix of upland plant communities now found on Merritt Island and the Canaveral Peninsula. Final selection of the reference stands was based on the judgment of I. J. Stout.

The line transect methodology, coupled with permanent points, was selected for the study (Larson 1958; Mueller-Dombois 1974). Within each reference stand, five transects, each 15 m in length, were objectively established. The ends of the transects were marked with sections of reinforcing rod 1.8 cm diameter. Each transect was numbered so that data from between or among years could be compared.

The quantity and composition of the vegetation along the transects were determined in the plane above and below a meter tape suspended between the transect markers. Areal extent of each plant intercepted by the transect was recorded to the nearest cm as "canopy coverage" (Daubenmire 1959). Individual measurements were taken with a hand-held retractable tape to obtain greater accuracy and repeatability.

Canopy coverage of woody plants was recorded for all the transects, whereas coverage of herbaceous plants was ignored except for on the beach grid. This decision to exclude herbs and grasses was based on two considerations. First, it was desirable to be able to take readings on the transects in any season. By concentrating on the woody plants, one can essentially ignore the seasonal dynamics of the annual plants. Secondly, the woody plants may be identified with confidence in any season whereas the herbs and grasses were more likely to be misidentified either early or late in their life cycle. Annual readings of the transects were scheduled for July or August.

Results

Vegetation Map/Community Classification

The distribution of major plant community types on Merritt Island and Cape Canaveral appears as a complex mosaic (Appendix Figure 2). Upland communities were classified as: hammocks, pine flatwoods, coastal scrub, coastal strand and coastal dunes. Citrus groves were also designated among the upland sites. Wetlands were distinguished as two general types: wetlands dominated by woody plants and wetlands dominated by non-woody plants.

The following section gives some of the biological and substratal features used in defining the plant communities types.

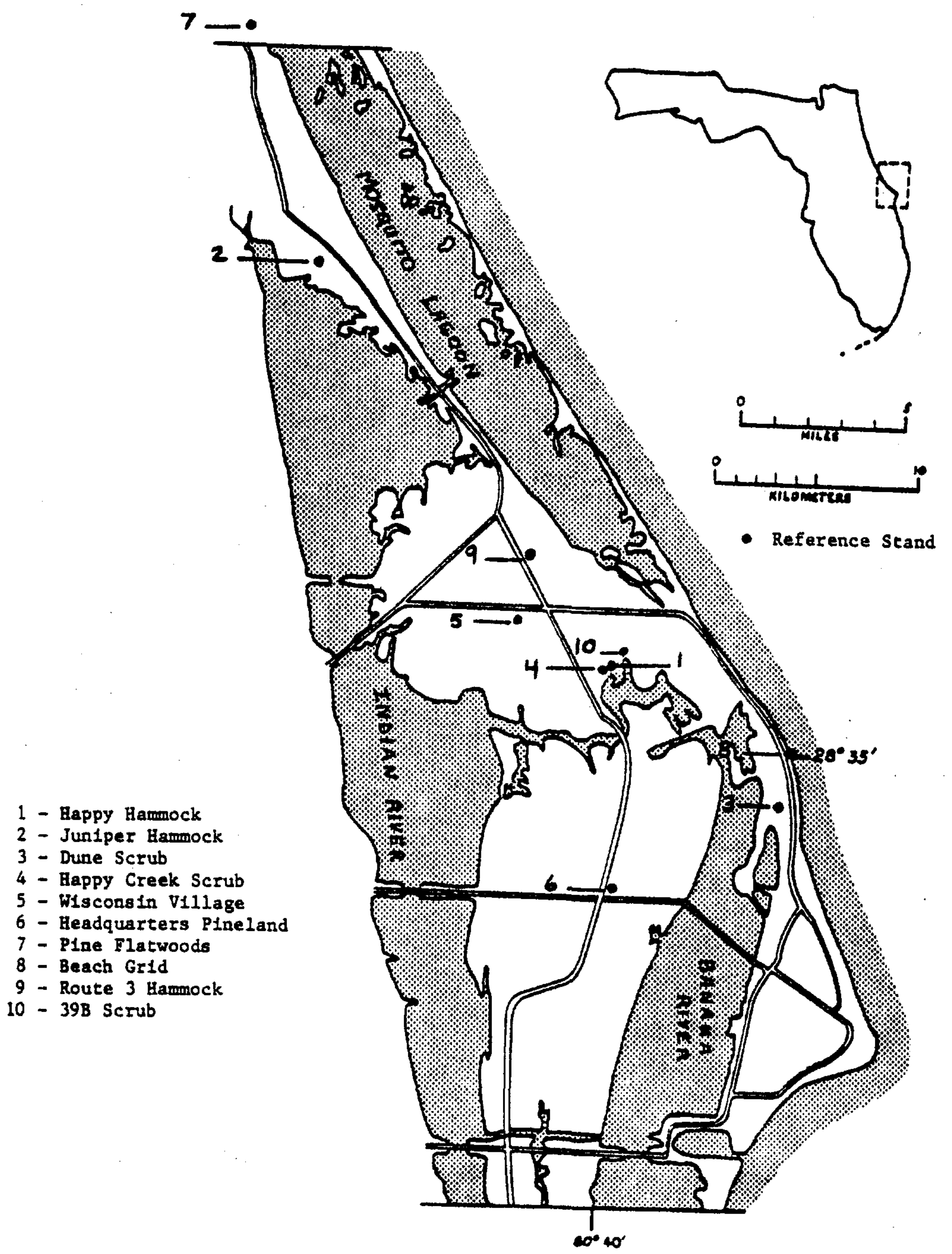

Figure 1. Terrestrial Community Reference Stands

Hammocks

Hammocks are forests primarily dominated by broadleafed evergreen trees. Typically, three layers of vegetation are found in hammocks. These layers are (1) tree, (2) shrub and (3) herb. A well developed tree layer is always present and may vary from nine to thirty meters (m) in height. Shrub layers vary in height from 0.5 to 3 m. The herb layer or ground layer may or may not be well developed in east-central Florida hammocks. Some herbaceous plants are always present, however.

Physical locations of hammocks on Merritt Island and Cape Canaveral are in areas that have had stable soil conditions for long periods. These sites tend to be on the interior sides of barrier strands and on higher portions of the main island.

Soils of hammocks range from poorly drained to well drained. In general, on Merritt Island they are classified in either Myakka-Bradenton or Copeland-Wabasso soil associations (Huckle et al. 1974).

Pine Flatwoods

Pine flatwoods on Merritt Island are dominated by a tree layer of slash pine. However, not all flatwoods on the island have a tree layer at this time. Past land-use patterns, alteration of the incidence and periodicity of wild fires, and selective cutting have contributed to the reduction in pine. The shrub layer of pine flatwoods is dominated by saw palmetto. Thus, in profile, two layers, pine and palmetto are obvious. Several species of woody plants also occur in the shrub layer. A well developed herb layer is also present.

Flatwoods are extensive on Merritt Island and occur on poorly drained soils that are relatively level. The soils are normally classified into Myakka-EauGallie-Immokalee and Pineda-Wabasso soil assocations (Huckle et al. 1974).

Coastal Scrub

The coastal scrub on Merritt Island and Cape Canaveral is best described as an impenetrable thicket of woody plants. In profile the community appears as one-layer which may vary in height from one to three m. Little ground layer vegetation is present.

The distribution of coastal scrub is correlated with areas of recent sand deposition (e.g., Cape Canaveral) and excessive drainage. Soils of the coastal scrub sites are classified in the Paola-Pomello-Astatula and Canaveral-Palm Beach-Welaka associations (Huckle et al. 1974).

Coastal Strand

Coastal strand vegetation is most extensive on Cape Canaveral. Elsewhere on the coast of Merritt Island and the barrier strand bordering Mosquito Lagoon, it occurs as a narrow "strand". The occurrence of strand vegetation is correlated with the limits of the salt-spray zone immediately inland from coastal scrub, the coastline and coastal dunes. This community type, as with coastal scrub, is composed of a dense thicket of woody plants. Its profile is that of a single layer which, depending on exposure, may be from one to four m in height. Shrubs on the eastern margin of the "strand" usually are hedged by the salt spray.

The relief of the "strand" community may vary from flat to slightly ridged where old dune lines have been stranded by continued sand deposition on the ocean side. Soils are well drained to excessively drained and are classified within the Canaveral-Palm Beach-Welaka association (Huckle et al. 1974).

Coastal Dunes

Coastal dune vegetation is largely confined to the shoreline and front of the primary dune. All examples of this community exist within the salt spray zone. The vegetation appears as one layer of grass, herbs, and dwarf shrubs. The soils are classified within the Canaveral-Palm Beach-Welaka association (Huckle et al. 1974).

Groves

Citrus groves are the only agricultural lands remaining within the study area.

Wetlands

Wetlands were defined as those portions of the landscape where soils were saturated with or inundated by water. Extensive wetlands occur on the western portion of Merritt Island and border the Indian River. No attempt was made to classify the wetland vegetation types beyond those dominated by woody plants and non-woody plants.

Stand Analysis

Thirty-one stands of six upland community types were sampled. Each of these stands represented a point sample of a widely distributed ecosystem type in the region of Merritt Island and east central Florida (Appendix Figure 3). Demonstration of similarities and differences among stands of a community type and between stands of different community types was a primary goal of the analysis. Successional relationships were elaborated on when possible.

Hammocks

The distribution of hammocks on Merritt Island is shown on the general vegetation map (Appendix Figure 2). Brief accounts are given of each hammock studied.

Happy Hammock

This hammock had the greatest number of plant species (76) among the stands examined (Table 2; species list in Appendix). The site was mesic with an organic soil (23.1%) (Table 3). Cation exchange capacity was 21.2

Herbaceous vegetation was not well developed and the coverage (ca. 16%) was largely contributed by fern (Nephrolepis cordifolia), Arisaema, and the grass Oplismenus (Appendix Table 2). A dense shrub layer was present at 15 stems per square meter (m^2) (Appendix Table 3; Appendix Figure 4). Data on the tree layer are summarized in Appendix Tables 4 and 5. Sabal palm had the greatest basal area with 4,918 square centimeters (cm^2) per 100 square meters (m^2) and was closely followed by live oak (3,182). In terms of importance values, the leading tree dominants were sabal palm, lancewood and live oak. The dominance-diversity curve for the tree layer is shown in Appendix Figure 5. Size-frequency distributions of tree species with 20 or more individuals included in the sample are shown in Appendix Figures 6, 7, 8, and 9. Most of the common trees were in the diameter class from 2.5 - 10.2 cm (1-4 in.).

Indian River Hammock

This hammock is located west of the Indian River in the north-west corner of the junction of Routes 405 and 1 (Appendix Figure 3). The site was quite hydric and had the most organic soil (36%) among the hammocks (Table 3). Cation exchange capacity was 29.9. A minimum of 58 plant species were on the site (Table 2; species list in Appendix).

Herbaceous cover was abundant (ca. 53%) and on a relative basis the fern Nephrolepis accounted for 56 percent (Appendix Table 6). Seventeen species of shrubs, tree seedlings and vines were present at an overall density of 13 stems per m^2 (Appendix Table 7). A high density (4.6 per m^2) of sabal palm seedlings was noteworthy. Dominance relations among the shrub species are shown in Appendix Figure 10. Absolute and relative estimates of density, frequency and basal area for the trees of the Indian River Hammock are summarized in Appendix Table 8 and 9. Leading tree dominants included pumpkin ash (Fraxinus tomentosa), sabal palm and red maple. Size-frequency distributions of sabal palm and pumpkin ash are given in Appendix Figures 11 and 12. The reproductive success of pumpkin ash was apparent from the observed range in individual size classes. A dominance-diversity curve for the tree layer is shown in Appendix Figure 13.

Table 2. The number of plant species encountered in nine hammocks.

	NUMBER OF SPECIES								
HABIT	Happy Hammock	Route 3 Hammock	Indian Mound Hammock	Ross' Hammock	Juniper Hammock	Indian River Hammock	Black Hammock	Jerome Road Hammock	Castle Windy Hammock
Trees	20	30	14	9	11	16	18	15	12
Shrubs	8	10	15	10	3	10	8	9	15
Herbs	28	22	3	10	15	17	21	31	10
Vines	13	10	4	10	6	8	13	10	9
Epiphytes	7	8	5	8	7	7	12	5	8
Total #	76	63	41	47	42	58	72	70	56

Table 3. Summary of soils data for nine hammocks from Merritt Island and east central Florida. Values for three hammocks (a) are seasonal means from Madsen (1979); whereas, the remaining values are single determinations from composite samples. These latter analyses were performed by the Soil Science Department, University of Florida.

Variable	Happy[a] Hammock	Indian River Hammock	Juniper[a] Hammock	Ross' Hammock	Route 3[a] Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average
pH	8.2	6.7	7.2	4.6	6.2	6.9	5.9	7.0	6.7	6.6
Na (ppm)	193.0	340.0	540.0	40.0	282.0	44.0	640.0	40.0	72.0	243.4
K (ppm)	26.0	20.0	101.0	12.0	43.0	16.0	68.0	60.0	16.0	40.2
Ca (ppm)	>1999.0	5600.0	>1999.0	40.0	>1999.0	520.0	2960.0	3200.0	3200.0	--
Mg (ppm)	>758.0	192.0	583.0	16.0	350.0	44.0	800.0	8.0	116.0	--
Al (ppm)	1.0	0.0	32.7	8.0	78.9	12.0	72.0	4.0	84.0	32.5
P (ppm)	6.9	1.8	>17.0	1.0	>36.5	8.6	2.6	512.0	1.4	--
Cl^- (ppm)	104.7	150.0	425.6	6.0	276.4	4.0	300.0	14.0	32.0	145.8
NO_3 (ppm)	15.7	520.0	18.6	<1.2	>63.0	20.0	6.6	168.0	196.0	--
Organic Matter (%)	23.1	36.1	16.0	0.9	10.5	1.4	12.3	8.3	3.2	12.4
Cation Exchange Capacity (meq/100g)	21.2	29.9	17.4	1.1	16.6	23.5	16.3	14.3	10.6	16.8

Juniper Hammock

This hammock had a relatively low number (42) of plant species (Table 2; species list in Appendix). The site was mesic with an organic soil (16%) (Table 3). Cation exchange capacity was 17.4.

Herbaceous cover was estimated to be ca. 34 percent (Appendix Table 10). The ground layer was dominated by sedges and grasses, and probably indicated past disturbance. The density of shrubs, tree seedlings and vines was 9.25 per m^2 (Appendix Table 11). The holly (*Ilex vomitoria*) was the most common shrub (3.1 per m^2). No seedlings of juniper were noted. The dominance-diversity curve is shown in Appendix Figure 14. Density, frequency and dominance-diversity measures on the tree layer are summarized in Appendix Tables 12 and 13 and Appendix Figure 15. Sabal palm was the leading dominant in terms of density, frequency and basal area (1472 cm^2 per 100 m^2) and ranked third in terms of importance value. Size-frequency distributions of sabal palm and *Ilex* are given in Appendix Figures 16 and 17. *Ilex*, as opposed to sabal, is largely represented by small (2.5-5.0 cm diam.) individuals.

Ross' Hammock

This hammock had a minimum of 47 plant species (Table 2; species list in Appendix). The site was xeric with a mineral soil (organic matter 0.9%) and the lowest cation exchange capacity among the hammocks studied (Table 3).

Herbaceous vegetation was poorly developed and coverage (8%) was meager (Appendix Table 14). Fourteen species of shrubs, tree seedlings and vines were recorded at a stem density of 9.6 per m^2 (Appendix Table 15). Seedlings of laurel oak and sabal palm were prominent in terms of density and frequency of occurrence. Dominance-diversity relations are shown in Appendix Figure 18. Density, frequency and dominance-diversity relations for the tree layer are given in Appendix Tables 16 and 17 and Appendix Figure 19. The leading dominant was laurel oak with a basal area of 1,993 cm^2 per 100 m^2. Both sabal palm and laurel oak showed a wide range in size classes, however the continued prominance of laurel oak appeared to be assured by its reproductive success (Appendix Figures 20 and 21).

Route 3 Hammock

This hammock had a relatively large number of plant species (63) (Table 2; species list in Appendix). The site was somewhat mesic with a fair amount (10.5%) of organic matter in the soil (Table 3). Cation exchange capacity was 16.6.

Herbaceous cover amounted to ca. 10 percent (Appendix Table 18). Shrubs, tree seedlings and vines were present at a density of 24 stems per m^2 (Appendix Table 19). Wild coffee (2 species) seedlings and vines, e.g., Toxicodendron, Parthenocissus, Smilax, and Vitis, were major contributors to the shrub layer density and dominance-diversity curve (Appendix Figure 22). Density, frequency and dominance-diversity data on the tree layer are given in Appendix Tables 20 and 21 and Appendix Figure 23. Sabal palm was the leading dominant with a basal area of 7,388 cm^2 per 100 m^2 and a size-frequency distribution which included individuals greater than 43 cm diameter at breast height (dbh) (17 in.) (Appendix Figure 24). Live oak basal area was estimated to be 2,155 cm^2 per 100 m^2. An examination of its size-frequency distribution suggested considerable reproductive success and a trend toward increased dominance in future years (Appendix Figure 25).

Indian Mound Hammock

This hammock had a minimum of 41 species of plants (Table 2; species list in Appendix). The site was xeric and the soil was highly mineral (1.4 percent organic matter) in composition (Table 3). Cation exchange capacity was, however, unusually high (23.5) and may have been influenced by a nearby shell mound which was slightly higher in elevation.

The herb layer was virtually non-existent. A single individual of Kalanchoe pinnata was encountered in the herb study plots. Shrub, tree seedlings and vine density was 10.3 stems per m^2 (Appendix Table 22). Cherry laurel (Prunus caroliniana) and Ardisia were prominent shrubs on the site. A dominance-diversity curve for the shrub layer is shown in Appendix Figure 26. Density, frequency and dominance-diversity relations among the tree species are given in Appendix Tables 23 and 24 and Appendix Figure 27. Persea borbonia was the leading tree dominant with a basal area of 1,747 cm^2 per 100 m^2. The size distribution of Persea indicated a recent history of reproductive success (Appendix Figure 28). Sabal plam and live oak also were prominent in terms of basal area. The site represented a northern limit in Florida for gumbo-limbo (Bursea simaruba), Eugenia foetida and leadwood (Krugiodendron ferreum).

Black Hammock

This hammock is located north of Oviedo, Florida near Lake Jessup. Drainage was altered by ditching many years ago. The number of plant species present was 72 and was second only to Happy Hammock (76) (Table 2; species list in Appendix). The site was hydric and the soil organic (12.5%) (Table 3). Cation exchange capacity was 16.3.

Herbaceous cover (ca. 27%) was well developed (Appendix Table 25). A considerably richer assemblage of herbs was present than appeared in the sample (See species list in Appendix). Twelve species of shrubs, tree seedlings, and vines were present at a density of 3.7 stems per m^2. (Appendix Table 26). The dominance-diversity curve for the shrub layer indicates that many of the less common species yielded similar importance values (Appendix Figure 29). Density, frequency and dominance-diversity data on the tree species are summarized in Appendix Tables 27 and 28 and Appendix Figure 30. In terms of basal area, sabal palm (2,810 cm^2 per 100 m^2) and red maple (1,477 cm per 100 m) were the most important trees. The size distribution of the sabal palm population is shown in Appendix Figure 31. Individuals range in size from 17-38 cm dbh (7-15 in. dbh).

Castle Windy Hammock

This hammock is located on the barrier strand between the Atlantic Ocean and Mosquito Lagoon in Volusia County (Canaveral National Seashore). The minimum number of plant species present is 56 (Table 2; species list in Appendix). The site was a shell mound, and the soil is 8.3 percent organic (Table 3). Cation exchange capacity is fairly high at 14.3.

A poorly developed herbaceous layer (six percent cover) was present (Appendix Table 29). An unusually high stem count of shrbs, tree seedlings and vines (31 per m^2) was recorded (Appendix Table 30). At least in part, the density was enhanced by the recovery of tropical shrubs such as Ardisia and Psychotria following the freeze-back in the winter of 1976-77. However, the species diversity of the shrub layer was as high as any recorded among the hammocks (Appendix Figure 32). Density, frequency and dominance relations among the tree species are summarized in Appendix Tables 31 and 32 and Appendix Figure 33. Live oak was a leading dominant in terms of basal area (3,252 cm^2 per 100 m^2) and was second to sabal palm in importance value. The size-frequency distribution of live oak included individuals greater than 78 cm dbh (31 in. dbh) (Appendix Figure 34). Sabal palms ranged in size from 20-38 cm dbh (8-15 in. dbh) (Appendix Figure 35).

Jerome Road Hammock

This site is located on a mineral soil (3.2 percent organic material) approximately 30 cm (12 in.) thick and overlaying limestone (Table 3). Cation exchange capacity was 10.6. A minimum of 70 plant species was recorded on the site (Table 2; species list in Appendix).

This hammock supported the richest herbaceous layer among the stands studied (31) and 12 species were included in the herb study plots. In spite of the high species number, coverage was ca. three percent (Appendix Table 33). Shrubs, tree seedlings and vines were found at a stem density of 6.9 per m^2 (Appendix Table 34). Seedlings of live oak (1.5 per m^2) and poison ivy (2.4 per m^2) were the most common species among the shrub layer. The dominance-diversity curve for the shrubs is shown in Appendix

Figure 36. Density, frequency and dominance-diversity statistics on the tree species are given in Appendix Tables 35 and 36 and Appendix Figure 37. Sabal palm, slash pine and live oak were the leading dominants among the trees. Sabal palm was estimated to have a basal area of 7,395 cm^2 per 100 m^2. Its site-frequency distribution ranged from 17 to 35 cm dbh (7-14 in. dbh) (Appendix Figure 38). The importance of slash pine in the stand (1,637 cm^2 per 100 m^2) supported the notion that the hammock had developed from a pine flatwood site.

Pine Flatwoods

The pine flatwood complex of Florida includes three phases: longleaf pine, slash pine, and pond pine. Five stands were analyzed to document the variation among these phases.

Wisconsin Village

This site is located at the north end of the shuttle runway (Appendix Figure 3). The soil is acid (pH 4.0), mineral (5.2 percent organic) with a cation exchange capacity of 7.17 meq./100 g (Table 4). Thirty-seven species of plants were found on the site (Table 5; species list in Appendix).

Absolute and relative coverage and frequency of the plants on the site are provided in Appendix Table 37. In terms of coverage, wire grass (32.5%), *Lyonia lucida* (24.5%), saw palmetto (24.6%) and dwarf liveoak (12.7%) were the most important plants among the 21 species recorded on the transects. The dominance-diversity curve was relatively flat and suggested a lack of pronounced dominance among the species (Appendix Figure 39).

A single large slash pine existed on the area and several seedlings (12-15 years old) were established. A small slash pine stand was located to the west of the site ca. 500 m. The site may have been cleared of pine in the past and regeneration was not immediately successful.

Headquarters Pineland

This site is located adjacent to and east of Route 3, to the north of KSC headquarters. The soil is acid (pH 4.3), mineral (2.3 percent organic) with a cation exchange capacity of 3.13 meq/100 g (Table 4). Thirty-nine species of plants were present (Table 5; species list in Appendix).

Data on the understory vegetation are summarized in Appendix Table 38. Shrub species, e.g., saw palmetto, *Lyonia lucida*, scrub live oak, and, myrtle oak were the leading dominants as measured by coverage, relative coverage and importance values. Wire grass, *Aristida stricta*,

Table 4. Summary of soils for five stands of pine flatwoods from Merritt Island and east central Florida. Values for three stands (a) are seasonal means from Madsen (1979); whereas, the remaining values are single determinations from composite samples. These latter analyses were performed by the Soil Science Department, University of Florida.

Variable		Wisconsin[a] Village	Head-quarters[a] Pineland	UCF Pineland	UCF Pond Pine	Volusia[a] Pineland	Stand Average
pH		4.1	4.4	4.3	3.5	5.3	4.3
Na	(ppm)	34.4	36.6	44.0	52.0	30.2	39.4
K	(ppm)	18.9	9.6	12.0	8.0	6.8	11.1
Ca	(ppm)	245.7	640.4	80.0	56.0	95.0	223.4
Mg	(ppm)	68.2	37.6	24.0	40.0	11.3	36.2
Al	(ppm)	27.8	15.2	32.0	360.0	123.6	111.7
P	(ppm)	1.3	2.9	0.6	0.6	10.0	3.1
Cl^-	(ppm)	11.9	12.1	12.0	12.0	10.1	11.6
NO_3	(ppm)	5.7	11.6	5.8	36.0	10.2	13.8
Organic Material (%)		5.2	2.3	2.1	4.7	1.4	3.1
Cation Exchange Capacity (meq/100g)		7.2	3.1	2.4	7.6	1.7	4.4

Table 5. The number of plant species encountered in pine flatwoods stands.

Habit	Number of Species				
	Wisconsin Village	Headquarters	UCF (Longleaf Pine)	UCF (Pond Pine)	Volusia
Trees	1	1	2	5	1
Shrubs	11	12	7	7	11
Sub-shrubs	8	6	7	3	4
Herbs	15	15	31	13	21
Vines	2	3	2	3	1
Epiphytes	0	2	0	0	0
Total #	37	39	49	31	38

ranked eighth in importance value, in contrast to number one on the Wisconsin Village site. A lack of recent fires on the area has favored the woody hardwoods at the expense of grass and herbs. The dominance-diversity curve for the understory species in shown in Appendix Figure 40.

Slash pine was not sufficiently common on the area to estimate its density by the point-centered quarter methodology. Twenty-five trees were measured on the site and their size-frequency distribution indicated two distinct size classes were present (Appendix Figure 41).

UCF Pine Flatwoods

This stand is located on the undeveloped portion of the campus of the University of Central Florida (Appendix Figure 3). The soil is acid (pH 4.3), mineral (2.1% organic) with a cation exchange capacity of 2.4 (Table 4). The area had a minimum of 49 plant species (Table 5; species list in Appendix).

Forty-seven species of grasses, herbs and shrubs were encountered on the line transects in the UCF pine flatwoods (Appendix Table 39). Grasses such as *Aristida spiciformis* and *Aristida stricta* were ranked two and three in importance values while saw palmetto was the leading dominant. A rich assemblage of herbs contributed to the relatively flat dominance-diversity curve (Appendix Figure 42). Longleaf pine, (*Pinus palustris*), was the dominant tree (IV = 289) and occurred at a density of 1.7 individuals per 100 m^2 (Appendix Table 40). The size-frequency distribution of longleaf pine showed the largest trees were 30-33 cm dbh (12-13 in. dbh) with the greatest number of trees in the 17-20 cm (7-8 in.) diameter class (Appendix Figure 43). A few pond pine, (*Pinus serotina*), were present.

UCF Pond Pine Flatwoods

This site is located on the campus of the University of Central Florida and is part of an ecological preserve (Appendix Figure 3). The site is low, relative to the surrounding landscape, and the watertable frequently is at or near the soil surface in the summer months. The soil is highly acid (pH 3.5) and mineral (4.7 percent organic matter) with a cation exchange capacity of 7.6 meq/100 g (Table 4). Thirty-one plant species were recorded as being present on the study area (Table 5; species list in Appendix).

Herbaceous cover was very limited (ca. 7%) in the pond pine stand (Appendix Table 41), in sharp contrast to the condition in the slash and longleaf pine stands. Abundance of shrubs, tree seedlings and vines was quite high (17 stems per m^2) and two shrubs, *Ilex glabra* (IV rank 1) and *Lyonia lucida* (IV rank 2) were the major contributors to the dense understory (Appendix Table 42). The dominance-diversity curve for the shrub layer is shown in Appendix Figure 44. Five tree species were present (Appendix Table 43). Pond pine, (Pinus serotina), was the leading dominant with a basal area of 2448 cm^2 per 100 m^2. Its size-frequency distribution is shown in Appendix Figure 45. Two bays, Gordonia lasianthus and Magnolia virginiana, a holly, (Ilex cassine), and blackgum, (Nyssa sylvatica), were found at low densities. The dominance-diversity for the tree species is shown in Appendix Figure 46.

Volusia Pineland

This site was located on the Canaveral National Seashore south and east of the junction of highways Route 3 and 1 (Appendix Figure 3). The soil is acid (pH 5.2), mineral (1.4 percent organic) with a cation exchange capacity of 4.4 (Table 4). A minimum of 38 plant species was found on the area (Table 5).

Frequency, coverage, and importance values of grass, herb, and shrub species are summarized in Appendix Table 44. A rich mixture of plants (29 species) was present; however, five of six leading dominants were shrubs. Wire grass, (Aristida stricta), was ranked third in importance value. A plot of the dominance-diversity curve of the understory plants revealed that many of the lesser species were of similar rank without a marked concentration of dominance (Appendix Figure 47). Density of slash pine was estimated to be 0.9 per 100 m^2 (Appendix Table 45). The size-frequency of the pine ranged from 7-33 cm dbh (3-13 in. dbh) (Appendix Figure 48).

Sand Pine Scrub

The scrub complex of Florida appears to have at least two phases, viz., sand pine scrub and coastal scrub. An analysis of the relationship among these phases is not the purpose here; therefore, data on sand pine scrub stands are reported separate from the coastal scrub stands. Six stands of sand pine scrub were examined in east central Florida.

UCF Sand Pine Scrub

This scrub is located on the campus of UCF and is designated as an ecological preserve (Appendix Figure 3). The soil is sandy (0.6 percent organic material), acid (pH 4.3) and nutrient deficient (Table 6). Cation exchange capacity is 0.8 meq/100 g. Of the 31 species of plants discovered, 19 were shrubs (Table 7; species list in Appendix).

Density, frequency and importance values of plants less than 50 cm tall are summarized in Appendix Table 46. Seedlings and root sprouts of myrtle oak were numerous. Herbs and vines were uncommon. Similar data

Table 6. Summary of soils data for six stands of sand pine scrub from east central Florida. Values are single determinations from composite samples, and were analyzed by the Soil Science Department, University of Florida.

Variable	UCF Sand Pine Scrub	Debary Sand Pine Scrub	Rt. 50 Sand Pine Scrub	Rt. 405 Sand Pine Scrub	Rockledge Sand Pine Scrub	Wekiva Sand Pine Scrub	Stand Average
pH	4.3	4.4	4.8	4.6	4.7	4.6	4.5
Na (ppm)	32.0	40.0	36.0	36.0	40.0	36.0	36.6
K (ppm)	4.0	8.0	4.0	4.0	8.0	8.0	6.0
Ca (ppm)	12.0	24.0	4.0	24.0	56.0	4.0	20.6
Mg (ppm)	4.0	8.0	12.0	8.0	12.0	8.0	8.6
Al (ppm)	4.0	36.0	0.0	4.0	12.0	4.0	10.0
P (ppm)	T[a]	1.0	T[a]	0.2	1.8	T[a]	-
Cl^- (ppm)	4.0	4.0	2.0	4.0	6.0	4.0	4.0
NO_3 (ppm)	38.0	2.4	5.0	1.5	2.4	5.6	9.1
Organic Material (%)	0.6	1.1	0.5	1.6	1.2	0.2	0.9
Cation Exchange Capacity (meq/100g)	0.8	1.2	0.4	1.4	1.6	2.7	1.3

T[a] = trace

on shrubs greater than 50 cm tall are given in Appendix Table 47. Leading dominants were myrtle oak and Lyonia ferruginea. Overall shrub density was estimated to be 3.4 m^2. A dominance-diversity curve for the shrub layer is shown in Appendix Figure 49. Data on tree species are shown in Appendix Table 48 and Appendix Figure 50. Sand pine was the dominant species (IV = 171). Lyonia ferruginea and live, myrtle and Chapman oaks were of lesser importance. Size-frequency distributions of the more common trees indicated that most individuals were in the 2.7 cm dbh (1-3 in. dbh) class; however, sand pine had a broad range of size (age) classes (Appendix Figures 51, 52, and 53).

Debary Sand Pine Scrub

This stand is located in Volusia County near Debary (Appendix Figure 3), where extensive stands of sand pine scrub occupy old dune lines formed near the present course of the St. Johns River. The soils are sandy (1.1 percent organic matter), acid (pH 4.4) and nutrient deficient (Table 6). Cation exchange capacity is 1.17 meq/100 g. A minimum of 29 species of plants were found on the area (Table 7).

Density, frequency, and importance values for plants less than 50 cm tall are summarized in Appendix Table 49. Myrtle oak root sprouts, gopher apple, (Licania michauxii) and milk pea, (Galactia mollis), were prominent elements. Data on shrubs greater than 50 cm in height are given in Appendix Table 50 and Appendix Figure 54. Myrtle oak and scrub bay, (Persea borbonia var. humilis), were ranked first and second in terms of importance values. Scrub sabal (Sabal etonia) was a noteworthy member of the community and was not discovered in any stands to the south or east of this site. Statistics on density, frequency and basal area of trees are provided in Appendix Table 51. Sand pine was the leading dominant (IV = 196.4) and myrtle oak was second (IV = 37.4). The dominance-diversity curve for the tree layer is given in Appendix Figure 55. The size distribution of sand pine included trees from 2 to 5 cm diameter class through 27-30 cm dbh (11-12 in. dbh) (Appendix Figure 56). In contrast, the myrtle oaks were small (2-4 cm dbh) (Appendix Figure 57).

Route 50 Sand Pine Scrub

This site is located in Orange County immediately south of Route 50 at its intersection with Route 520 (Appendix Figure 3). The soil is sandy, contains little organic material (0.5%) and is acid (pH 4.8) (Table 6). Cation exchange capacity is 0.39 meq/100 g. The number of species of plants on the site (38) exceeded other sand pine scrub areas examined (Table 7; species list in Appendix).

Statistics on plants less than 50 cm in height are summarized in Appendix Table 52. Nineteen species were encountered in these samples. Myrtle oak (IV 41.9) and Gaylussacia dumosa (IV = 40.8) were the leading dominants. Density, frequency, and importance values for the shrub

Table 7. The number of plant species encountered in six stands of Sand Pine scrub.

Habit	UCF Sand Pine Scrub	Debary Sand Pine Scrub	Route 50 Scrub	Route 405 Scrub	Rockledge Scrub	Wekiva Scrub
Trees	1	1	1	1	1	1
Shrubs	19	14	17	13	13	12
Herbs	7	6	15	4	5	3
Vines	2	5	2	0	4	2
Epiphytes	2	3	3	2	4	2
Total #	31	29	38	20	27	20

species greater than 50 cm in height are given in Appendix Table 53 and Appendix Figure 58. Overall stem density was 1.9 per m^2. Myrtle oak (.8 per m^2) and Lyonia ferruginea (.4 per m^2) were the most important shrubs. Statistics on trees are given in Appendix Table 54. This stand was unusual in that terms of density and frequency measures, the five tree species were very similar. Sand pine, however, was clearly dominant in terms of basal area (238.2 cm^2 per 100 m^2). The dominance-diversity curve reflected the relative similarity in importance among the tree species (Appendix Figure 59). Size-frequency distribution of live oak was indicative of a species which had had good reproductive success in past years (Appendix Figure 60). Most individuals of Chapman oak, myrtle oak, and Lyonia ferruginea were in the 2-5 cm dbh class (Appendix Figures 61, 62, and 63).

Route 405 Sand Pine Scrub

This site is east of Rt. 405, on a series of old dunes now vegetated with sand pine scrub (Appendix Figure 3). The soil is mineral (1.6 percent organic material), acid (pH 4.6), and nutrient deficient (Table 6). Cation exchange capacity is 1.44 meq/100 g. A minimum of 20 species of plants was identified (Table 7; species list in Appendix).

Myrtle oak was the most commonly encountered species among plants less than 50 cm tall (Appendix Table 55). Among the shrubs, myrtle oak occurred at the greatest density (1.6 per m^2) (Appendix Table 56). Seedlings of sand pine were notably abundant (.09 per m^2), in contrast to the other study sites. A dominance-diversity curve for the shrubs is given in Appendix Figure 64. Sand pine was the dominant tree (basal area 1860 cm^2 per 100 m^2) with an importance value of 243 (Appendix Table 57 and Appendix Figure 65). Basal area of scrub hickory (49.1) was more than double that of the oaks. Examination of the size-frequency distribution of the sand pine indicated a few large (old) individuals and numerous smaller trees (2-12 cm in diameter) (Appendix Figure 66).

Rockledge Scrub

This site is in Rockledge on Route 1 (Appendix Figure 3). Old dunes are vegetated with sand pine scrub. The soil is mineral (1.2 percent organic material), acid (pH 4.7), and nutrient poor. Cation exchange capacity is 1.58 meq/100 g (Table 6). Twenty-seven plant species were noted on the area (Table 7; species list in Appendix).

Fifteen species of plants were found among those less than 50 cm in height (Appendix Table 58). Live oak (4.3 per m^2) and myrtle oak (3.4 per m^2), were major elements of the ground cover. Importance values of shrubs greater than 50 cm in height are summarized in Appendix Table 59 and Appendix Figure 67. Shrub density was estimated to be 2.1 stems per m^2. Myrtle oak and live oak were major contributors to the shrub layer.

Sand pine and live oak were the major tree species (Appendix Table 60). The dominance-diversity curve was steep and indicated dominance by sand pine (Appendix Figure 68). The size distribution of sand pine suggested the stand was regenerated over several years rather than as one reseeding episode (Appendix Figure 69). The slower growing live oak were distinctly smaller than the sand pine (Appendix Figure 70).

Wekiva Sand Pine Scrub

This site is located in Seminole County on Wekiva State Park. The soil is sandy (0.2 percent organic material), acid (pH 4.6), and nutrient deficient (Table 6). Cation exchange capacity was 2.72 meq/100 g. Twenty plant species were identified on the site (Table 7; species list in Appendix).

Based on importance values for plants less than 50 cm in height, myrtle oak, green-brier and live oak were the leading dominants (Appendix Table 61). Density, frequency and importance values for shrubs greater than 50 cm in height are given in Appendix Table 62. Myrtle oak (IV = 83.9) and saw palmetto (IV = 35.8) were leading elements. Shrub stem density was estimated to be 1.5 m^2 of which myrtle oak contributed to 0.7 per m^2. Dominance-diversity curve for the shrub layer is shown in Appendix Figure 71. Statistics on the tree species are presented in Appendix Table 63 and Appendix Figure 72. Sand pine (IV = 100.8) had a basal area of 1394 cm^2 per 100 m^2. Myrtle oak was ranked second in terms of importance value at 90.8. Size-frequency distributions for myrtle and Chapman oak indicated myrtle had a few large and many smaller individuals (Appendix Figures 73 and 74). Most of the Chapman oak were 2-5 cm dbh.

Coastal Scrub

Coastal scrub is a phase of scrub vegetation which appears to be a temporary stage that may tend toward features of xeric flatwoods, sand pine scrub or xeric coastal hammock. Results of analysis of six stands are reported here.

Dune Scrub Grid

This site is located on the northern portion of Cape Canaveral (Appendix Figure 3). The sandy soil has 1.3 percent organic material and a pH of 4.79. Cation exchange capacity is 1.3 meq/100 g (Table 8). Seventeen species of plants were discovered (Table 9; species list in Appendix).

Densities and frequency of plants less than 50 cm tall are given in Appendix Table 64. Myrtle and live oak were the leading elements. Shrubs (50 cm or greater in height) were fairly dense with an average of 2.9 per m^2 (Appendix Table 65). The dominance-diversity curve for the shrubs is shown in Appendix Figure 75. Rosemary, Ceratiola ericoides (IV = 53.6) and myrtle oak, (IV = 52.4) were the dominant shrub species. No trees were present on the sample area. A single sand pine was growing ca. 100 m north of the study area.

Happy Creek Scrub

This site is north of Happy Creek Road (Appendix Figure 3). The soil is sandy, low in organic material (1.7%) and has a distinct yellow sub-surface sand overlaid with gray sand (Table 8). Cation exchange capacity is 1.18 meq/100 g. Twenty-four plant species were located on the site (Table 9; species list in Appendix).

Density, frequency, and importance values for grasses, herbs, vines, and shrubs less than 50 cm in height are summarized in Appendix Table 66. Myrtle oak was first in importance value. Other shrubs also were prominent. Wire grass, (Aristida stricta), was fifth with an importance value of 17.8. Data on shrubs greater than 50 cm in height are summarized in Appendix Table 67 and Appendix Figure 76. An average stem density of 4.6 per m^2 was indicated. Myrtle oak (IV = 70.4) and saw palmetto (IV = 41.3) were the leading species. Typical flatwoods species, e.g., Befaria racemosa and Lyonia lucidia, were fairly common.

Route 3 Scrub

This site is near the southern terminus of the coastal scrub on north Merritt Island (Appendix Figures 2 and 3). The soil is sandy and acid (pH 4.3), but the organic content (3.75%) was twice that of the other scrub stands (Table 8). Cation exchange capacity was 2.40 meq/100 g. Twenty-seven species of plants were observed on the area (Table 9; species list in Appendix).

Data on plants less than 50 cm tall are given in Appendix Table 68. Myrtle oak and blueberry, (Vaccinium myrsinites), were ranked one and two according to importance value. Most of the plants were typical scrub species, but a few species were characteristic of flatwoods, e.g., Befaria racemosa and Lyonia lucida. Density, frequency, and importance values for shrubs greater than 50 cm in height are summarized in Appendix Table 69 and Appendix Figure 77. Myrtle oak and saw palmetto were the leading dominants with respect to density, frequency, and importance values. Stem density of shrubs was estimated to be 4.6 per m^2.

Ground Winds Tower Scrub

This site is located east of LC 39B (Appendix Figure 3). The soil is mineral (1.75 percent organic material), acid (pH 4.09) and has a cation exchange capacity of 2.25 meq/100 g (Table 8). The largest number

Table 8. Summary of soils data for six stands of coastal scrub from Merritt Island, Florida. Values for three stands (a) are seasonal means from Madsen (1979); whereas, the remaining values are single determinations from composite samples. These latter analyses were performed by the Soil Science Department, University of Florida.

Variable	Dune[a] Scrub	Happy[a] Creek	Route 3 Scrub	Wind Tower[a] Scrub	Cape Rosemary Scrub	Complex 34	Stand Average
pH	4.8	4.1	4.3	4.1	6.0	5.1	4.7
Na (ppm)	35.2	31.9	44.0	32.7	44.0	44.0	38.6
K (ppm)	11.3	10.2	12.0	9.7	4.0	12.0	9.8
Ca (ppm)	141.0	88.5	32.0	109.9	520.0	100.0	165.2
Mg (ppm)	20.4	13.0	16.0	20.4	8.0	16.0	15.6
Al (ppm)	6.1	27.6	8.0	8.6	4.0	4.0	9.7
P (ppm)	0.8	1.4	0.8	0.5	2.0	2.0	1.2
Cl^- (ppm)	11.7	9.1	6.0	10.1	6.0	8.0	8.5
NO_3 (ppm)	8.6	9.4	<1.2	8.6	3.2	3.6	-
Organic Material (%)	1.3	1.7	3.7	1.7	0.4	1.8	1.8
Cation Exchange Capacity (meq/100g)	1.3	1.2	2.4	2.2	0.7	3.5	1.9

Table 9. The number of plant species encountered in six stands representative of coastal scrub vegetation on Merritt Island

Habit	Dune Scrub Grid	Happy Creek Scrub	Route 3 Scrub	Wind Tower Scrub	Cape Rosemary	Complex 34 Scrub
Tree	0	0	0	1	0	2
Shrub	8	11	13	12	8	4
Sub-shrubs	3	5	4	6	2	0
Herbs	1	6	6	16	0	0
Vines	3	2	2	2	1	2
Epiphytes	2	0	2	0	0	0
Total #	17	24	27	37	11	8

number of plant species (37) among the scrub stands was observed on this site (Table 9; species list in Appendix).

Data on density, frequency and importance values of plants less than 50 cm in height are given in Appendix Table 70. These samples revealed a considerable diversity of herbaceous plants relative to the other scrub stands (Table 9), but woody plants still were the leading dominants. Among the shrubs greater than 50 cm in height, myrtle oak (IV = 58.2) and saw palmetto (IV = 33.5) were most important (Appendix Table 71 and Appendix Figure 78). Typical flatwoods species, viz., Lyonia lucidia and Befaria racemosa, were well represented.

Cape Rosemary Scrub

This site is located on Cape Canaveral approximately .5 km south of LC 40 (Appendix Figure 3). The surface sand is white and the pH is 6.0 (Table 8). Little organic material is present (0.4%) and the cation exchange capacity is 0.66 meq/100 g. Eleven species of plants were observed on the area (Table 9; species list in Appendix).

Among the plants less than 50 cm in height, 9 species were woody shrubs and one was a vine (Appendix Table 72). Vaccinium myrsinites and Lyonia ferruginea were the leading elements. Data on shrubs are summarized in Appendix Table 73 and Appendix Figure 79. Rosemary, Ceratiola ericoides, was the major species with an importance value of 101.0. Myrtle oak was ranked second. Stem density of shrubs was a modest .76 per m^2.

Complex 34 Scrub

This site is located on Cape Canaveral (Appendix Figure 3). The soil is mineral (1.8% organic matter), and acid (pH 5.1), with a cation exchange capacity of 3.50 meq/100 g (Table 8). Only eight species of plants were discovered on the site (Table 9; species list in Appendix).

Very little vegetation was present in the less than 50 cm height class (Appendix Table 74). Root sprouts and seedlings of scrub oak, Quercus virginiana var. maritima and live oak, Quercus v. var. virginiana, were most frequently found. Two vines were present. In the shrub layer, saw palmetto (IV = 137.7) was the dominant plant species, whereas myrtle oak was ranked fifth (IV = 5.5) Appendix Table 75 and Appendix Figure 80). Stem density of shrubs was .88 per m^2. This site differed from the other scrub areas in that a distinct tree layer was present (Appendix Table 76). The two varieties of live oak (virginiana and maritima) were co-existing with the leading dominant, myrtle oak (IV = 122.2). Analysis of the size-frequency distribution of myrtle oak indicated most of the stems were in the diameter range of 2-7 cm (Appendix Figure 81). Live oak, Quercus v. var. virginiana specimens of larger diameter than myrtle oak were recorded (Appendix Figure 82); however, scrub oak, Quercus v. var. maritima were present in the greatest number at the larger size classes (Appendix Figure 83). A dominance-diversity curve for the tree layer is shown in Appendix Figure 84. This stand revealed the potential of coastal scrub to grow into the life-form of a hammock.

Coastal Dunes

The data reported in this section represent the results of study of primary dune vegetation in what is generally referred to as the sea oats zone. Much of the coastal vegetation of Merritt Island and the Canaveral Peninsula has been disturbed over the past three decades. More recently, beach erosion has contributed to the loss of this habitat type.

The coastal dune habitat includes, as a rule, the area from the high tide line to a point somewhere between the primary and secondary dune crest. Exact delineation must be done in the field, but as a rule the inland limit of sea oats marks the limits of the coastal dune community as used here.

Beyond the coastal dune community, and continuous with it extends the coastal strand.

Beach Grid Zone 1

This site is located on the beach between LC40 and LC41 on Cape Canaveral (Appendix Figure 3). The pH of the sandy soil was 8.5 and the organic matter content was 6.2 percent (Table 10). Cation exchange capacity was 0.35 meq/100 g. A total of 26 plant species were encountered (Table 11; species list in Appendix).

Frequency and cover values for the 24 species recorded from line transects are given in Appendix Table 77. A sunflower, Heterotheca subaxillaris (IV = 34.4) and sea oats, Uniola paniculata (IV = 23.8) were the dominant species as indicated by importance values. The dominance-diversity curve was relatively flat and suggested a lack of pronounced dominance by any species (Appendix Figure 85).

Beach Grid Zone 2

This site is adjacent to and inland from the previously described stand. The sandy soil had a pH of 8.4 and the organic component was 5.2 percent (Table 10). Cation exchange capacity was 0.26. Eighteen plant species were found (Table 11; species list in Appendix).

Table 10. Summary of soils data for three stands from the coastal dunes of Merritt Island. Values for two stands (a) are seasonal means from Madsen (1979); whereas, the remaining values are single determinations from composite samples. These latter analyses were performed by the Soil Science Department, University of Florida.

Variable	Beach Grid[a] Zone 1	Beach Grid[a] Zone 2	LC 39-B Beach	Stand Average
pH	8.5	8.4	7.1	8.0
Na (ppm)	90.7	93.0	100.0	94.5
K (ppm)	6.0	7.0	8.0	7.0
Ca (ppm)	>1999.0	>1999.0	5200.0	-
Mg (ppm)	39.4	33.9	52.0	41.8
Al (ppm)	3.0	5.6	0.0	2.8
P (ppm)	27.2	>47.7	14.0	-
Cl^- (ppm)	12.2	15.4	17.2	15.1
NO_3 (ppm)	12.6	15.4	17.2	15.1
Organic Material (%)	6.2	5.2	7.2	6.2
Cation Exchange Capacity (meq/100g)	0.3	0.2	0.4	0.3

Table 11. The number of plant species encountered in three stands representative of coastal dune vegetation on Merritt Island.

Habit	Beach Grid Zone 1	Beach Grid Zone 2	LC 39-B Beach
Shrubs	9	6	6
Herbs	15	8	7
Vines	2	4	1
Epiphytes	0	0	0
Total #	26	18	14

Data on frequency, cover and importance values for the species are provided in Appendix Table 78. Sea oats ranked fifth with an importance value of 10.8. Saw palmetto (IV = 72.7) and sea grape Coccoloba uvifera (IV = 31.7) were the dominant species in terms of cover and frequency of occurrence. The dominance-diversity curve illustrated the concentration of dominance in a few species (Appendix Figure 86).

LC 39-B Beach

This site is on the primary dune opposite LC 39-B (Appendix Figure 3). The sandy soil was nearly neutral in pH (7.1) and was 7.2 percent organic material (Table 10). Cation exchange capacity was 0.39 meq/100 g. Fourteen plant species were found on the site (Table 11; species list in Appendix).

Appendix Table 79 summarizes frequency, coverage and importance values of the plants encountered on the transects. Sea oats (IV = 58.5) was the plant with greatest coverage (2838 cm). Atriplex arenaria and an unidentified composite were ranked second and third in importance values. The dominance-diversity curve is shown in Appendix Figure 87.

Coastal Strand

The general distribution of coastal strand vegetation is shown in Appendix Figure 2. Coastal strand is dominated by shrubs with little or no development of ground layer vegetation with the exception of seedlings or root sprouts. Often the shrubs exhibit a hedged appearance owing to the effects of salt spray.

The strands were analyzed.

Beach Grid Zone 3

This site is continuous with and landward from the two coastal dune stands described in the previous section (Appendix Figure 3). The soil was basic (pH 7.63) and contained 5.2 percent organic material (Table 12). Cation exchange capacity was 0.46 meq/100 g. Twenty-six species of plants were found on the area (Table 13; species list in Appendix).

Summarized in Appendix Table 80 are coverage, frequency, and importance values for the nine species encountered on the transects. Saw palmetto was the dominant species with a relative cover of 65.3%. Wax myrtle (IV = 28.1), buckthorn (IV = 26.5) and Chiococca alba (IV = 23.9) were closely ranked in overall importance. The dominance-diversity curve was relatively steep (Appendix Figure 88). In summary, vegetation cover was continuous, with saw palmetto, alone, intercepting 67 percent of the total transect length.

Table 12. Summary of soils data for two stands of coastal strand from Merritt Island, Florida. Values for the Beach Grid are based on seasonal means from Madsen (1979); whereas, the remaining values are single determinations from a composite sample. These latter analyses were performed by the Soil Science Department, University of Florida.

Variable	Beach Grid Zone 3	Canaveral Strand	Stand Average
pH	7.6	7.1	7.3
Na (ppm)	95.5	96.0	95.7
K (ppm)	11.4	20.0	15.7
Ca (ppm)	>1999.0	5200.0	-
Mg (ppm)	32.5	96.0	64.2
Al (ppm)	6.5	24.0	15.2
P (ppm)	>50.7	107.6	-
Cl^- (ppm)	14.0	18.0	6.0
NO_3 (ppm)	19.2	74.0	46.6
Organic Material (%)	5.2	4.7	4.9
Cation Exchange Capacity (meq/100g)	0.5	10.6	5.5

Table 13. The number of plant species encountered in two stands representative of coastal vegetation on Merritt Island.

Habit	Beach Grid Zone 3	Canaveral Strand
Shrubs	16	7
Herbs	9	0
Vines	1	0
Epiphytes	0	0
Total #	26	7

Canaveral Strand

This site is located north of LC 41 on Cape Canaveral (Appendix Figure 3). The soil is near neutral pH at 7.1, and organic material amounted to 4.7 percent (Table 12). Cation exchange capactiy was 4.7 meq/100 g. Seven species of shrubs were found (Table 13; species list in Appendix).

Plant abundance data are given in Appendix Table 81. Saw palmetto was the dominant species and intercepted 80 percent of the total transect (6044 cm/7500 cm). Five other shrubs were enumerated. The dominance-diversity curve was very steep (Appendix Figure 89).

Community Analysis

This section examines the similarities and differences among the stands of the particular community types. A community is a group of species populations that occupy or share a specified place at some time. No attempt has been made to apply rigorous standards in the assignment of stands to community types. None the less, in terms of plant species composition, life form or physiognomy, and physical setting, the stands do fall into natural groupings. Variation among stands regarded as belonging to a common community type is examined with respect to the species composition of the growth forms, i.e., trees, shrubs, and herbs, and the relative importance of species within stands and among stands. Prominence of species, when evaluated strictly from a structural viewpoint, may be quantified on the basis of density, frequency of occurrence, or some measure of ecologic dominance. A convenient synthetic index to prominence is the importance value (IV). This index has been employed where it is possible to reduce comparisons among species to an equivalent basis.

Hammocks

Two trees, *Sabal palmetto* and *Quercus v.* var. *virginiana* were characteristic of most hammocks with constancy values (percentage of occurrence among series of stands) of 100 percent and 77 percent. Among the nine stands, only *Sabal palmetto* occurred in each stand. Its overall frequency of occurrence was 76 percent (Table 14). *Quercus v.* var. *virginiana* was the next most widespread tree (seven of nine stands) with an average frequency of 24 percent. Among the other 41 species of trees, frequencies ranged from 0.22 to 16 percent and indicated wide variation in tree species composition among the hammocks studied.

Frequency of occurrence within hammocks also revealed the prominence of *Sabal palmetto* (Table 14). For example, it was found at 96 percent of the sample points in Jerome Road Hammock. Other species with very high frequencies within specific stands were *Quercus v.* var. *virginiana*, *Q. laurifolia*, *Ilex vomitoria*, and *Persea borbonia*.

Table 14. Frequency (percentage) of occurrence of tree species in sample points from nine east central Florida hammocks.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Ross' Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average $\bar{X}$	Stand Average S.D.
Morus rubra	30.6	3.0		3.3	20.0		17.0	6.7		8.95	11.0
Sabal palmetto	69.3	73.0	93.3	73.3	90.0	26.6	83.0	80.0	96.6	76.12	20.87
Nectandra coriacea	65.3	10.0								8.36	21.60
Citrus sinensis	6.1				3.0			3.3		1.37	2.23
Myrsine guianensis	36.7				10.0				6.6	5.92	12.11
Myrcianthes fragrans	10.2	6.0						23.3		4.38	7.98
Ulmus americana	10.2	16.0			16.0		3.0			5.02	7.05
Forestiera segregata	2.0							16.7		2.07	5.52
Bumelia reclinata	2.0									.22	.66
Celtis laevigata	8.1	3.0			13.0		17.0	10.0		5.67	6.54
Acer negundo	2.0									.22	.66
Ficus aurea	2.0					3.3				.58	1.21
Quercus v. var. virginiana	6.1		40.0	13.3	70.0	20.0		50.0	23.3	24.74	24.09
Persea palustris	2.0				3.0		7.0			1.33	2.39
Fraxinus tomentosa		70.0					30.0			11.11	24.20
Acer rubrum		33.0					27.0			6.66	13.31
Quercus laurifolia		40.0		76.6			20.0	3.3	10.0	16.65	26.17
Carya glabra		6.0	23.3	50.0						8.81	17.24
Zanthoxylum clava-herculis		3.0								.33	1.0
Ilex vomitoria			83.3	13.3				40.0		15.17	28.81
Carya aquatica			3.3							.36	1.10
Juniperus silicicola			30.0	6.6				13.3		5.54	10.26
Magnolia graniflora				30.0						3.33	10.00
Osmanthus a. var. americanus				6.6						.73	2.20
Myrica cerifera					6.0				20.0	2.88	6.71
Prunus caroliniana					6.0	26.6				3.62	8.84
Ardisia escallonioides						33.3				3.70	11.10
Persea borbonia						93.3		20.0		12.58	30.98
Eugenia axillaris						16.6				1.84	5.53
Eugenia foetida						3.3				.36	1.10
Chiococca alba						3.3				.36	1.10
Bursea simaruba						6.6				.73	2.20
Quercus nigra						3.3				.36	1.10
Bumelia tenax						3.3				.36	1.10
Carya floridana						6.6				.73	2.20
Nyssa sylvatica var. biflora							10.0			1.11	3.33
Magnolia virginiana							23.0			2.55	7.66
Sambucus simpsonii							17.0			1.88	5.66
Liquidambar styraciflua							7.0			.77	2.33
Zanthoxylum fagara								13.3		1.47	4.43
Pinus elliottii var. densa									20.0	2.22	6.66
Ilex cassine									3.3	.36	1.10
Rhus copallina									3.3	.36	1.10

Tree density averaged 14.7 stems per 100 m^2 (SD = 5.9) and ranged from 7.8 (Ross' Hammock) to 24.9 (Happy Hamock) (Table 15). Sabal palmetto had the highest density among stands (5.35) and the highest density within stands (11.3). Nectandra coriacea (8.5 per 100 m^2) and Persea borbonia (9.4 per 100 m^2) were very abundant in single stands.

Basal area of trees ranged from 38.4 m^2 per hectare (ha) to 99 m^2 per ha (Table 16). The stands had an average basal area of 70.4 m^2 per ha. Leading tree species among stands were Sabal palmetto (34.8 m^2 per ha) and Quercus v. var. virginiana (13.5 m^2 per ha). High basal area of Sabal was the result of relatively uniform frequency and high density among all the stands. In contrast, Q. v. var. virginiana achieved substantial basal area in Happy Hammock and Castle Windy Hammock, primarily as a result of size of individual trees rather than owing to its frequency and density. Other trees that were significant among the stands in terms of basal area included Fraxinus tomentosa, Acer rubrum, Q. laurifolia and Persea borbonia.

The importance values of the 43 tree species ranged from a low of 0.11 (Acer negundo) to a high of 111.22 (Sabal palmetto) (Table 17). Among the stands, Sabal palmetto ranked first and Q. v. var. virginiana (IV = 37.88) second. Within the stands, Sabal ranked first in importance value at six sites and second at the remaining three. Out of a possible IV of 300, Sabal had a value of 191 at Jerome Road Hammock. Other exceptionally high values were indicated for Quercus laurifolia (IV = 99) in Ross' Hammock and for Persea borbonia (IV = 136) in the Indian Mound Hammock.

Fifty-three species of tree seedlings, shrubs and vines were encountered among the nine hammocks (Table 18). Sabal palmetto seedlings occurred in all the hammocks (100 percent constancy) with an average frequency of 45.7 percent. Among the shrubs, wild coffee, Psychotria nervosa, was most prominent with a frequency of 30 percent. The species that appeared to be characteristic of hammocks over a wide range of conditions were Sabal palmetto, Toxicodendron radicans, Smilax bona-nox, Quercus v. var. virginiana, and Psychotria nervosa.

Stem densities of tree seedlings, shrubs and vines averaged 13.8 (SD = 8.75) among the nine hammocks (Table 19). A considerable range in densities was evident from a high of 31 per m^2 in Castle Windy Hammock to 3.7 per m^2 in Black Hammock. In terms of density, the most common species were Psychotria nervosa, Sabal palmetto, Ardisia escalloniodes and Psychotria sulzneri. The highest density recorded for a shrub was Psychotria nervosa in Castle Windy Hammock, 13.43 per m^2.

In the shrub layer of the nine hammocks, seedlings of Sabal yielded the highest importance value (IV = 28.4) (Table 20). The shrub, Psychotria nervosa, was ranked second (IV = 21.3) and a vine, Toxicodendron radicans, third (IV = 15.8). Seedlings of Quercus v. virginiana were ranked fifth in importance value (11.1).

Table 15. Density (number per 100 m^2) of tree species from nine east central Florida hammocks.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Rose* Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average $\overline{X}$	Stand Average S.D.
Morus rubra	2.8	0.1		0.1	1.2		0.5	0.2		.54	.93
Sabal palmetto	7.0	3.1	4.5	2.3	11.3	1.2	4.6	3.9	10.3	5.35	3.49
Nectandra coriacea	8.5	0.7								1.02	2.81
Citrus sinensis	0.2				0.2			0.1		.05	.08
Myrsine guianensis	3.4				0.7				0.3	.48	1.11
Myrcianthes fragrans	0.8	0.2						0.9		.21	.36
Ulmus americana	0.5	0.6			1.2		0.1			.26	.42
Forestiera segregata	0.1							0.5		.06	.16
Bumelia reclinata	0.1									.01	.03
Celtis laevigata	0.8	0.1			0.7		0.7	0.3		.28	.34
Acer negundo	0.1									.01	.03
Ficus aurea	0.1					0.1				0.02	0.04
Quercus virginiana var. *virginiana*	0.4		1.3	0.4	6.9	0.8		1.9	1.3	1.44	2.14
Persea palustris	0.1				0.2		0.3			.06	.11
Fraxinus tomentosa		3.8					0.9			.52	1.26
Acer rubrum		1.3					0.9			.24	.49
Quercus laurifolia		1.6		2.2			0.6	0.1	0.5	.55	.80
Carya glabra		0.4	0.6	1.0						.22	.36
Zanthoxylum clava-herculis		0.1								.01	.03
Ilex vomitoria			3.0	0.6				1.8		.60	1.08
Carya aquatica			0.1							.01	.03
Juniperus silicicola			0.8	0.1				0.4		.14	.27
Magnolia grandiflora				1.0						.11	.33
Osmanthus americanus var. *americanus*				0.1						.01	.03
Myrica cerifera					0.2				1.3	.16	.43
Prunus caroliniana					0.5	1.4				.21	.47
Ardisia escallonioides						2.1				.23	.70
Persea borbonia						9.4		0.7		1.12	3.11
Eugenia axillaris						0.8				.08	0.26
Eugenia foetida						0.1				.01	.03
Chiococca alba						0.1				.01	.03
Bursera simaruba						0.3				.03	.10
Quercus nigra						0.1				.01	.03
Bumelia tenax						0.1				.01	.03
Carya floridana						0.3				.03	.01
Nyssa sylvatica var. *biflora*							0.3			.03	.01
Magnolia virginiana							0.9			.10	.30
Sambucus simpsonii							0.8			.08	0.26
Liquidambar styraciflua							0.3			.03	.01
Zanthoxylum fagara								0.4		.04	.13
Pinus elliottii var. *densa*									1.9	.21	.63
Ilex cassine									0.1	.01	.03
Rhus copallina									0.3	.03	.01
Total	24.90	12.00	10.30	7.8	23.10	16.80	10.90	11.2	16.00	14.7	5.93

Table 16. Basal area (cm^2 per 100 m^2) of tree species from nine east central Florida hammocks.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Ross' Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average $\bar{X}$	Stand Average S.D.
Morus rubra	225	1		1	14		175	59		52.77	86.50
Sabal palmetto	4918	1747	2246	1314	7388	978	2811	2615	7375	3488.00	2479.51
Nectandra coriacea	188	8								21.77	62.38
Citrus sinensis	6				2			8		1.77	3.07
Myrsine guianensis	42				4				2	5.33	13.82
Myrcianthes fragrans	21	10						93		13.77	30.58
Ulmus americana	75	139			29		195			48.66	72.88
Forestiera segregata	1							42		4.77	13.96
Bumelia reclinata	1									.11	.33
Celtis laevigata	56	1			6		730	52		93.88	239.64
Acer negundo	56									6.22	18.66
Ficus aurea	70					227				33.00	76.34
Quercus v. var. *virginiana*	3182		1473	718	2155	541		3253	802	1347.11	1256.97
Persea palustris	1				1		195			21.88	64.91
Fraxinus tomentosa		2066					934			333.33	719.43
Acer rubrum		1669					1478			349.66	695.48
Quercus laurifolia		771		1993			674	2	70	390.00	676.08
Carya glabra		19	560	596						130.55	253.91
Zanthoxylum clava-herculis		0.4								.04	0.13
Ilex vomitoria			44	4				20		7.55	15.15
Carya aquatica			38							4.22	12.66
Juniperus silicicola			369	59				225		72.55	133.64
Magnolia grandiflora				96						10.66	32.00
Osmanthus a. var. *americanus*				4						0.44	1.33
Myrica cerifera					36				13	5.44	12.23
Prunus caroliniana					8	23				3.44	7.79
Ardisia escallonioides						15				1.66	5.00
Persea borbonia						1747		373		235.55	580.06
Eugenia axillaris						9				1.00	3.00
Eugenia foetida						1				.11	.33
Chiococca alba						1				.11	.33
Bursea simaruba						232				25.77	77.33
Quercus nigra						13				1.44	4.33
Bumelia tenax						20				2.22	6.66
Carya floridana						33				3.66	11.00
Nyssa sylvatica var. *biflora*							216			24.00	72.00
Magnolia virginiana							931			103.44	310.33
Sambucus simpsonii							42			4.66	14.00
Liquidambar styraciflua							31			3.44	10.33
Zanthoxylum fagara								47		5.22	15.66
Pinus elliottii var. *densa*									1637	181.88	545.66
Ilex cassine									1	.11	.33
Rhus copallina									1	.11	.33
Total Basal Area	8842	6431.4	4730	4785	9643	3840	8412	6789	9901		

Table 17. Importance values (IV = relative frequency + relative density + relative dominance) of tree species from nine east central Florida hammocks.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Ross' Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average $\bar{X}$	Stand Average S.D.
Morus rubra	25	2		2	13		13	5		6.66	8.63
Sabal palmetto	110	81	125	83	161	41	107	102	191	111.22	44.40
Nectandra coriacea	61	12								8.11	20.22
Citrus sinensis	4				2			2		0.88	1.45
Myrsine guianensis	28				7				5	4.44	9.22
Myrcianthes fragrans	7	4						18		3.22	6.07
Ulmus americana	7	13			11		4			3.88	5.23
Forestiera segregata	0.2							11		1.24	3.65
Bumelia reclinata	0.2									0.02	0.06
Celtis laevigata	7	2			8		22	7		5.11	7.20
Acer negunda	1									0.11	0.33
Ficus aurea	1					7				0.88	2.31
Quercus v. var. virginiana	40		58	25	80	26		83	29	37.88	30.56
Persea palustris	0.1				2		7			1.01	2.34
Fraxinus tomentosa		90					31			13.44	30.48
Acer rubrum		49					36			9.44	19.02
Quercus laurifolia		40		99			21	2	9	19.00	32.93
Carya glabra		6	26	76						12.00	25.47
Zanthoxylum clava-herculis		2								0.22	0.66
Ilex vomitoria			60	12				30		11.33	20.88
Carya aquatica			3							0.33	1.00
Juniperus silicicola			26	5				11		4.66	8.84
Magnolia grandiflora				25						2.77	8.33
Osmanthus a. var. americanus				4						0.40	1.26
Myrica cerifera					3				19	2.44	6.28
Prunus caroliniana					4	24				3.11	7.94
Ardisia escallonioides						28				3.11	9.33
Persea borbonia						136		19		17.22	44.98
Eugenia axillaris						10				1.11	3.33
Eugenia foetida						2				0.22	0.66
Chiococca alba						2				0.22	0.66
Bursea simaruba						9				1.00	3.00
Quercus nigra						2				0.22	0.66
Bumelia tenax						2				0.22	0.66
Carya floridana						4				0.40	1.26
Nyssa sylvatica var. biflora							9			1.00	3.00
Magnolia virginiana							28			3.11	9.33
Sambucus simpsonii							14			1.55	4.66
Liquidambar styraciflua							6			0.66	2.00
Zanthoxylum fagara								9		1.00	3.00
Pinus elliottii var. densa									39	4.33	13.00
Ilex cassine									2	0.22	0.66
Rhus copallina									3	0.33	1.00

Table 18. Frequency (percentage) of occurrence of tree seedlings, shrubs, and vines in sample points from nine east central Florida hammocks.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Ross' Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average X̄	Stand Average S.D.
Persea palustris	2				3		3			.9	1.3
Psychotria nervosa	82	20			36	46	6	80		30.0	33.0
Psychotria sulzneri	6	6			73				27	12.4	24.3
Nectandra coriacea	73	46								13.2	27.1
Myrsine guianensis	75				10		1	6	23	11.5	23.5
Acer rubrum	10	33					3			5.1	10.9
Citrus sinensis	8						3	3		1.5	2.7
Toxicodendron radicans	28	13	26		43		6	6	57	19.9	20.1
Myrcianthes fragrans	30	3				23		43		11.0	16.5
Quercus v. var. virginiana	6		26		26	20		16	47	15.6	16.0
Ulmus americana	8		3				3			1.5	2.7
Sabal palmetto	8	66	70	56	80	20	13	56	43	1.5	2.7
Parthenocissus quinquefolia	10	3	13	6	30					6.9	9.9
Mikania scandens	4									.4	1.3
Ipomoea alba	2									.2	.6
Celtis laevigata	6	23			3		30	3		7.2	11.2
Morus rubra	2									.2	.6
Ampelopsis arborea	2				3				3	.9	1.3
Smilax bona-nox	2	6	16	20	20	6		3		8.1	8.3
Matelea suberosa	2				3					.5	1.1
Sambucus simpsonii		3					13			1.8	4.3
Quercus laurifolia		43		60					3	11.8	22.9
Zanthoxylum clava-herculis		6								.6	2.0
Itea virginica		3								.3	1.0
Rivina humilus		3				3		6		1.3	2.2
Rubus trivialis		3			36				3	4.6	11.8
Ardisia escallonioides		10			30	60		100		22.2	35.6
Ilex vomitoria			66	16				50		14.6	25.4
Erythrina herbacea			3							.3	1.0
Vitis rotundifolia			3	26	40	23			13	11.6	14.8
Serenoa repens			23	26		6		3	13	7.9	10.3
Callicarpa americana			3							.3	1.0
Carya glabra			6	20						2.9	6.7
Magnolia grandiflora				3						.3	1.0
Myrica cerifera				3	6				13	2.4	4.4
Amorpha fruticosa				3						.3	1.0
Asimina parviflora				6						.6	2.0
Valeriana scabra				3						.3	1.0
Galactia elliottii				6						.6	2.0
Prunus caroliniana					10	76		30		12.9	25.7
Eugenia axillaris						23		23		5.1	10.1
Persea borbonia						23		43		7.3	15.4
Quercus nigra						3				.3	1.0
Krugiodendron ferreum						3				.3	1.0
Rhapidophyllum hystrix							13			1.4	4.3
Momordica charantia							3			.3	1.0
Magnolia virginiana							3			.3	1.0
Zanthoxylum fagara								16		1.7	5.3
Sageretia minutiflora								16		1.7	5.3
Schinus terebinthefolius									3	.3	1.0
Rhus copallina									3	.3	1.0
Kosteletzkya virginica									6	.6	2.0
Pinus elliottii var. densa									3	.3	1.0

Table 19. Density (number per m^2) of tree seedlings, shrubs, and vines in nine east central Florida hammocks.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Ross' Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average $\bar{X}$	Stand Average S.D.
Persea palustris	0.02				0.03		0.06			.01	.02
Psychotria nervosa	5.69	0.73			4.06	1.47	0.46	13.43		2.9	4.4
Psychotria sulzneri	1.59	0.06			6.66				0.60	1.0	2.2
Nectandra coriacea	2.67	2.16								0.5	1.1
Myrsine guianensis	3.36				0.23			0.16	0.40	0.5	1.1
Acer rubrum	0.10	1.40					0.12			0.2	0.5
Citrus sinensis	0.08						0.06	0.03		0.01	0.03
Toxicodendron radicans	0.67	0.73	1.76		2.13		0.40	0.16	2.46	0.9	0.9
Myrcianthes fragrans	0.92	0.33				1.00		2.46		0.5	0.8
Quercus v. var. *virginiana*	0.06		1.70		0.86	0.80		2.23	1.56	0.8	0.8
Ulmus americana	0.08		0.03				0.12			0.02	0.04
Sabal palmetto	0.12	4.66	1.76	2.43	3.46	0.20	0.46	1.00	0.63	1.6	1.6
Parthenocissus quinquefolia	0.16	0.03	0.23	0.06	1.70					0.2	0.5
Mikonia scandens	0.16									0.02	0.05
Ipomoea alba	0.02									0.002	0.01
Celtis laevigata	0.10	0.46			0.03		1.32	0.03		0.2	0.5
Morus rubra	0.04									0.004	0.01
Ampelopsis arborea	0.02				0.06				0.03	0.01	0.02
Smilax bona-nox	0.04	0.06	0.16	1.10	0.40	0.07		0.03		0.2	0.3
Matelea suberosa	0.02				0.10					0.01	0.03
Sambucus simpsonii		0.03					0.32			0.03	0.1
Quercus laurifolia		0.63		2.53					0.33	0.4	0.8
Zanthoxylum clava-herculis		0.06								0.01	0.02
Itea virginica		0.06								0.01	0.02
Rivina humilus		0.23				0.03		0.02		0.03	0.1
Rubus trivialis		0.03			1.33				0.06	0.15	0.4
Ardisia escallonioides		1.36			1.23	2.40		6.73		1.3	2.2
Ilex vomitoria			3.10	1.43				2.30		0.75	1.2
Erythrina herbacea			0.03							0.003	0.01
Vitis rotundifolia			0.06	0.50	1.13	0.30			0.20	0.2	0.4
Serenoa repens			0.33	0.60		0.07		0.03	0.16	0.1	0.2
Callicarpa americana			0.03							0.003	0.01
Carya glabra			0.06	0.23						0.03	0.1
Magnolia grandiflora				0.03						0.003	0.01
Myrica cerifera				0.06	0.13				0.30	0.05	0.1
Amorpha fruticosa				0.03						0.003	0.01
Asimina parviflora				0.10						0.01	0.03
Valeriana scabra				0.03						0.003	0.01
Galactia elliottii				0.53						0.05	0.2
Prunus caroliniana					0.73	2.50		0.56		0.4	0.8
Eugenia axillaris						0.57		0.70		0.1	0.3
Persea borbonia						0.33		0.86		0.1	0.3
Quercus nigra						0.53				0.05	0.2
Krugiodendron ferreum						0.03				0.003	0.01
Rhapidophyllum hystrix							0.26			0.02	0.1
Momordica charantia							0.06			0.006	0.02
Magnolia virginiana							0.06			0.006	0.02
Zanthoxylum fagara								0.16		0.02	0.05
Sageretia minutiflore								0.20		0.02	0.06
Schinus terebinthefolius									0.10	0.01	0.03
Rhus copallina									0.03	0.003	0.01
Kostelyzkya virginica									0.06	0.006	0.02
Pinus elliottii var. *densa*									0.03	0.003	0.01
Total Stems/m^2	15.92	13.02	9.25	9.66	24.27	10.24	3.7	31.09	6.95		

Table 20. Importance values (IV = relative density + relative frequency) of tree seedlings, shrubs, and vines from nine east central Florida hammocks.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Ross' Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average $\bar{X}$	Stand Average S.D.
Persea palustris	1				1		4			0.7	1.3
Psychotria nervosa	58	12			23	28	12	59		21.3	23.3
Psychotria sulzneri	11	2			43				18	8.2	14.5
Nectandra coriacea	36	32								7.6	15.0
Myrsine guianensis	41				3			2	14	6.7	13.6
Acer rubrum	3	22					6			3.4	7.3
Citrus sinensis	3						4	1		0.9	1.5
Toxicodendron radicans	12	10	29		17		17	2	55	15.8	17.5
Myrcianthes fragrans	14	3				16		16		5.4	7.5
Quercus v. var. *virginiana*	2		28		8	13		10	39	11.1	13.8
Ulmus americana	3		1				6			1.1	2.1
Sabal palmetto	3	58	46	47	31	8	25	14	24	28.4	18.8
Parthenocissus quinquefolia	4	1	7	3	13					3.1	4.4
Mikania scandens	2									0.2	0.7
Ipomoea alba	1									0.1	0.3
Celtis laevigata	2	11			1		66	1		9.0	21.7
Morus rubra	1									0.1	0.3
Ampelopsis arborea	1				1				1	0.4	1.1
Smilax bona-nox	1	2	8	19	5	2		1		4.2	6.1
Matelea suberosa	1				1					0.2	0.4
Sambucus simpsonii		1					9			1.1	3.0
Quercus laurifolia		19		49					15	9.2	16.7
Zanthoxylum clava-herculis		2								0.2	0.7
Itea virginica		1								0.1	0.3
Rivina humilus		3				1		1		0.6	1.0
Rubus trivialis		1			12				2	1.7	3.9
Ardisia escallonioides		14			11	41		41		11.9	17.3
Ilex vomitoria			59	21				17		10.8	19.9
Erythrina herbacea			1	15						1.8	5.0
Vitis rotundifolia			2		12	10			7	3.4	4.9
Serenoa repens			12	16		2		1	7	4.2	6.0
Callicarpa americana			1							0.1	0.3
Carya glabra			3	10						1.4	3.3
Magnolia grandiflora				1						0.1	0.3
Myrica cerifera				2	1				9	1.3	2.9
Amorpha fruticosa				1						0.1	0.3
Asimina parviflora				3						0.3	1.0
Valeriana scabra				1						0.1	0.3
Galactia elliottii				8						0.9	2.7
Prunus caroliniana					5	47		8		6.7	15.4
Eugenia axillaris						12		7		2.1	4.4
Persea borbonia						10		11		2.3	4.6
Quercus nigra						6				0.7	2.0
Krugiodendron ferreum						1				0.1	0.3
Rhapidophyllum hystrix							20			2.2	6.7
Momordica charantia							4			0.4	1.3
Magnolia virginiana							4			0.4	1.3
Zanthoxylum fagara								4		0.4	1.3
Sageretia minutiflora								4		0.4	1.3
Schinus terebinthefolius									2	0.2	0.7
Rhus copallina									1	0.1	0.3
Kostelyzleya virginica									3	0.3	1.0
Pinus elliottii var. *densa*									1	0.1	0.3

Table 21. Species of herbaceous plants and their importance values (IV = relative cover + relative frequency) in hammocks from each central Florida.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Ross' Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock	Stand Average $\bar{X}$	S.D.
Oplismenus setarius	11	66			128		26			25.6	44.2
Toxicodendron radicans	15									1.6	5.0
Panicum joorii	3	18								2.3	5.9
Mikania scandens	3				8		60	17	9	10.7	19.3
Ponthieva racemosa	3									0.3	1.0
Arisaema triphyllum	11									1.2	3.6
Nephrolepis cordifolia	154	89					12			28.3	55.4
Thelypteris normalis		26								2.8	8.6
Cyperus sp. (1)			23							2.5	7.6
Unknown sedge			23							2.5	7.6
Blechnum serrulatum			35		8					5.4	11.5
Cyprerus sp. (2)			23							2.5	7.6
Andropogon virginicus var. *glomeratus*			23	66						9.8	22.4
Panicum sp.			23							2.5	7.6
Chasmanthium sesseliflorum			23							2.5	7.6
Ipomoea tuba				66						8.1	21.8
Vernonia gigantea				66						8.1	21.8
Pteridium aquilinum					34					3.7	11.3
Asplenium platyneuron					8					0.8	2.6
Ipomoea alba					5					0.5	1.6
Boehmeria cylindrica					5					0.5	1.6
Dennstaedia bipinnata							78			8.6	26.0
Cynanchum scoparium							24			2.6	8.0
Pavonia spinifex								146		16.2	48.6
Salvia coccinea								37		4.1	12.3
Elephantopus elatus									9	1.0	3.0
Cyperus tetragonus									9	1.0	3.0
Cladium jamaicense									23	2.5	7.6
Panicum polycaulon									55	6.1	18.3
Ipomoea acuminata									9	1.0	3.0
Hedyotis procumbens									9	1.0	3.0
Rhus copallina									32	3.5	10.6
Eryngium prostratum									18	2.0	6.0
Scleria triglomerata									9	1.0	3.0
Phoebanthus grandiflora									9	1.0	3.0
Habenaria odontopetala									9	1.0	3.0

Thirty-six species of herbaceous plants were recorded in samples from nine hammocks (Table 21). Not a single herbaceous plant was found in samples from all the hammocks. The vine, Mikania scandens, had the highest constancy at 55 percent. A species of grass typical of hammocks, Oplismenus setarius, was recorded in 4 for a constancy of 44 percent. Nephrolepis cordifolia, a fern, was the leading herbaceous element (IV = 28.3).

Pine Flatwoods

The tree layer of pine flatwoods communities on Merritt Island is dominated by Pinus elliottii var. densa. Pine density was not sufficient to be studied by point-centered quarter methodology at the Wisconsin Village and Headquarters stands. The density (0.99 per 100 m^2) and basal area (5.7 m^2 per ha) of Pinus elliottii on the Volusia site was similar to that measured for Pinus palustris (1.75 per 100 m^2 and 5.1 m^2 per ha) on the UCF stand (Appendix Tables 40 and 45). A low density (0.04 per 100 m^2) of Pinus serotina occurred in the UCF stand. In contrast to the other stands, the UCF pond pine site supported four tree species in addition to Pinus serotina (Appendix Table 43). These species, Magnolia virginiana (IV = 17.6), Nyssa sylvatica var. biflora (IV = 5.8), Ilex cassine (IV = 5.6), and Gordonia lasianthus (IV = 5.3) were, however, minor components of the stand relative to Pinus serotina (IV = 265.7). Basal area of Pinus serotina (24.4 m^2 per ha) was nearly five times that measured on the sites dominated by Pinus elliottii and Pinus palustris.

Understory plants of four flatwoods stands included 55 species (Table 22). The following species were found in all the stands: Serenoa repens, Lyonia lucida, Aristida stricta, Galactia elliottii, Hypericum reductum, Gaylussacia dumosa, Vaccinium myrsinites, Ilex glabra, Andropogon virginicus, and Myrica cerifera var. pumila. Seventeen of 55 species were unique to the UCF flatwoods; whereas, no more than six species were limited to any one of the remaining sites. Serenoa repens and Aristida stricta shared the highest average relative frequency at 8.7 percent. Twenty-nine species yielded relative frequencies of <1.0 percent.

Among the four flatwoods stands, Serenoa repens had the highest average coverage at 29.1 percent (Table 23). Other species with significant coverage included Aristida stricta (15.3%), Quercus myrtifolia (12.7%), Lyonia lucida (10.7%) and Aristida spiciformis (5.2%). Within stands, Aristida stricta, Serenoa repens and Quercus myrtifolia yielded the highest individual relative coverage values.

The leading dominants among the understory plants were Serenoa repens (IV = 37.7), Aristida stricta (IV = 24.0), Lyonia lucida (IV = 17.0) and Quercus Myrtifolia (IV = 17.0) (Table 24). The highest importance values within the stands were for Serenoa repens (44%), Q. myrtifolia (45%) and A. stricta (36%).

Table 22. Relative frequency (percentage) of understory plants in four stands of pine flatwoods, east central Florida.

Species	Wisconsin Village	Headquarters	Volusia	UCF	Stand $\overline{X}$	Average SD
Quercus minima	9.2	0.6		5.7	3.9	4.4
Serenoa repens	9.2	8.4	11.3	6.1	8.7	2.1
Lyonia lucida	9.2	8.4	6.9	1.2	6.4	3.6
Aristida stricta	9.2	7.3	12.2	6.1	8.7	2.6
Galactia elliottii	1.2	3.4	2.6	0.4	1.9	1.3
Hypericum reductum	2.4	0.6	3.5	1.6	2.0	1.2
Solidago microcephala	0.6			0.8	0.35	0.4
Gaylussacia dumosa	7.9	1.7	4.3	0.4	3.6	3.3
Panicum patentifolium	2.4				0.6	1.2
Vaccinium myrsinites	6.1	7.9	3.5	1.6	4.8	2.8
Befaria racemosa	4.9	7.3	0.9		3.3	3.4
Lyonia fruticosa	7.9	6.7		4.5	4.8	3.5
Ilex glabra	4.9	1.7	1.7	1.2	2.4	1.7
Andropogon virginicus	3.0	0.6	1.7	5.3	2.6	2.0
Myrica cerifera var. *pumila*	8.5	7.9	5.2	1.2	5.7	3.3
Asimina reticulata	2.4	3.4		6.1	3.0	2.5
Quercus myrtifolia	3.7	4.5	10.4		4.6	4.3
Satureja rigida	4.9	1.1			1.5	2.3
Lachnocaulon anceps	0.6		0.9	2.0	0.9	0.8
Sericocarpus bifoliatus	0.6				0.1	0.3
Pteridium aquilinum	1.2	2.2			0.8	1.1
Quercus v. var. *maritima*		8.4	5.2		3.4	4.1
Quercus chapmanii		2.2	8.7		2.7	4.1
Smilax auriculata		2.8	0.9	0.4	1.0	1.2
Vitis rotundifolia		5.6			1.4	2.8
Baccharis halimifolia		1.1			0.3	0.5
Ximenia americana		0.6	2.6		0.8	1.2
Tillandsia usneoides		1.1			0.3	0.5

Table 22. Relative frequency (percentage) of understory plants in four stands of pine flatwoods, east central Florida. (Continued)

Species	Wisconsin Village	Headquarters	Volusia	UCF	Stand $\overline{X}$	Average SD
Ludwigia maritima		0.6		0.4	0.2	0.3
Rhus copallina		0.6			0.1	0.3
Lechea torreyi		0.6	0.9		0.4	0.4
Centrosema virginica			1.7		0.4	0.8
Lyonia ferruginea			4.3		1.1	2.1
Licania michauxii			0.9		0.2	0.4
Carphephorus odoratissimum			3.5		0.9	1.7
Rhynchosia cinerea			0.9		0.2	0.4
Pterocaulon pycnostachyum			0.9	3.2	1.0	1.5
Persea borbonia var. *humilis*			0.9		0.2	0.4
Aristida spiciformis				6.1	1.5	3.0
Carphephorus corymbosus				3.2	0.8	1.6
Panicum ciliatum				3.6	0.9	1.8
Panicum webberianum				5.7	1.4	2.8
Panicum ensifolium				4.9	1.2	2.4
Schrankia nuttallii				3.6	0.9	1.8
Hypericum tetrapetalum				2.4	0.6	1.2
Aster squarrosus				4.1	1.0	2.0
Amphicarpum sp.				2.0	0.5	1.0
Aster reticulatus				2.0	0.5	1.0
Rhynchospora fascicularis				0.4	0.1	0.2
Phoebanthus grandiflorus				2.0	0.5	1.0
Agalinis fasciculatus				0.8	0.2	0.4
Euphorbia polyphylla				1.2	0.3	0.6
Helianthus radulla				1.2	0.3	0.6
Quercus pumila				0.8	0.2	0.4
Elephantopus elatus				1.2	0.3	0.6

Table 23. Relative coverage (percentage) of understory plants in four stands of pine flatwoods, east central Florida.

Species	Wisconsin Village	Headquarters	Volusia	UCF	Stand $\overline{X}$	Average SD
Quercus minima	10.5	0.1		4.0	3.6	4.9
Serenoa repens	20.3	35.3	23.1	37.7	29.1	8.7
Lyonia lucida	20.1	13.4	7.7	1.6	10.7	7.9
Aristida stricta	26.7	3.0	12.6	18.9	15.3	10.0
Galactia elliottii	0.3	0.6	0.1	0.0	0.2	0.3
Hypericum reductum	0.3	0.1	0.5	0.0	0.2	0.2
Solidago microcephala	0.05			0.1	0.03	0.05
Gaylussacia dumosa	2.0	0.1	1.8	0.0	1.0	1.1
Panicum patentifolium	0.08				0.02	0.04
Vaccinium myrsinites	0.7	4.4	0.4	0.5	1.5	1.9
Befaria racemosa	1.7	3.4	0.3		1.3	1.5
Lyonia fruticosa	1.7	3.1		2.2	1.7	1.3
Ilex glabra	4.2	1.1	1.8	0.6	1.9	1.6
Andropogon virginicus	0.3	0.3	0.0	2.6	0.8	1.2
Myrica cerifera var. *pumila*	5.0	3.8	1.3	0.5	2.6	2.1
Asimina reticulata	0.4	0.6		1.8	0.7	0.8
Quercus myrtifolia	4.7	10.9	35.2		12.7	15.6
Satureja rigida	0.4				0.1	0.2
Lachnocaulon anceps	0.01		0.1	0.2	.07	.09
Sericocarpus bifoliatus	0.01				0.002	.005
Pteridium aquilinum	0.4	1.1			0.4	0.5
Quercus V. var. *maritima*		12.9	2.9		3.9	6.1
Quercus chapmanii		2.8	9.6		3.1	4.5
Smilax auriculata		0.8	0.1	0.0	0.2	0.4
Vitis rotundifolia		1.5			0.4	0.7
Baccharis halimifolia		0.3			0.07	0.1
Ximenia americana		0.1	0.7		0.2	0.3
Tillandsia Usneoides		0.1			0.02	0.05
Ludwigia maritima		0.0		0.1	0.02	0.05
Rhus copallina		0.1			0.02	0.05

Table 23. Relative coverage (percentage) of understory plants in four stands of pine flatwoods, east central Florida. (Continued).

Species	Wisconsin Village	Headquarters	Volusia	UCF	Stand $\bar{X}$	Average SD
Lechea torreyi		0.0	0.1		0.02	0.05
Centrosema virginica			0.1		0.02	0.05
Lyonia ferruginea			0.6		0.1	0.03
Licania michauxii			0.1		0.02	0.05
Carphephorus odoratissimum			0.4		0.1	0.2
Rhynchosia cinerea			0.1		0.02	0.05
Pterocaulon pycnostachyum			0.0	0.3	0.07	0.1
Persea borbonia var. *humilis*			0.3		0.07	0.1
Aristida spiciformis				20.9	5.2	10.4
Carphephorus corymbosus				0.4	0.1	0.2
Panicum ciliatum				0.7	0.2	0.3
Panicum webberianum				0.9	0.2	0.4
Panicum ensifolium				1.3	0.3	0.6
Schrankia nuttallii				0.8	0.2	0.4
Hypericum tetrapetalum				0.1	0.02	0.05
Aster squarrosus				0.4	0.1	0.2
Amphicarpum sp.				0.1	0.02	0.05
Aster reticulatus				0.8	0.2	0.4
Rhynchospora fascicularis				0.2	0.05	0.1
Phoebanthus grandiflorus				0.2	0.05	0.1
Agalinis fasciculatus				0.3	0.07	0.1
Euphorbia polyphylla				0.1	0.02	0.05
Helianthus radulla				0.1	0.02	0.05
Quercus pumila				1.5	0.4	0.7
Elephantopus elatus				0.2	0.05	0.1

Table 24. Importance values (IV = relative frequency + relative coverage) of understory plants in four stands of pine flatwoods, east central Florida.

Species	Wisconsin Village	Headquarters	Volusia	UCF	Stand Average $\bar{X}$	Stand Average SD
Quercus minima	20	1		10	7.75	9.3
Serenoa repens	29	44	34	44	37.75	7.5
Lyonia lucida	29	22	14	3	17.0	11.2
Aristida stricta	36	10	25	25	24.0	10.7
Galactia elliottii	1	4	3	0.4	2.1	1.7
Hypericum reductum	3	0.7	4	1	2.2	1.6
Solidago microcephala	1			1	0.75	0.5
Gaylussacia dumosa	10	2	6	0.4	4.6	4.3
Panicum patentifolium	2				0.5	1.0
Vaccinium myrsinites	7	12	4	2	6.25	4.3
Befaria racemosa	6	11	1		4.5	5.1
Lyonia fruticosa	9	10		7	6.5	4.5
Ilex glabra	9	3	3	2	4.25	3.2
Andropogon virginicus	3	1	2	8	3.5	3.1
Myrica cerifera var. *pumila*	13	12	6	2	8.25	5.2
Asimina reticulata	3	4		8	3.75	3.3
Quercus myrtifolia	8	15	45		17.0	19.6
Satureja rigida	5	1			1.5	2.4
Lachnocaulon anceps	0.6		1	2	0.9	0.8
Sericocarpus bifoliatus	0.6				0.15	0.3
Pteridium aquilinum	1	3			1.0	1.4
Quercus v. var. *maritima*		21	8		7.25	9.9
Quercus chapmanii		5	18		5.75	8.5
Smilax auriculata		3	1	0.4	1.1	1.3
Vitis rotundifolia		7			1.75	3.5
Baccharis halimifolia		1			0.25	0.5
Ximenia americana		1	3		1.0	1.4
Tillandsia usneoides		1			0.25	0.5
Ludwigia maritima		0.6		0.5	0.3	0.3

Table 24. Importance values (IV = relative frequency + relative coverage) of understory plants in four stands of pine flatwoods, east central Florida. (Continued).

Species	Wisconsin Village	Headquarters	Volusia	UCF	Stand $\overline{X}$	Average SD
Rhus copallina		1			0.25	0.5
Lechea torreyi		0.6	1		0.4	0.5
Centrosema virginica			2		0.5	1.0
Lyonia ferruginea			5		1.25	2.5
Licania michauxii			1		0.25	0.5
Carphephorus odoratissimum			4		1.5	2.0
Rhynchosia cinerea			1		0.25	0.5
Pterocaulon pycnostachyum			1	3	1.0	1.4
Persea borbonia var. humilis			1		0.25	0.5
Aristida spiciformis				27	6.75	13.5
Carphephorus corymbosus				3	0.75	1.5
Panicum ciliatum				4	1.0	2.0
Panicum webberianum				6	1.5	3.0
Panicum ensifolium				6	1.5	3.0
Schrankia nuttallii				4	1.0	2.0
Hypericum tetrapetalum				2	0.5	1.0
Aster squarrosus				4	1.0	2.0
Amphicarpum sp.				2	0.5	1.0
Aster reticulatus				3	0.75	1.5
Rhynchospora fascicularis				0.6	0.15	0.3
Phoebanthus grandiflorus				2	0.5	1.0
Agalinis fasciculatus				1	0.25	0.5
Euphorbia polyphylla				1	0.25	0.5
Helianthus radulla				1	0.25	0.5
Quercus pumila				2	0.5	1.0
Elephantopus elatus				1	0.25	0.5

Sand Pine Scrub

Nine species reached tree size (>2.54 cm dbh) in sand pine scrub stands. Pinus clausa was the only pine species present. Its frequency varied within stands from 33 to 100 percent and averaged 75 percent (Table 25). Among the nine species, Pinus clausa, Quercus myrtifolia, and Quercus chapmanii occurred in all the stands. Quercus v. var. virginiana was found in only one stand.

An average of 16.8 trees per 100 m^2 was present in the stands of sand pine scrub (Table 26). Pinus clausa was the most common tree in four of six stands and averaged 8.9 stems per 100 m^2. Quercus myrtifolia, Q. chapmanii and Lyonia ferruginea were fairly common.

Basal area of trees ranged from 9.2 m^2 per ha at UCF to 39.6 m^2 per ha at Debary (Table 27). Pinus clausa had an average basal area of 16.9 m^2 per ha. The remaining trees contributed relatively small increments to the basal area of the stands.

Pinus clausa had an average importance value of 152.6 (out of a possible 300) and ranked first within and among the six stands (Table 28). Quercus myrtifolia (IV = 28.9) ranked second and Lyonia ferruginea (IV = 18.0) third among the stands.

Twenty-two species of shrubs were found to compose the "scrub". All stands shared four species, viz., Lyonia ferruginea, Quercus chapmanii, Serenoa repens, and Quercus myrtifolia (Table 29). Quercus myrtifolias found at 63-93 percent of the sample points within stands and had an average frequency of 81.6 percent. Other species, e.g., Carya floridana, were limited to only a few stands and the special conditions of these sites.

Shrub density averaged 248.2 stems per 100 m^2 (Table 30). The UCF stand exhibited the highest density of shrubs at 368.6 per 100 m^2. The species which contributed most to the stem counts within stands was Quercus myrtifolia (averaged 121.6 per 100 m^2).

The five most important shrubs in the sand pine scrub stands were Quercus myrtifolia (IV = 85.1), Quercus chapmanii (IV = 23.5), Serenoa repens (IV = 22.8), Lyonia ferruginea (IV = 21.8) and Quercus virginiana var. maritima (IV = 11.0) (Table 31).

Forty-two species of plants in the less than 50 cm height class were enumerated among the six stands of sand pine scrub (Table 32). In this grouping were herbs and woody plants including seedlings of shrubs and trees. Only Lyonia ferruginea, Quercus myrtifolia, and Quercus chapmanii were found in all the stands. Quercus myrtifolia yielded an average frequency of 70.5 percent. Thirty species had an average frequency of less than five percent.

Table 25. Frequency (percentage) of occurrence of trees (>2.54 cm dbh) from six stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Lyonia ferruginea	67	37	60	17		23	34.0	25.8
Quercus myrtifolia	53	40	77	10	27	83	48.3	28.4
Quercus v. var. *maritima*	33	3	60	3		33	22.0	24.0
Pinus clausa	87	93	47	100	93	33	75.5	28.1
Quercus chapmanii	13	37	57	13	10	60	31.6	22.9
Persea borbonia var. humilis		7					1.2	2.8
Ilex ambigua		3				3	1.0	1.5
Carya floridana				10	23		5.5	9.4
Quercus v. var. *virginiana*					53		8.8	21.6

Table 26. Density (number per 100 m^2) of trees (>2.54 cm dbh) from six stands of sand pine in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Lyonia ferruginea	2.19	2.79	1.44	1.75		1.10	1.54	0.96
Quercus myrtifolia	2.02	4.32	2.27	0.75	1.07	7.09	2.92	2.40
Quercus v. var. *maritima*	0.89	0.21	1.85	0.24		1.92	0.85	0.85
Pinus clausa	4.30	15.07	1.17	24.87	6.24	2.18	8.97	9.23
Quercus chapmanii	0.32	2.79	1.51	1.27	0.27	3.96	1.68	1.44
Persea borbonia var. humilis		0.44					0.07	0.18
Ilex ambigua		0.21				0.13	0.05	0.09
Carya floridana				1.27	1.16		0.40	0.63
Quercus v. var. *virginiana*					1.96		0.32	0.80
Totals	9.72	25.83	8.24	30.15	10.70	16.38	16.83	

Table 27. Basal area (cm^2 per 100 m^2) of trees (>2.54 cm dbh) from six stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\bar{X}$	Average S.D.
Lyonia ferruginea	15.9	32.5	13.9	15.0		34.1	19.2	11.7
Quercus myrtifolia	20.8	92.9	27.1	11.4	22.7	234.7	68.2	86.7
Quercus v. var. *maritima*	27.1	1.8	55.0	1.9		163.8	41.6	63.6
Pinus clausa	852.1	3800.7	238.3	1860.8	2236.9	1394.8	1697.2	1172.6
Quercus chapmanii	2.4	28.0	21.5	9.1	4.1	72.5	22.9	26.3
Persea borbonia var. humilis		4.7					0.8	1.9
Ilex ambigua		2.4				1.0	0.5	1.0
Carya floridana				49.1	20.6		11.6	20.1
Quercus v. var. *virginiana*					66.8		11.1	27.3
Totals	918.3	3963.0	355.8	1947.3	2351.1	1900.9		

Table 28. Importance values (IV = relative density + relative frequency + relative dominance) of trees (>2.54 cm dbh) from six stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Lyonia ferruginea	50	28	41	17		18	25.6	18.0
Quercus myrtifolia	44	37	61	9	24	91	44.3	28.9
Quercus v. var. *maritima*	25	2	58	3		34	20.3	23.1
Pinus clausa	171	196	97	243	198	101	152.6	84.4
Quercus chapmanii	9	28	43	13	7	53	25.5	19.2
Persea borbonia var. *humilis*		5					0.8	2.0
Ilex ambigua		2				2	0.6	1.0
Carya floridana				13	23		6.0	9.8
Quercus v. var. *virginiana*					47		7.8	19.2

Table 29. Frequency (percentage) of occurrence of shrubs (>50 cm in height; less than 2.54 cm dbh) from six stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Osmanthus americanus	17	7	3				4.5	6.7
Lyonia ferruginea	30	13	50	27	20	10	25.0	14.5
Quercus chapmanii	27	17	27	27	27	47	28.6	9.8
Serenoa repens	27	27	43	7	23	50	29.5	15.2
Quercus myrtifolia	80	93	90	77	63	87	81.6	10.9
Quercus virginiana var. *maritima*	23	13	13	13		20	13.6	7.9
Befaria racemosa	3						0.5	1.2
Lyonia lucida	3		3		7		2.1	2.8
Garberia heterophylla	3					17	3.3	6.8
Ceratiola ericoides	3		7				1.6	2.9
Persea borbonia var. *humilis*		27					4.5	11.0
Vaccinium stamineum		7		10		7	4.0	4.5
Ilex ambigua		7				7	2.3	3.6
Vaccinium myrsinites		3	3				1.0	1.5
Sabal etonia		3					0.5	1.2
Asimina obovata		3					0.5	1.2
Pinus clausa				10		3	2.1	4.0
Carya floridana				7	7		2.3	3.6
Ximenia americana				7	13		3.3	5.5
Myrica cerifera					3		0.5	1.2
Quercus v. var. *virginiana*					60		10.0	24.4
Unknown shrub						3	0.5	1.2

Table 30. Density (number per 100 m^2) of shrubs (>50 cm in height; less than 2.54 cm dbh) from six stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Osmanthus americanus	14.3	4.9	1.6				3.4	5.6
Lyonia ferruginea	51.0	12.1	39.7	37.8	15.9	6.2	27.1	18.0
Quercus chapmanii	36.7	12.1	21.4	37.8	24.9	22.1	25.8	9.8
Serenoa repens	45.3	21.6	29.8	7.6	15.9	23.3	23.9	12.8
Quercus myrtifolia	150.4	179.8	86.0	166.4	74.4	72.5	121.6	49.2
Quercus virginiana var. *maritima*	28.2	12.1	9.9	20.3		7.4	12.9	9.9
Befaria racemosa	5.8						0.9	2.3
Lyonia lucida	2.7		5.0		5.3		2.1	2.5
Garberia heterophylla	2.7					7.4	1.7	3.0
Ceratiola ericoides	2.7		3.4				1.0	1.6
Persea borbonia var. *humilis*	28.8						4.8	11.7
Vaccinium stamineum		4.9		12.7		2.5	3.3	4.9
Ilex ambigua		4.9				3.7	1.4	2.2
Vaccinium myrsinites		2.3	1.6				0.6	1.0
Sabal etonia		2.3					0.4	0.9
Asimina obovata		2.3					0.4	0.9
Pinus clausa				10.0		1.2	1.8	4.0
Carya floridana				5.1	3.6		1.4	2.3
Ximenia americana				5.1	7.0		2.0	3.2
Myrica cerifera					1.7		0.3	0.7
Quercus v. var. *virginiana*					63.8		10.6	26.0
Unknown shrub						1.2	0.2	0.5
Totals	368.6	259.3	198.4	302.8	212.5	147.5	248.2	

Table 31. Importance values (IV = relative density + relative frequency) of shrubs (>50 cm in height; less than 2.54 cm dbh) from six stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Osmanthus americanus	12	5	2				3.2	4.7
Lyonia ferruginea	29	10	41	27	16	8	21.8	12.7
Quercus chapmanii	23	12	22	27	23	34	23.5	7.2
Serenoa repens	25	19	33	6	18	36	22.8	10.9
Quercus myrtifolia	81	105	81	97	63	84	85.1	14.5
Quercus virginiana var. *maritima*	19	10	10	14		13	11.0	6.3
Befaria racemosa	3						0.5	1.2
Lyonia lucida	2		4		5		1.8	2.2
Garberia heterophylla	2					12	2.3	4.8
Ceratiola ericoides	2		4				1.0	1.6
Persea borbonia var. *humilis*		22					3.6	8.9
Vaccinium stamineum		5		10		4	3.1	4.0
Ilex ambigua		5				5	1.6	2.6
Vaccinium myrsinites		2	2				0.6	1.0
Sabal etonia		2					0.3	0.8
Asimina obovata		2					0.3	0.8
Pinus clausa				9		2	1.8	3.6
Carya floridana				5	5		1.6	2.6
Ximenia americana				5	9		2.3	3.8
Myrica cerifera					2		0.3	0.8
Quercus v. var. *virginiana*					57		9.5	23.3
Unknown shrub						2	0.3	0.8

Table 32. Frequency (percentage) of occurrence of plants less than 50 cm in height from 6 stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\bar{X}$	Average S.D.
Bumelia reclinata	7						1.1	2.8
Persea borbonia var. *humilis*	7	17					4.0	6.9
Lyonia ferruginea	20	17	17	17	10	7	14.6	5.0
Quercus myrtifolia	70	93	60	93	50	57	70.5	18.6
Vaccinium stamineum	7	17		7			5.1	6.7
Vaccinium myrsinites	3		3				1.0	1.5
Galactia elliottii	53		7		3		10.5	21.0
Quercus v. var. *maritima*	40	17	27	10		23	19.5	13.9
Gaylussacia dumosa	30		40			3	12.1	18.0
Quercus chapmanii	27	17	23	17	30	33	24.5	6.7
Palafoxia feayi	20						3.3	8.1
Osmanthus americanus	7						1.1	2.8
Smilax auriculata	3	10	3		10	53	13.1	20.0
Rhynchospora megalocarpa	10	7	3				3.3	4.3
Licania michauxii	3	10	3	3		3	3.6	3.3
Opuntia compressa	3						1.0	1.5
Panicum patentifolium	3						1.0	1.5
Lyonia lucida	3				7		1.6	2.9
Andropogon virginicus		13	7				3.3	5.5
Galactia mollis		13					2.1	1.4
Panicum nitidum		7	7				2.3	3.6
Ilex ambigua		7				3	1.6	2.9
Serenoa repens		10	20		10		6.6	8.1
Smilax pumila		7					1.1	2.8
Selaginella arenicola			23				3.8	9.4
Euphorbia polyphylla			7				1.1	2.8
Aristida stricta			7				1.1	2.8
Palafoxia integrifolia			10		3		2.1	4.0
Liatris tenuifolia			7				1.1	2.8

Table 32. Frequency (percentage) of occurrence of plants less than 50 cm in height from 6 stands of sand pine scrub in east central Florida. (Continued).

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Heterotheca graminifolia			3				1.0	1.5
Unknown species of shrub				3			1.0	1.5
Panicum sp.					7	7	2.3	3.6
Unknown species of grass					7		1.1	2.8
Quercus v. var. *virginiana*					70		11.6	28.6
Ximenia americana					7		1.1	2.8
Unknown species of sedge					13	47	10.0	18.8
Pinus clausa					13	10	3.8	1.9
Vitis rotundifolia					3		1.0	1.5
Garberia heterophylla						3	1.0	1.5
Unknown legume						30	5.0	12.2
Gaylussacia frondosa						10	1.6	4.1
Unknown Legume (vine)						3	1.0	1.5

Few of the plants less than 50 cm in height were individually very abundant; however, collectively, they represented 15.9 stems per m^2 (Table 33). The greatest stem density (19.13 per m^2) was found at the Debary site. Quercus myrtifolia was the most common species (4.8 per m^2) among the stands.

Dominant species among the ground layer plants included Quercus myrtifolia (IV = 69.5), Quercus chapmanii (IV = 16.8), Quercus v. var. maritima (IV = 14.0) and Lyonia ferruginea (IV = 11.5) (Table 34). The importance value of Quercus v. var. virginiana (10.5) was fairly high, but the species occurred in only one stand.

Coastal Scrub

Considerable variation existed from stand to stand in the species of ground level plants that were present in the coastal scrub (Table 35). Of 33 species recorded, 14 achieved shrub size (>50 cm in height) in the stands. Two of these species, Quercus v. var maritima and Quercus myrtifolia, were found with high frequencies in all the stands. It is notable that a group of 19 species remained in the <50 cm height size class. Most of these species were herbaceous and characteristic of pine flatwoods.

Densities of inidividual species of ground level plants were generally very modest (Table 36). Gaylussacia dumosa (7.2 per m^2) and Quercus myrtifolia (6.8 per m^2) were exceptions. The highest density recorded within stands was of Gaylussacia (29.8 per m^2) on the Wind Tower site. This species accounted for the extremely high stem count of 62.6 per m^2 at the Wind Tower stand. The average of the stands was 27.9 per m^2.

Leading dominants among the plants less than 50 cm in height were Quercus myrtifolia (IV = 38.5) and Quercus v. var. maritima (IV = 34.0) (Table 37). In the shrub layer (50 cm in height) of the coastal scrub, Quercus myrtifolia, Quercus v. var. maritima and Sereona repens were found in all the stands (100 percent constancy) (Table 38). Ceratiola ericoides, an indicator of sand pine scrub communities in some areas, was found in two stands with an average frequency of 27.2 percent.

Among the 14 species of shrubs, Quercus myrtifolia (110.76 per 100 m^2), Serenoa repens (66.91 per 100 m^2) and Quercus v. var. maritima (34.26 per 100 m^2) achieved the greatest densities (Table 39). Among the stands, Route 3 had the highest density of shrubs (177.21 per 100 m^2) and Rosemary the lowest density (16.48 per 100 m^2).

In terms of overall dominance, as indicated by the importance value, Quercus myrtifolia (IV = 50.8) and Serenoa repens (IV = 50.7) were the codominants of the coastal scrub stands (Table 40).

A tree layer was found at one stand of coastal scrub, Complex 34. Quercus myrtifolia (IV = 122.2) was the leading dominant, Quercucs v. var. maritima ranked second (IV = 104.0) and Quercus virginiana var. virginiana third (IV = 54.2) (Appendix Table 76).

Table 33. Density (number per m^2) of plants less than 50 cm in height from six stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Bumelia reclinata	0.67	9.80					1.7	3.9
Persea borbonia var. *humilis*	0.13	0.93					0.2	0.4
Lyonia ferruginea	1.47	1.07	0.47	0.87	1.33	0.13	0.9	0.5
Quercus myrtifolia	7.20		3.53	11.13	3.47	3.60	4.8	3.8
Vaccinium stamineum	0.33	0.40		0.33			0.2	0.2
Vaccinium myrsinites	0.07		0.67				0.1	0.2
Galactia elliottii	1.67		1.33		0.07		0.5	0.8
Quercus v. var. *maritima*	2.33	0.60	0.87	1.33		1.60	1.1	0.8
Gaylussacia dumosa	1.00		4.60			0.07	0.9	1.8
Quercus chapmanii	1.47	0.60	1.40	1.80	0.87	1.00	1.2	0.4
Palafoxia feayi	0.47						0.1	0.2
Osmanthus americanus	0.20						0.0	0.1
Smilax auriculata	0.07	0.40	0.07		0.20	2.20	0.5	0.8
Rhynochospora megalocarpa	0.60	0.13	0.07				0.1	0.2
Licania michauxii	0.07	1.80	0.07	0.27		0.40	0.4	0.7
Opuntia compressa	0.07						0.0	0.0
Panicum patentifolium	0.07						0.0	0.0
Lyonia lucida	0.07				0.33		0.1	0.1
Andropogon virginicus		0.87	0.13				0.1	0.3
Galactia mollis		1.53					0.2	0.6
Panicum nitidum		0.20	1.33				0.2	0.5
Ilex ambigua		0.27				0.13	0.1	0.1
Serenoa repens		0.20	0.47		0.20		0.1	0.2
Smilax pumila		0.33					0.0	0.2
Selaginella arenicola			1.33				0.2	0.5
Euphorbia polyphylla			0.40				0.1	0.2
Aristida stricta			0.27				0.1	0.1
Palafoxia integrifolia			0.20		0.07		0.0	0.1
Liatris tenuifolian			0.20				0.0	0.1

Table 33. Density (number per m^2) of plants less than 50 cm in height from six stands of sand pine scrub in east central Florida. (Continued).

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Heterotheca graminifolia			0.07				0.1	0.1
Unknown species of shrub				0.73			0.1	0.3
Panicum sp.					0.13	0.13	0.0	0.1
Unknown species of grass					0.13		0.0	0.0
Quercus v. var. *virginiana*					4.33		0.7	1.7
Ximenia americana					0.13		0.0	0.0
Unknown species of sedge					0.60	1.60	0.3	0.6
Pinus clausa					0.60	0.20	0.1	0.2
Vitis rotundifolia					0.07		0.1	0.1
Garberia heterophylla						0.07	0.1	0.1
Unknown legume						0.80	0.1	0.3
Gaylussacia frondosa						0.33	0.1	0.1
Unknown Legume (vine)						0.07	0.1	0.1

Table 34. Importance values (IV = relative density + relative frequency) of plants less than 50 cm in height from six stands of sand pine scrub in east central Florida.

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Bumelia reclinata	6						1.0	2.4
Persea borbonia var. *humilis*	3	11					2.3	4.4
Lyonia ferruginea	14	12	9	16	15	3	11.5	4.8
Quercus myrtifolia	62	87	42	130	48	48	69.5	33.8
Vaccinium stamineum	4	8		6			3.0	3.5
Vaccinium myrsinites	1		5				1.0	2.0
Galactia elliottii	26		10		2		6.3	10.4
Quercus v. var. *maritima*	25	9	14	15		21	14.0	8.8
Gaylussacia dumosa	15		41			2	9.6	16.4
Quercus chapmanii	16	9	16	22	19	19	16.8	4.4
Palafoxia feayi	9						1.5	3.7
Osmanthus americanus	3						0.5	1.2
Smilax auriculata	1	6	1		6	36	8.3	13.8
Rhynchospora megalocarpa	6	3	1				1.6	2.4
Licania michauxii	1	13	1	4		4	3.8	4.8
Opuntia compressa	1						0.1	0.4
Panicum patentifolium	1						0.1	0.4
Lyonia lucida	1				5		1.0	2.0
Andropogon virginicus		9	3				2.0	3.6
Galactia mollis		13					2.1	5.3
Panicum nitidum		3	10				2.1	4.0
Ilex ambigua		4				2	1.0	1.6
Serenoa repens		5	10		6		3.5	4.2
Smilax pumila		4					0.6	1.6
Selaginella arenicola			16				2.6	6.5
Euphorbia polyphylla			5				0.8	2.0
Aristida stricta			4				0.6	1.6
Palafoxia integrifolia			5		2		1.1	2.0
Liatris tenuifolia			3				0.5	1.2

Table 34. Importance values (IV = relative density + relative frequency) of plants less than 50 cm in height from six stands of sand pine scrub in east central Florida. (Continued).

Species	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva	Stand $\overline{X}$	Average S.D.
Heterotheca graminifolia			1				0.1	0.4
Unknown species of shrub				7			1.1	2.8
Panicum sp.					4	3	1.1	1.8
Unknown species of grass					4		0.6	1.6
Quercus v. var. virginiana					63		10.5	25.7
Ximenia americana					4		0.6	1.6
Unknown species of sedge					10	19	4.8	8.0
Pinus clausa					10	5	2.5	4.2
Vitis rotundifolia					2		0.3	0.8
Garberia heterophylla						2	0.3	0.8
Unknown legume						17	2.8	6.9
Gaylussacia frondosa						6	1.0	2.4
Unknown Legume (vine)						2	0.3	0.8

Table 35. Frequency (percentage) of occurrence of plants less than 50 cm in height from six stands of coastal scrub on Merritt Island.

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\overline{X}$	Average S.D.
Quercus v. var. *maritima*	53	70	70	43	33	47	52.6	14.9
Quercus myrtifolia	73	87	90	63	17	20	58.3	32.3
Quercus chapmanii	13	13	37	37	13		18.8	14.9
Ximenia americana	17			3	10		5.0	7.0
Licania michauxii	7	13	7		3		5.0	5.0
Lyonia ferruginea	27	3	3		13	20	11.0	10.8
Vaccinium myrsinites	60	73	90	50	53		54.3	30.4
Serenoa repens	7	7	3		13		5.0	5.0
Lyonia lucida		37	7	50			15.6	22.1
Gaylussacia dumosa		83	60	80			37.1	41.5
Myrica cerifera var. *pumila*		23	53	17			15.5	20.9
Aristida stricta		67		30			16.1	27.6
Befaria racemosa		7	7	13			4.5	5.4
Smilax auriculata		3	3	3		27	6.0	10.4
Lyonia fruticosa		30		30			10.0	15.5
Carphephorus corymbosus		3					0.5	1.2
Vaccinium stamineum var. *caesium*		7	3	3			2.1	2.8
Galactia elliottii		30	37		7		12.3	16.7
Panicum patentifolium		13		13			4.3	6.7
Rhynchospora megalocarpa		3	13	10			19.3	39.8
Aristida spiciformus			27				4.5	11.0
Panicum nitidum			3				0.5	1.2
Liatris tenuifolia			10	10			3.3	5.1
Pteridium aquilinum				3			0.5	1.2
Andropogon virginicus				7			1.1	2.8
Sartureja rigida				3			0.5	1.2
Bulbostylis ciliatifolia				10			1.6	4.1
Hypericum reductum				3			0.5	1.2
Paronychia americana				3			0.5	1.2

Table 35. Frequency (percentage) of occurrence of plants less than 50 cm in height from six stands of coastal scrub on Merritt Island. (Continued).

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\bar{X}$	Average S.D.
Lachnocaulon minus				7			1.1	2.8
Ceratiola ericoides					17		2.8	6.9
Quercus v. var. virginiana						10	1.6	4.1
Vitis rotundifolia						3	0.5	1.2

Table 36. Density (number per m^2) of plants less than 50 cm in height from six stands of coastal scrub on Merritt Island.

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\overline{X}$	Average S.D.
Quercus v. var. *maritima*	3.87	3.27	3.60	1.73	1.33	2.27	2.7	1.0
Quercus myrtifolia	5.07	9.87	10.20	14.00	0.67	1.00	6.8	5.4
Quercus chapmanii	0.47	1.40	2.20	3.93	0.47		1.4	1.4
Ximenia americana	0.40			0.07	0.40		0.1	0.2
Licania michauxii	1.00	0.27	1.20		0.07		0.4	0.5
Lyonia ferruginea	2.00	0.20	0.33		2.67	0.93	1.0	1.1
Vaccinium myrsinites	1.20	4.53	6.80	2.40	5.07		3.3	2.6
Serenoa repens	0.13	0.13	0.07		0.40		0.6	1.2
Lyonia lucida		2.67	0.13	3.20			1.0	1.5
Gaylussacia dumosa		9.27	4.00	29.87			7.2	11.7
Myrica cerifera var. *pumila*		0.87	2.60	0.53			0.6	1.0
Aristida stricta		2.40		0.87			0.5	1.0
Befaria racemosa		0.20	0.27	0.33			0.1	0.1
Smilax auriculata		0.07	0.07	0.07		0.53	0.1	0.2
Lyonia fruticosa		1.53		3.00			0.7	1.2
Carphephorus corymbosus		0.07					0.0	0.0
Vaccinium stamineum var. *caesium*		0.20	0.07	0.33			0.1	0.1
Galactia elliottii		1.13	1.13		0.13		0.4	0.6
Panicum patentifolium		0.27		0.33			0.1	0.1
Rhynchospora megalocarpan		0.07	0.33	0.20			0.1	0.1
Aristida spiciformis			0.80				0.1	0.3
Panicum nitidum			0.07				0.0	0.0
Liatris tenuifolia			0.20	0.40			0.1	0.2
Pteridium aquilinum				0.07			0.0	0.0
Andropogon virginicus				0.13			0.0	0.0
Satureja rigida				0.07			0.0	0.0
Bulbostylis ciliatifolia				0.33			0.0	0.1
Hypericum reductum				0.13			0.0	0.0
Paronychia americana				0.07			0.0	0.0

Table 36. Density (number per m^2) of plants less than 50 cm in height from six stands of coastal scrub on Merritt Island. (Continued).

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\overline{X}$	Average S.D.
Lachnocaulon minus				0.53			0.1	0.2
Ceratiola ericoides					0.60		0.1	0.2
Quercus v. var. *virginiana*						2.13	0.3	0.9
Vitis rotundifolia						0.07	0.0	0.0
Stand Average	14.14	38.42	34.07	62.59	11.81	6.93	27.9	21.1

Table 37. Importance values (IV = relative density + relative frequency) of plants less than 50 cm in height from six stands of coastal scrub on Merritt Island.

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\overline{X}$	Average S.D.
Quercus v. var. *maritima*	48	21	24	11	30	70	34.0	21.5
Quercus myrtifolia	64	41	46	35	15	30	38.5	16.4
Quercus chapmanii	8	6	13	14	11		8.6	5.2
Ximenia americana	9			1	9		3.2	4.5
Licania michauxii	10	3	5		2		3.3	3.7
Lyonia ferruginea	24	1	1		30	29	14.2	14.9
Vaccinium myrsinites	32	24	37	14	72		29.8	24.5
Serenoa repens	3	1	1		11		2.6	4.2
Lyonia lucida		13	2	15			5.0	7.0
Gaylussacia dumosa		38	23	64			20.8	26.3
Myrica cerifera var. *pumila*		6	18	4			4.6	7.0
Aristida stricta		18		7			4.2	7.3
Befaria racemosa		2	2	3			1.2	1.3
Smilax auriculata		1	1	1		28	5.2	11.2
Lyonia fruticosa		9		11			3.3	5.2
Carphephorus corymbosus		1					0.2	0.4
Vaccinium stamineum		1	1	1			0.5	0.5
Galactia elliottii		8	10		5		3.8	4.5
Panicum patentifolium		3		3			1.0	1.5
Rhynchospora megalocarpa		1	3	2			1.0	1.2
Aristida spiciformis			7				1.2	2.8
Panicum nitidum			1				0.2	0.4
Liatris tenuifolia			2	2			0.6	1.0
Pteridium aquilinum				1			0.2	0.4
Andropogon virginicus				1			0.2	0.4
Satureja rigida				1			0.2	0.4
Bulbostylis ciliatifolia				2			0.3	0.8
Hypericum reductum				1			0.2	0.4
Paronychia americana				1			0.2	0.4

Table 37. Importance values (IV = relative density + relative frequency) of plants less than 50 cm in height from six stands of coastal scrub on Merritt Island. (Continued).

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\bar{X}$	Average S.D.
Lachnocaulon minus				2			0.3	0.8
Ceratiola ericoides					14		2.3	5.7
Quercus v. var. virginiana						38	6.3	15.5
Vitis rotundifolia						3	0.5	1.2

Table 38. Frequency (percentage) of occurrence of shrubs (>50 cm in height) from six stands of coastal scrub on Merritt Island.

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\overline{X}$	Average S.D.
Quercus myrtifolia	67	80	73	60	63	7	27.8	34.1
Lyonia ferruginea	40	13	10	10		30	17.2	14.8
Serenoa repens	60	57	53	40	13	100	53.8	28.4
Ceratiola ericoides	70				93		27.2	42.7
Quercus v. var. *maritima*	30	30	30	37	33	7	27.8	10.6
Quercus chapmanii	7	27	37	23	7		16.8	14.3
Ximenia americana	3			3	13		9.2	12.3
Lyonia lucida		37	13	30			13.3	16.6
Myrica cerifera var. *pumila*		7	17	3		17	7.3	7.9
Befaria racemosa		7	10	33			8.3	12.8
Vaccinium stamineum var. *caesium*			3				0.5	1.2
Gaylussacia dumosa				7			1.2	2.8
Hypericum reductum				3			0.5	1.2
Quercus v. var. *virginiana*						13	2.2	5.3

Table 39. Density (Number per 100 m^2) of shrubs (>50 cm in height) from six stands of coastal scrub on Merritt Island.

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\overline{X}$	Average S.D.
Quercus myrtifolia	83.83	179.82	198.34	185.97	15.12	1.50	110.76	89.33
Lyonia ferruginea	41.92	15.14	18.45	22.84		6.61	17.49	14.53
Serenoa repens	56.89	88.07	87.64	95.16	3.18	70.56	66.91	34.20
Ceratiola ericoides	83.83				44.76		21.43	35.42
Quercus v. var. *maritima*	23.95	49.54	50.74	72.32	7.56	1.50	34.26	27.73
Quercus chapmanii	5.99	42.20	46.12	36.43	1.89		22.10	21.64
Ximenia americana	2.40			4.35	3.18		1.65	1.91
Lyonia lucida		68.81	23.06	63.62			25.91	32.51
Myrica cerifera var. *pumila*		7.80	18.45	4.35		5.12	5.95	6.83
Befaria racemosa		7.80	13.84	45.13			11.12	17.58
Vaccinium stamineum var. *caesium*			3.69				0.61	1.50
Gaylussacia dumosa				9.24			1.54	3.77
Hypericum reductum				4.35			0.72	1.77
Quercus v. var. *virginiana*						2.91	0.48	1.18
Stand Average	42.68	57.38	106.70	49.43	12.61	14.70	22.92	31.19

Table 40. Importance values (IV = relative density + relative frequency) of shrubs (>50 cm in height) from six stands of coastal scrub on Merritt Island.

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34	Stand $\overline{X}$	Average S.D.
Quercus myrtifolia	52	70	72	58	48	5	50.8	24.4
Lyonia ferruginea	29	8	8	8		25	13.0	11.3
Serenoa repens	41	41	41	33	10	138	50.7	44.4
Ceratiola ericoides	53				101		25.7	42.6
Quercus v. var. *maritima*	18	22	23	28	25		19.3	10.0
Quercus chapmanii	4	19	25	16	5	5	12.3	8.9
Ximenia americana	2			2	10		2.3	3.9
Lyonia lucida		29	10	24			10.5	13.1
Myrica cerifera var. *pumila*		4	11	2		15	5.3	6.2
Befaria racemosa		4	7	21			5.3	8.2
Vaccinium stamineum var. *caesium*			2				0.3	0.8
Gaylussacia dumosa				4			0.7	1.6
Hypericum reductum				2			0.3	0.8
Quercus v. var. *virginiana*						11	1.8	4.5

Coastal Strand

Ten species of plants were recorded from two stands representative of coastal strand on Cape Canaveral (Table 41). Frequency of occurrence of Serenoa repens (100%), Myrica cerifera (80%), Bumelia tenax (81.5%) and Chiococca alba (80%) were notably high.

Canopy coverage was clearly dominated by Serenoa repens (73.5%) in the strand community (Table 42).

Serenoa repens yielded an importance value of 86.5 and ranked first among the 10 species (Table 43).

Coastal Dunes

A considerable increase in plant species diversity (36) was recorded on the coastal dunes relative to the coastal strand (10) (Tables 44 and 41). Uniola paniculata (83%) and Heterotheca subaxillaris (53%) had the highest frequencies of occurrence. Four species, Uniola, Heterotheca, Croton punctatus, and Opuntia compressa were found in all three stands.

Owing to their herbaceous nature, coverage of most species was slight (Table 45). Uniola paniculata (14.6%), Atriplex arenaria (8.3%) and Serenoa repens (6.6%) were most prominent.

Uniola paniculata was the overall dominant species with an importance value of 31.0 (Table 46). However, dominance within the stands varied somewhat. On the Beach Grid (Zone 1), Heterotheca subaxillaris was first (IV = 34). Serenoa repens (IV = 72) was most prominent on Zone 2 of the Beach Grid. Uniola was the most important species (IV = 58) at the LC 39-B site.

Reference Stands

Reference stands (Figure 1) were first established in 1977. Three stands were evaluated in 1977 and 10 stands in 1978. Canopy coverage data for 1977 and 1978 are summarized in Appendix Tables 82-94.

The usefulness of the reference stands for detecting change in plant community structure can be evaluated in a preliminary way by examining data from 1977 and 1978 on the Dune Scrub, Headquarters Pineland and Beach stands. In 1977, 10 species of woody plants yielded an average transect coverage of 2,078.2 cm on the Dune Scrub (Table 47). Canopy coverage amounted to 2,208.7 cm in 1978 or an absolute change of 130.5 cm (5.9%). Two species observed in 1977, Quercus chapmanii and Myrica cerifera, were not seen on the transects in 1978.

Table 41. Frequency (percentage) of occurrence of plants from two stands of coastal strand on the Cape Canaveral portion of Merritt Island.

Species	Beach Grid	Cape Canaveral	Stand $\overline{X}$	Average S.D.
Serenoa repens	100	100	100.0	0.0
Myrica cerifera	100	60	80.0	28.3
Bumelia tenax	83	80	81.5	2.1
Myrcianthes fragrans	16	100	58.0	59.4
Chiococca alba	100	60	80.0	28.3
Cnidoscolus stimulosus	16		8.0	11.3
Coccoloba uvifera	50		25.0	35.3
Smilax auriculata	16		8.0	11.3
Licania michauxiin	16		8.0	11.3
Forestiera segregata		20	10.0	14.1

Table 42. Coverage (percentage) of plants from two stands of coastal strand on the Cape Canaveral portion of Merritt Island.

Species	Beach Grid	Cape Canaveral	Stand $\bar{X}$	Average S.D.
Serenoa repens	67	80	73.5	9.2
Myrica cerifera	8	3	5.5	3.5
Bumelia tenax	10	7	8.5	2.1
Myrcianthes fragrans	3	31	17.0	19.8
Chiococca alba	4	1	2.5	2.1
Cnidoscolus stimulosus	.05		.025	.035
Coccoloba uvifera	8.3		4.1	5.8
Smilax auriculata	0.6		0.3	0.4
Licania michauxiin	0.2		0.1	0.1
Forestiera segregata		2	1.0	1.4

Table 43. Importance values (IV = relative coverage + relative frequency) of plants from two stands of coastal strand on the Cape Canaveral portion of Merritt Island.

Species	Beach Grid	Cape Canaveral	Stand $\bar{X}$	Average S.D.
Serenoa repens	85	88	86.5	2.1
Myrica cerifera	28	16	22.0	8.5
Bumelia tenax	26	24	25.0	1.4
Myrcianthes fragrans	7	49	28.0	29.7
Chiococca alba	24	15	19.5	6.3
Cnidoscolus stimulosus	3		1.5	2.1
Coccoloba uvifera	18		9.0	12.7
Smilax auriculata	4		2.0	2.8
Licania michauxii	3		1.5	2.1
Forestiera segregata		6	3.0	4.2

Table 44. Frequency (percentage) of occurrence of plants from three stands of vegetation on coastal dunes, Merritt Island.

Species	Beach Grid (Zone 1)	Beach Grid (Zone 2)	LC 39-B	Stand $\bar{X}$	Average S.D.
Heterotheca subaxillaris	89	50	20	53.0	34.6
Uniola paniculata	100	50	100	83.3	28.8
Panicum amarulum	55		20	25.0	27.8
Atriplex arenaria	44		80	41.3	40.0
Andropogon virginicus	66	33		33.0	33.0
Canavalia rosea	22			7.3	12.7
Paspalum vaginatum	44			14.5	25.4
Ipomoea stolonifer	100		60	23.3	32.1
Ipomoea pes-caprae	44			14.6	25.4
Sesuvium maritima	33			11.0	19.0
Croton punctatus	44	16	60	40.0	22.3
Chloris petraea	33	16		16.3	16.5
Opuntia compressa	22	50	20	30.6	16.8
Spartina patens	11		80	30.3	43.3
Licania michauxii	11	16		9.0	8.2
Phyllanthus abnormis	22			7.3	12.7
Polygala grandiflora	22	16		12.6	11.4
Cnidoscolus stimulosus	11	16		9.0	8.2
Yucca aloifolia	11			3.6	6.3
Physalis visosa maritima	11			3.6	6.3
Hydrocotyla bonariensis	11		40	17.0	20.6
Commelina diffusa	11	16		9.0	8.2
Bumelia tenax	11			3.6	6.3
Cakile fusiformis	11			3.6	6.3
Serenoa repens		83		27.6	47.9
Coccoloba uvifera		83	40	41.0	41.5
Smilax auriculata		66		22.0	38.1
Strophostyles helvola		16		5.3	9.2
Chiococca alba		16		5.3	9.2
Chamaesyce maculata		16		5.3	9.2
Lantana camara			20	6.6	11.5
Scaevola plumieri			20	6.6	11.5
Cenchrus incertus			20	6.6	11.5
Unknown composite			100	33.3	57.7
Unknown I			20	6.6	11.5
Unknown II			20	6.6	11.5

Table 45. Coverage (percentage) of plants from three stands of vegetation on coastal dunes, Merritt Island.

Species	Beach Grid (Zone 1)	Beach Grid (Zone 2)	LC 39-B	Stand $\bar{X}$	Average S.D.
Heterotheca subaxillaris	9	1	1	3.6	4.6
Uniola paniculata	5	1	38	14.6	20.3
Panicum amarulum	4		0.1	1.3	2.3
Atriplex arenaria	4		21	8.3	11.1
Andropogon virginicus	3	0.3		1.1	1.6
Canavalia rosea	2			0.6	1.1
Paspalum vaginatum	2			0.6	1.1
Ipomoea stolonifer	3		1	1.1	1.5
Ipomoea pes-caprae	1			0.6	0.6
Sesuvium maritima	2			0.6	1.1
Croton punctatus	1	1	1	1.0	0.0
Chloris petraea	0.6	0.05		0.2	0.3
Opuntia compressa	0.2	1	0.7	0.4	0.5
Spartina patens	0.3		2	0.7	1.0
Licania michauxii	0.1	1		0.3	0.5
Phyllanthus abnormis	0.1			0.03	0.06
Polygala grandiflora	0.06	0.1		0.05	0.05
Cnidoscolus stimulosus	0.06	0.1		0.05	0.05
Yucca aloifolia	0.04			0.01	0.02
Physalis visosa maritima	0.04			0.01	0.02
Hydrocotyla bonariensis	0.03		1	0.3	0.6
Commelina diffusa	0.03	0.1		0.04	0.05
Bumelia tenax	0.02			0.01	0.01
Cakile fusiformis	0.02			0.01	0.01
Serenoa repens		20		6.6	11.5
Coccoloba uvifera		6	2	2.6	3.0
Smilax auriculata		1		0.3	0.6
Strophostyles helvola		0.5		0.1	0.3
Chiococca alba		0.1		0.03	0.05
Chamaesyce maculata		0.04		0.01	0.02
Lantana camara			2.4	0.8	1.4
Scaevola plumieri			0.4	0.01	0.02
Cenchrus incertus			0.6	0.2	0.3
Unknown composite			11.3	3.7	6.5
Unknown I			0.1	0.03	0.05
Unknown II			0.2	0.06	0.1

Table 46. Importance values (IV = relative frequency + relative coverage) of plants from three stands of vegetation on coastal dunes, Merritt Island.

Species	Beach Grid (Zone 1)	Beach Grid (Zone 2)	LC 39-B	Stand $\bar{X}$	Average S.D.
Heterotheca subaxillaris	34	12	3	16.3	15.9
Uniola paniculata	24	11	58	31.0	24.2
Panicum amarulum	17		3	6.6	9.0
Atriplex arenaria	16		36	17.3	18.0
Andropogon virginicus	16	7		7.6	8.0
Canavalia rosea	7			2.6	3.8
Paspalum vaginatum	10			3.3	5.7
Ipomoea stolonifer	19		10	9.6	9.5
Ipomoea pes-caprae	9			3.0	5.2
Sesuvium maritima	8			2.6	4.6
Croton punctatus	9	10	10	9.6	0.6
Chloris petraea	5	3		2.6	2.5
Opuntia compressa	3	11	3	5.6	4.6
Spartina patens	2		14	5.3	7.6
Licania michauxii	2	7		3.0	3.6
Phyllanthus abnormis	3			1.0	1.7
Polygala grandiflora	3	3		2.0	1.7
Cnidoscolus stimulosus	1	3		1.3	1.5
Yucca aloifolia	1			0.3	0.6
Physalis visosa maritima	1			0.3	0.6
Hydrocotyla bonariensis	1		7	2.6	3.8
Commelina diffusa	1	4		1.6	2.1
Bumelia tenax	1			0.3	0.6
Cakile fusiformis	1			0.3	0.6
Serenoa repens		73		24.3	42.1
Coccoloba urifera		32	8	13.3	16.6
Smilax auriculata		15		5.0	8.6
Strophostyles helvola		4		1.3	2.3
Chiococca alba		4		1.3	2.3
Chamaesyce maculata		3		1.0	1.7
Lantana camara			5	1.6	2.8
Scaevola plumieri			3	1.0	1.7
Cenchrus incertus			3	1.0	1.7
Unknown composite			27	9.0	15.6
Unknown I			3	1.0	1.7
Unknown II			3	1.0	1.7

Table 47. Changes in canopy coverage of woody plants on permanent line transects in the Dune Scrub Reference Stand (Coastal Scrub).

Species	Mean Coverage (cm) per Transect 1977	Mean Coverage (cm) per Transect 1978	Absolute change (cm)	% change
Lyonia ferruginea	455.6	501.0	+45.4	+ 9.0
Serenoa repens	319.3	295.6	-23.7	- 7.4
Ceratiola ericoides	343.6	427.6	+84.0	+ 19.6
Quercus v. var. maritima	244.6	311.3	+66.7	+ 21.4
Quercus myrtifolia	499.3	544.6	+45.3	+ 8.3
Quercus chapmanii	33.0	0.0	-33.0	-100.0
Vaccinium myrsinites	26.3	25.3	- 1.0	- 3.8
Myrica cerifera	3.3	0.0	- 3.3	-100.0
Ximenia americana	151.6	101.3	-50.3	- 33.1
Smilax auriculata	1.6	2.0	+ 0.4	+ 20.0
Average Coverage Per Transect	2078.2	2208.7	+130.5	+ 5.9%

Canopy coverage of 1,728.3 cm was measured in 1977 on the Headquarters Pinelands site (Table 48). The value increased by 10.34 percent to 1927.8 cm in 1978. Two species with very small coverage values in 1977, Ximenia americana and Satureja rigida, were not recorded in 1978.

The greatest change in canopy coverage between years was demonstrated on the Beach Reference Stand (Table 49). The 1978 measurement was 366.7 cm (29.8 percent) greater than the 1977 coverage value. Increases in canopy coverage of two species, Heterotheca subaxillaris (200.6 cm or 72 percent) and Serenoa repens (105.0 cm or 23 percent), accounted for 83 percent of the change.

Discussion

Community Analysis

Hammocks

Monk (1968) considered southern mixed hardwoods to be the climatic climax vegetation of north central Florida. Aside from floristic data on "The Hammock" of Dunedin, Florida (Genelle and Fleming (1978), ecological studies of central Florida hammocks have not been reported. Early work by Laessle (1942) in north Florida demonstrated that within the community type, xeric, mesic and hydric phases may be discerned. Thus, considerable variation within a sample of hammocks might be expected. An examination of the floristic similarity of the stands sampled in this study is given in Table 50. Based on Jaccard community coefficients, the greatest similarity was between the Route 3 and Castle Windy hammocks (38 percent). The least similarity (13 percent) was found between Black Hammock, a hydric site, and Indian Mound Hammock, a tropical hammock on Cape Canaveral. These general findings were the result of the great diversity of species composition of the tree, shrub and herb layers among the stands. Variation in the herbaceous layer exceeded that in the shrub and tree layers. Sources of this variation included soil factors, fires, and historically, past grazing or clearing. Floristic differences in the shrub layer probably came about owing to the same factors. Because little or no evidence of selective harvesting of trees was discovered in the hamocks, the species of trees present in the stands should have reflected individual ecological tolerances and availability of propagules from nearby populations. Regardless of the source of variation in floristics among the hammocks, its magnitude was unexpected.

Pairing of hammocks in the context of experimental and control procedures was severely limited by their dissimilarities. The most promising alternative to this approach would entail "pre" and "post" exposure (treatment) observations, thus using a stand as its own control.

A comparision of the nine hammocks on the basis of leading tree dominants provided some new information (Table 51). Sabal palm was ranked first or second in importance in every hammock. Monk (1965) indicated the average

Table 48. Changes in canopy coverage of plants on permanent line transects in the Headquarters Pineland Reference Stand (Pine Flatwoods).

Species	Mean Coverage (cm) per Transect		Absolute change (cm)	% change
	1977	1978		
Serenoa repens	691.3	720.3	+29.0	+ 4.0
Lyonia lucida	218.0	316.6	+98.6	+ 31.1
Lyonia fruticosa	54.6	63.3	+ 8.7	+ 13.7
Quercus v. var. *maritima*	444.3	509.6	+65.3	+ 12.8
Quercus myrtifolia	63.3	35.3	-28.0	- 44.2
Quercus chapmanii	23.3	42.6	+19.3	+ 45.3
Befaria racemosa	73.0	93.0	+20.0	+ 21.5
Asimina reticulata	11.0	6.6	- 4.4	- 40.0
Myrica c. var. *pumila*	98.6	62.3	-36.3	- 36.8
Vaccinium myrsinites	10.0	12.6	+ 2.6	+ 20.6
Smilax auriculata	30.6	61.3	+30.7	+ 50.0
Ximenia americana	3.0	0.0	- 3.0	-100.0
Vitus rotundifolia	2.0	4.3	+ 2.3	+ 53.4
Satureja rigida	5.3	0.0	- 5.3	-100.0
Average Coverage per Transect	1728.3	1927.8	+199.5	+ 10.34

Table 49. Changes in canopy coverage of woody plants on permanent line transects in the Beach Reference Stand (Coastal Dunes).

Species	Mean Coverage (cm) per Transect 1977	Mean Coverage (cm) per Transect 1978	Absolute change (cm)	% change
Heterotheca subaxillaris	77.0	277.6	+200.6	72.0
Sporobolus virginicus	0.6	1.0	+ 0.4	40.0
Andropogon virginicus	57.6	50.6	- 7.0	12.0
Croton punctatus	4.3	0.0	- 4.3	100.0
Uniola paniculata	29.0	43.0	+ 14.0	32.0
Canavalia rosea	20.6	0.0	- 20.6	100.0
Atriplex arenaria	27.0	31.3	+ 4.3	13.0
Panicum amarulum	5.6	10.0	+ 4.4	44.0
Chloris petraea	30.3	24.6	- 5.7	18.0
Ipomoea stolonifera	4.6	10.3	+ 5.7	55.0
Ipomoea pes-caprae	0.0	4.3	+ 4.3	100.0
Opuntia compressa	7.0	0.0	- 7.0	100.0
Serenoa repens	348.3	453.3	+105.0	23.0
Spartina patens	4.0	0.0	- 4.0	100.0
Myrica cerifera	121.6	179.3	+ 57.7	32.0
Coccoloba uvifera	46.6	36.0	- 10.6	22.0
Licania michauxii	72.3	96.6	+ 24.3	25.0
Mikania cordifolia	0.0	2.6	+ 2.6	100.0
Smilax auriculata	0.0	2.6	+ 2.6	100.0
Average Coverage per Transect	856.4	1223.1	+366.7	29.8%

Table 50. Jaccard community coefficients for nine hammocks. The coefficient is a measure of floristic similarity (%).

	Happy Hammock	Rt. 3 Hammock	Indian Mound Hammock	Ross Hammock	Jupiter Hammock	Indian River Hammock	Black Hammock	Castle Windy Hammock	Jerome Rd Hammock
Happy Hammock	100								
Rt. 3 Hammock	31	100							
Indian Mound Hammock	15	21	100						
Ross' Hammock	21	25	16	100					
Juniper Hammock	20	30	21	30	100				
Indian River Hammock	36	36	25	30	25	100			
Black Hammock	35	33	13	18	23	32	100		
Castle Windy Hammock	34	38	36	27	34	30	26	100	
Jerome Rd. Hammock	31	35	12	21	18	28	21	22	100

Table 51. The five leading tree dominants as ranked by importance values from hammocks in East Central Florida.

Species	Happy Hammock	Indian River Hammock	Juniper Hammock	Ross' Hammock	Route 3 Hammock	Indian Mound Hammock	Black Hammock	Castle Windy Hammock	Jerome Road Hammock
Sabal Palmetto	1 (110)	2 (81)	1 (125)	2 (83)	1 (161)	2 (41)	1 (107)	1 (102)	1 (191)
Nectandra coriacea	2 (61)								
Quercus v. var *virginiana*	3 (40)		3 (58)	5 (25)	2 (80)	4 (26)		2 (29)	3 (29)
Myrsine guianensis	4 (28)								
Morus rubra	5 (25)				3 (13)				
Fraxinus tomentosus		1 (90)					3 (31)		
Acer rubrum		3 (49)					2 (36)		
Quercus laurifolia		4 (40)		1 (99)					5 (9)
Ulmus americanus		5 (13)			4 (11)				
Ilex vomitoria			2 (60)					3 (30)	
Juniperus silicicola			4 (26)						
Carya glabra			5 (26)	3 (76)					
Magnolia grandiflora				4 (25)					
Celtis laevigata					5 (8)		5 (22)		
Persea borbonia						1 (136)		4 (19)	
Ardisia escallonioides						3 (28)			
Prunus caroliniana						5 (24)			
Magnolia virginiana							4 (28)		
Myrcianthes fragrans								5 (18)	
Pinus elliottii var. *densa*									2 (39)
Myrica cerifera									4 (19)

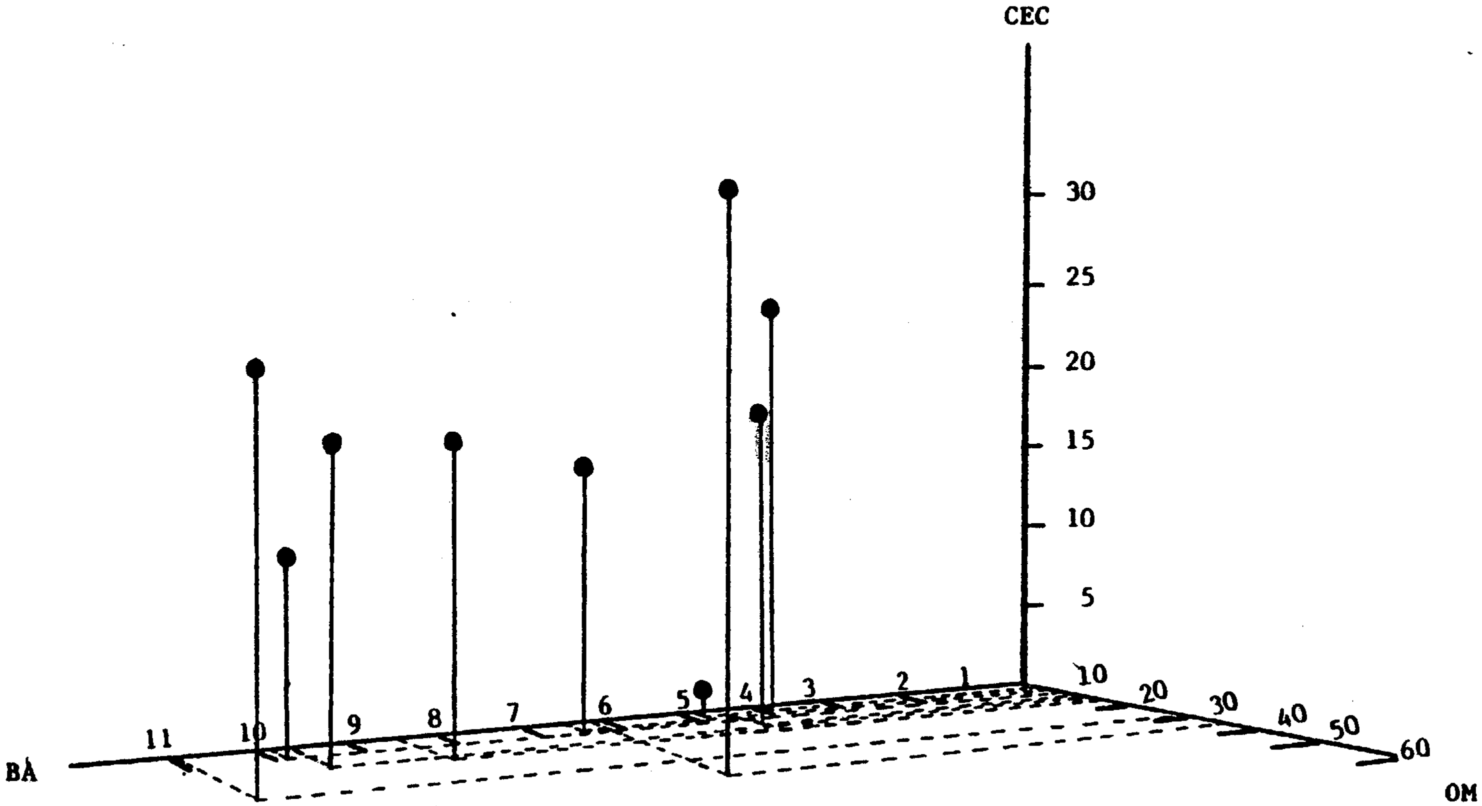

Figure 2. Observed basal area (BA) of 9 east central Florida hammocks in relation to cation exchange capacity (CEC, meq. per 100g) and soil organic material (%OM).

importance value of sabal palm as 12.3 in 60 hammocks from north Florida. Live oak (Quercus virginiana var. virginiana) was ranked among the five leading dominants in seven of nine hammocks. Its average importance value in Monk's stands was 50.0. Laurel oak (Quercus laurifolia) had the highest average importance value among the trees in north Florida (62.3), whereas it was prominent in three of the nine central Florida stands. In summary, hammocks from east central Florida are floristically different from north Florida stands.

The high average basal areas of trees in the hamocks appeared to be primarily the result of the abundance of Sabal palmetto. Owing to its small crown to trunk ratio, a high density of sabal can be interspersed among other tree species. Laessle and Monk (1961) reported 42.4 m^2 of basal area per ha from a mature, coastal hammock. The east central Florida hammocks averaged 70.4 m^2 per ha and ranged to 99.0. These values also exceeded the 56.6 m^2 per ha given by Alexander (1967) as representative of an "old" hammock near Miami. Basal area of trees from the east central Florida stands was not a simple function of nutrient factors (Figure 2) and was more likely related to the age of the stands. A direct measure of the age of the stands was not available, however.

Pine Flatwoods

Pine Flatwoods are one of the major community types in Florida (Monk 1968) and on Merritt Island. Flat, poorly drained topography typically supports flatwoods dominated by Pinus palustris on drier sites, Pinus elliottii on more mesic sites, and Pinus serotina where drainage is poorest (Edmister 1963; Monk 1968). Pinus palustris is the predominant pine with lesser quantities of P. elliottii and P. serotina among stands in east central Florida. On Merritt Island, Pinus elliottii is, with few exceptions the dominant pine in the flatwoods. Harper (1921) noted this distributional pattern and Little (1978) confirmed the observation. The exceptions involve a few isolated Pinus serotina which are clearly outside the range of the species in Florida as mapped by Little (1978).

Remarkably little quantitative data were found in the literature which reported on stand analysis of Pinus palustris or Pinus elliottii, nothing was found with regard to Pinus serotina. Basal area of the pine stands (5 m^2 per ha) in this study was very modest in comparison with the hammocks (70 m^2 per ha), because the pine stands were second growth and not densely stocked. A basal area of about 34 m^2 per ha of Pinus elliotti was reported by Hebb and Clewell (1976) from an old growth stand. Total basal area for this stand, including pines and hardwoods over 5 cm dbh, amounted to 45.8 m^2 per ha. Thus, mature pine stands may support as much biomass, as indicated by basal area, as some hammocks in east central Florida.

The lowest floristic similarity was found between the Pinus serotina stand and the remaining flatwoods stands (Table 52). This dissimilarity was sufficient to justify treating the remaining stands as a unit.

Table 52. Jaccard community coefficients for five stands of pine flatwoods. The coefficient is a measure of floristic similarity (%).

	Volusia Pineland	UCF Pineland	Wisconsin Village	UCF Pond Pine	Headquarters Pineland
Volusa Pineland	100.0	20.25	36.84	10.45	36.21
UCF Pineland	--	100.00	26.39	14.47	17.95
Wisconsin Village	--	--	100.00	16.67	44.23
UCF Pond Pine	--	--	--	100.00	16.39
Hqtrs. Pineland	--	--	--	--	100.00

In comparing the five leading dominants among the understory plants of the Pinus elliottii and P. palustris stands, 11 species were included (Table 53). Serenoa repens was ranked one or two by importance value in each stand. Lyonia lucida was prominent in all the Pinus elliottii stands on Merritt Island.

In the context of environmental monitoring, the Pinus elliottii stands on Merritt Island were floristically relative similar (Jaccard community coefficients ranged from 36.2 to 44.2). Certainly it could be argued that the three stands represented a normal range of variation associated with the community type; however, no two of the stands were clearly "replicates". Future monitoring should, therefore, treat the baseline data as pre-exposure observations and compare any future measurements with these.

Sand Pine Scrub

The sand pine scrub community type has been studied over most of its distribution in Florida by Laessle (1958; 1965; 1967). It is limited in occurrence to highly permeable marine sands considered by Laessle (1967) to represent former shorelines of Pleistocene seas. Sand pine scrubs are often associated with coastal areas and barrier islands such as Merritt Island (see Fig. 6 in Laessle 1958). Extensive areas of sand pine scrub now exist north and south of Titusville. The original distribution of sand pine scrub on Merritt Island is not known. Two small areas of sand pine are known to occur. One stand of perhaps 20 trees is located immediately north of the industrial area on Cape Canaveral. A second area of ca. 10 trees is adjacent to the wind tower scrub and east of LC 39-B. Until more is understood about the sand pine scrub community and its former status on Merritt Island, it seems best to protect these two stands as remnants.

Stands of sand pine scrub were relatively similar even though as much as 100 miles apart (Table 54). Normally only Pinus clausa occurred in the tree layer. Quercus myrtifolia was the leading dominant in all the stands studied (Table 55). Most of the leading shrub dominants were shared among the stands.

Coastal Scrub

Coastal scrub is a somewhat unique community type that appears to be limited to Merritt Island and Cape Canaveral. It may appear further south and north but this cannot be substantiated from the literature.

A tree layer is generally missing from coastal scrub. Often little in the way of a herb layer is present. A comparison of the stands with the Jaccard community coefficients revealed a considerable range in floristic similarity (Table 56). Based on importance values, the five leading dominants were quite variable among the stands (Table 57). In this subset of plants, only Serenoa repens was shared by all the stands.

Table 53. Relative rank and importance values of the five leading dominants of understory plants in four pine flatwood stands from east central Florida.

Species	Wisconsin Village	Headquarters	Volusia	UCF
Serenoa repens	2 (29.5)	1 (43.7)	2 (34.4)	1 (43.8)
Aristida stricta	1 (35.9)		3 (24.8)	3 (25.0)
Lyonia lucida	3 (29.3)	2 (21.8)	5 (14.6)	
Quercus myrtifolia		4 (15.4)	1 (45.6)	
Myrica cerifera var. *pumila*	5 (13.5)			
Quercus minima	4 (19.7)			4 (9.7)
Quercus virginiana var. *maritima*		3 (21.3)		
Vaccinium myrsinites		5 (12.3)		
Aristida spiciformis				2 (27.0)
Andropogon virginicus				5 (7.9)
Quercus chapmanii			4 (18.3)	

Table 54. Jaccard community coefficients for six stands of sand pine scrub. The coefficient is a measure of floristic similarity (%).

	UCF	Debary	Route 50	Route 405	Rockledge	Wekiva
UCF	100.0	40.9	55.5	40.5	29.7	40.5
Debary	--	100.0	38.7	38.8	34.1	31.5
Route 50	--	--	100.0	45.4	36.7	28.9
Route 405	--	--	--	100.0	40.0	33.3
Rockledge	--	--	--	--	100.0	32.4
Wekiva	--	--	--	--	--	100.0

Table 55. Relative rank and importance values of the five leading dominants among shrubs in six stands of sand pine scrub from east central Florida.

Species	UCF	Debary	Rt. 50	Rt. 405	Rockledge	Wekiva
Quercus myrtifolia	1 (81)	1 (105)	1 (81)	1 (97)	1 (63)	1 (84)
Lyonia ferruginea	2 (29)	5 (10)	2 (41)	2 (27)	5 (16)	a
Quercus chapmanii	4 (23)	4 (12)	4 (22)	2 (27)	3 (23)	3 (34)
Serenoa repens	3 (25)	3 (19)	3 (33)	a	4 (18)	2 (36)
Quercus v. var. *maritima*	5 (19)	5 (10)	5 (10)	3 (14)		4 (13)
Gerberia heterophylla						5 (12)
Persea borbonia var. *humilis*		2 (22)				
Vaccinium stamineum				4 (10)		
Pinus clausa				5 (9)		
Quercus v. var. *virginiana*					2 (57)	

a = ranked 6th in these stands

Table 56. Jaccard community coefficients for six stands of coastal scrub. The coefficient is a measure of floristic similarity (%).

	Dune Scrub	Happy Creek	Route 3	Ground Winds Tower	Cape Rosemary	Complex 34
Dune Scrub	100.00	41.38	45.16	28.57	64.71	25.00
Happy Creek	--	100.00	57.58	38.64	40.00	18.52
Route 3	--	--	100.00	41.30	34.48	16.13
Ground Winds Tower	--	--	--	100.00	23.08	15.38
Cape Rosemary	--	--	--	--	100.00	26.67
Complex 34	--	--	--	--	--	100.00

Table 57. Relative rank and importance values of the five leading shrubs in six stands of coastal scrub on Merritt Island and Cape Canaveral.

Species	Dune Scrub	Happy Creek	Route 3	Wind Tower	Rosemary	Complex 34
Ceratiola ericoides	1 (53)		1 (70)		1 (101)	
Quercus myrtifolia	2 (52)	1 (70)		1 (58)	2 (48)	5 (5)
Serenoa repens	3 (41)	2 (41)	2 (41)	2 (33)	4 (10)	1 (138)
Lyonia ferruginea	4 (29)					2 (25)
Quercus v. var. *maritima*	5 (18)	4 (22)	4 (23)	3 (28)	3 (25)	
Quercus chapmanii		5 (19)	3 (25)		5 (5)	5 (5)
Myrica cerifera var. *pumila*			5 (11)			3 (15)
Lyonia lucida		3 (29)		4 (24)		
Quercus v. var. *virginiana*						4 (11)
Befaria racemosa				5 (21)		

The leading dominants represent species of diverse habitat affinities (Table 57). Certiola ericordes is a typical plant of the sand pine scrub (Laessle 1958). Likewise, the scrub oaks, Quercus myrtifolia, Q. chapmanii, and Q. v. var. maritima are characteristic of sand pine scrub. However, Serenoa repens, Myrica cerifera var. pumila, Lyonia lucida and Befaria racemosa are flatwoods species. A comparison of densities of Quercus myrtifolia in the coastal scrub and sand pine scrub revealed no statistical differences.

The distribution of Florida mice (Peromyscus floridanus), Florida Scrub Jays (Aphelocoma coerulescens coerulescens) and Gopher Tortoise (Gopherus polyphemus) --all characteristic vertebrates of sand pine scrub-- on Merritt Island includes or is limited to the coastal scrub community type. This circumstance supports the hypothesis that coastal scrub is ecologically very similar to sand pine scrub.

Further analysis needs to be done to clarify the relationship between coastal scrub and sand pine scrub.

Coastal Strand

Coastal strand community type is confined to the immediate coastline of Cape Canaveral, Merritt Island and the barrier strand between the Atlantic Ocean and Mosquito Lagoon. The community type is widespread elsewhere in coastal Florida (Richardson 1977). Strand vegetation is dominated by shrubs and little in the way of ground layer plants is present in stands away from the coastal dunes. Stands near the dunes have more herbs. A comparison of the two stands studied on Cape Canaveral revealed a Jaccard community coefficient of 17.2 percent. Six shrubs were the leading dominants in the stands of coastal strand (Table 58). Four of these species were not found in the coastal scrub or sand pine scrub. Serenoa repens was the leading dominant. In Palm Beach County, Richardson (1977) stated Serenoa repens is a leading dominant in the distinctive strand community of that region. In general, species of oak (Quercus sp.) were relatively rare in the community type.

Coastal Dunes

The coastal dune community, or sea oats zone, extends from the coastal strand to approximately the limits of high tides. Much of the coastal dune vegetation on Merritt Island and Cape Canaveral had been disturbed over the past three decades. More recently, beach erosion has contributed to the loss of this habitat type.

Table 58. Relative rank and importance values of the five leading shrubs in two stands of coastal strand vegetation on Cape Canaveral.

Species	Beach (Zone 3)	Cape Canaveral
Serenoa repens	1 (85)	1 (88)
Myrica cerifera	2 (28)	4 (16)
Bumelia tenax	3 (26)	3 (24)
Myrcianthes fragrans		2 (49)
Chiococca alba	4 (24)	5 (15)
Coccoloba uvifera	5 (18)	

Coastal dune vegetation is fairly heterogeneous from place to place. A comparison of the floristic similarity indicated the range of variation that might be expected (Table 59). The importance of particular plants also is quite variable from stand to stand. Among the five top ranked plants in the stands, none shared the same importance value rank in another stand (Table 60).

Reference Stands

The purpose of the reference stands is to document changes in the species composition and relative importance of plants in several stands which belong to a common community type. Because the measurements are to be taken on permanent study sites, valid between year comparisons may be made. Use of permanent plots or transects to document the nature and rate of succession in plant communities has a long history (Daubenmire 1968). The work by Veno (1976) in north Florida shows the usefulness of the approach in this region. Elsewhere other investigators have made significant contributions through the interpretation of serial observations on permanent study plots (Schmelz et al. 1975; Abrel and Jackson 1977; Miceli et al. 1977). Adaptation of the general methods to the environmental monitoring program at the Kennedy Space Center appears to be appropriate.

Summary

The plant community types of Merritt Island were designated as follows: hammocks (forests dominated by broad-leafed evergreen species), pine flatwoods, coastal scrub, coastal strand, coastal dunes, wetlands dominated by woody vegetation, wetlands dominated by non-woody vegetation and citrus groves. The distribution of these community types was indicated in contrasting colors on a map prepared at a scale of 1:60,000.

The results of the community classification and mapping program served as a basis for the design of the plant community analysis and the selection of reference stands for a proposed future environmental monitoring program.

Relatively undisturbed areas (2 or more acres) were identified within the geographic extent of the major community types. During the summers of 1976-78 selected stands were sampled by standard methods detailed elsewhere. The allocation of sampling effort by community type was: hammocks (9 stands), pine flatwoods (5), coastal scrub (12), coastal strand (2), and coastal dunes (3). Availability of suitable stands partly determined the distribution of sampling effort. Density, frequency and basal area was estimated for tree species, density and frequency for shrubs, and coverage and frequency for herbaceous plants. A list of plants was prepared for each stand.

Hammocks occupied sites with a wide range of drainage patterns, but generally with organic soils, high nutrient concentrations, and near neutral pH.

Table 59. Jaccard community coefficients for three stands of coastal dune community type. The coefficient is a measure of floristic similarity (%).

	Beach Grid (zone 1)	Beach Grid (zone 2)	LC-39-B
Beach Grid (zone 1)	100.00	43.24	30.56
Beach Grid (zone 2)	--	100.00	20.00
LC-39-B	--	--	100.00

Table 60. Relative rank and importance values of the five leading plants in three stands of coastal dune vegetation of Merritt Island and Cape Canaveral.

Species	Beach Grid (Zone 1)	Beach Grid (Zone 2)	LC 39-B
Heterotheca subaxillaris	1 (34)	4 (12)	
Uniola paniculata	2 (24)	5 (11)	1 (58)
Ipomoea stolonifer	3 (19)		5 (10)
Panicum amarulum	4 (17)		
Artiplex arenaria	5 (16)		2 (36)
Andropogon virginicus	5 (16)		
Serenoa repens		1 (73)	
Coccoloba uvifera		2 (32)	
Smilax auriculata		3 (15)	
Opuntia compressa		5 (11)	
Unidentified Composite			3 (27)
Spartina patens			4 (14)
Croton punctatus			5 (10)

Twenty-eight species of trees with importance values (IV) equal or greater than unity were included in the samples. Sabal palmetto and Quercus virginiana var. virginiana were the leading dominants. Basal area was very high in most stands, owing, in part, to the high density of Sabal. A large variety of tree seedlings, shrubs and vines (27 species) were found in the hammocks. Sabal palmetto, Psychotria nervosa and Toxicodendron radicans were prominent. Herbaceous cover was modest and averaged 17 percent. The floristic similarity of the hammocks, based on Jaccard community coefficients, was low and reached 38 percent in only one comparison. Thus, pairing of hammocks in ecological monitoring was not possible.

The so-called pine flatwoods complex of Florida includes three phases, longleaf pine (Pinus palustris), slash pine (P. elliottii) and pond pine (P. serotina). Flatwoods dominated by P. elliottii are extensive on Merritt Island and three areas were sampled. In addition, single stands dominated by either longleaf or pond pine were studied on the mainland.

Soils of flatwoods are poorly drained and highly acidic. Stands were dominated by a tree layer of one species of pine, except in the stand of Pinus serotina, where several hardwoods were present. Basal areas of the pine flatwoods stands were very modest due to their being second growth and not densely stocked. Understory vegetation was quite diverse and Serenoa repens and Aristida stricta were the leading dominants.

The scrub complex of east central Florida appears to have at least two phases, sand pine scrub and coastal scrub. Both phases occur on soils that are 97-99 percent sand, acidic in reaction (4.3-5.0) and nutrient deficient. Sand pine (Pinus clausa) and a variety of hardwoods compose the tree layer in sand pine scrub; however, most of the basal area is contributed by P. clausa. A rich variety of small and large shrubs form a dense thicket (scrub) under the trees. Quercus myrtifolia was the leading dominant among the larger shrubs. Likewide, it was dominant among the smaller shrubs. Few ground layer plants were found.

Coastal scrub is fairly widespread on Merritt Island and Cape Canaveral. This is the result of its distribution being limited to sites derived from recent deposits of nutrient deficient marine sands. Coastal scrub is characterized by a dense layer of shrubby plants. A tree layer is generally missing. Likewise, little in the way of a herb layer is present. Most of the smaller woody plants (<50 cm in height) occurred at densities of <1.0 per m^2. Quercus myrtifolia and Gaylussacia dumosa were present at high densities, however. The species which occurred with the greatest frequency among the stands were Quercus v. var. maritima, Quercus myrtifolia and Vaccinium myrsinites. These were the leading dominants in importance values. The shrub layer of the coastal scrub was dominated by high densities of Quercus myrtifolia and Serenoa repens. Among the shrubs, Serenoa repens had the highest average frequency of occurrence. Quercus myrtifolia and Serenoa repens were codominants and ranked first and second by importance values. Ceratiola ericoides, often cited as an indicator of sand pine-scrub communities, ranked third.

Coastal strand vegetation is confined to the immediate coastline of Cape Canaveral, Merritt Island and the barrier strand between the Atlantic Ocean and Mosquito Lagoon. Soils of the strand communities are basic ($\bar{x}$ pH = 7.3) and about 95 percent sand. Strand vegetation is dominated by shrubs with little or no development of ground layer vegetation. Often the shrubs exhibit a hedged appearance owing to the limiting effects of salt spray. *Serenoa repens* was the dominant species in terms of frequency, coverage and importance value. Other typical shrub species included *Myrica cerifera*, *Chiococca alba*, *Bumelia tenax* and *Myrcianthes fragrans*.

The coastal dune community, or sea oats zone, extends from the coastal strand to approximately the limits of high tide. Much of the coastal dune vegetation of Merritt Island and Cape Canaveral has been disturbed over the past three decades. More recently, beach erosion has contributed to the loss of this habitat type. Three stands were sampled within the sea oats zone. Their soils are about 94 percent sand, basic in reaction and nutrient deficient. Thirty-six species were recorded in the study. In contrast, only 10 species were included in the samples from coastal strand. Sea oats (*Uniola paniculata*) was the dominant species in terms of frequency, coverage and importance value. *Heterotheca subaxillaris* and *Atriplex arenaria* were relatively important elements of the coastal dune community.

A series of 10 ecosystems was selected for long-term study of plant community change or succession. These reference stands were sites from among those included in the plant community analysis. Permanent line transects (5 per site) 15 m in length were objectively established. Canopy coverage of woody plants was recorded on three sites in 1977 and on 10 sites in 1978. Between year comparisons of coverage on the stands studied in both years showed modest increases in vegetal cover. The greatest change (29.8 percent) was indicated on the coastal dunes (beach grid).

Conclusions

1. The upland plant communities of Merritt Island were mapped as: hammocks, pine flatwoods, coastal scrub, coastal strand, coastal dunes, and citrus groves. Wetland plant communities are of two general types, those dominated by woody vegetation and those dominated by non-woody vegetation. Plant community analysis and future monitoring programs should be designed with these major landscape units as a basis for decision making with regard to ecological stratification and sampling.

2. Thirty-one stands were selected to describe the upland plant community types of Merritt Island and vicinity.

3. Quantitative analysis of stands representative of these communities revealed a substantial amount of variation between stands within a community type. This within-community-type heterogeneity appears to be normal and reveals the continuous nature of variation to be expected in moderately disturbed landscapes such as Merritt Island. The existing data

base is adequate to describe this variation for hammocks, pine flatwoods, and coastal scrub; however, analysis of two additional stands of coastal strand and coastal dune vegetation would be desirable to add reliability for those two vegetation types.

4. Dominance-diversity curves proved to be useful in providing a quantitative comparison of the similarity of several stands from a single community type.

5. Ten stands were found to be suitable to serve as reference stands for an ongoing plant community monitoring program. Future study of the vegetation on the reference stands should involve careful assessment of canopy coverage. Canopy coverage is an excellent indicator of relative dominance in an ecological context (Daubenmire 1968). In addition, data collection on the reference stands should be carried out in precisely the same manner for ease of comparison.

6. Annual assessment of canopy coverage should be obtained from a minimum of five permanent transects in each reference stand. Trends in canopy coverage statistics can provide rigorous evidence of chronic change in species composition and structural attributes of the reference stands. The influence of acute perturbations will not be clearly revealed if measurements are taken annually.

SMALL MAMMAL POPULATIONS

Introduction

Small mammals are important components of terrestrial community structure (Golley et al. 1975; Chew 1978). In the present context, small mammals include those insectivore and rodent species no larger than 250 grams; smaller individuals of other mammal groups may on occasion be included in the samples, e.g., skunks, opossums or rabbits. Small mammals feed directly on plants, or on plant parts such as seeds, and on certain other consumers. Likewise, they are food resources for larger predators and smaller parasites. The role of small mammals in energy flow is the subject of considerable research (Petrusewicz and Ryszkowski 1969; Petrusewicz and Hansson 1975). French et al. (1976) suggest that small mammals contribute more to energy flow in grasslands than do birds (Wiens 1973). The importance of small mammals in nutrient cycles is in a preliminary state of understanding (Gentry et al. 1975). Potter (1978) has reviewed the recent work and concludes small mammals have little effect on the input-output relationships of nutrients in most ecosystems.

Small mammal populations are very sensitive to changes in environmental conditions, e.g., rainfall and primary production (Whitford 1976; Tast and Kalela 1971); as a consequence, they exhibit considerable spatial and temporal dynamics in their abundance patterns (Terman 1968; Krebs and Myers 1974). Changes in vegetative cover often are correlated with variations in small mammal populations (Batzli and Pitelka 1970; 1971; Batzli 1974; Goertz 1964).

Due to their local abundance, sedentary nature, non-migratory tendencies, and high trappability, small mammals lend themselves to ecosystem monitoring programs. Thus, small mammals have been studied where ionizing radiation may influence ecosystems (Dunaway and Kaye 1961; Golley et al. 1965; French et al. 1974; O'Farrell et al. 1975; Buech 1974).

Small mammal populations on Merritt Island were sampled monthly in four diverse plant communities. Changes in relative abundance, species diversity, standing crop biomass, reproductive activity, movements and other demographic features were documented over a period of thirty-four months. Development of an ability to detect non-natural change in the systems was the ultimate goal of the research.

Specific study objectives were:

1. to monitor small mammal species in flatwoods (Wisconsin Village Grid), hammock (Happy Hammock Grid), coastal dune (Beach Grid), and coastal scrub (Dune Scrub Grid) communities.

2. to estimate population size of the small mammals at monthly intervals throughout the year.

3. to document demographic aspects of the populations, viz., survival rates, reproductive activity, sex ratios, ectoparasite burdens, and movements in relation to seasonal and yearly variations on the same area and among areas.

The small mammal species of main concern for the purposes of this research were the following myomorph rodents: Peromyscus polionotus niveiventris, P. gossypinus palmarius, P. floridanus, and Sigmodon hispidus littoralis. Also involved to a lesser extent were Ochrotomys nuttalli floridanus and Rattus rattus.

The genus Peromyscus (white-footed mice or deer mice) is a large North American group. Hooper (1968) outlined the taxonomic arrangements of the genus as presented by Osgood (1909), Hall and Kelson (1959), and Hooper and Musser (1964). The most recent of these schemes listed 57 species in seven subgenera. Peromyscus are generally medium-sized mice (13 to 40 g) with relatively large ears, long tails, and white feet. They are nocturnal. The gestation period is 21 to 27 days, and mean litter sizes range from 1.6 to nearly 5 (Blair et al. 1968; Layne 1968; Burt and Grossenheider 1976).

Peromyscus polionotus Wagner (the beach mouse or old-field mouse) is the smallest U.S. species in the genus. The beach mouse is a burrowing species which prefers coastal dunes and inland fields of Florida, Alabama, Georgia, and South Carolina (Blair et al., 1968). The pelage color and pattern vary considerably with soil color (Kaufman 1974). The subspecies in Brevard County, Florida is P. p. niveiventris (Hall and Kelson 1959).

Peromyscus gossypinus LeConte (the cotton mouse) is a medium-sized, relatively dark species found in most of the Southeast U.S. Wolfe and Linzey (1977) summarized the biology of this species. P. gossypinus is a good climber. It feeds on seeds and insects (Burt and Grossenheider 1976). In Florida, cotton mice are found in a variety of habitats and nest in a variety of positions (Layne 1974). The sub-species in East Central Florida is P. g. palmarius (Hall and Kelson 1959).

Peromyscus floridanus Chapman (the Florida mouse or gopher mouse) is a robust species with large hind feet. This species prefers sand pine scrub and turkey oak-pine habitats (Layne 1969). It is endemic to peninsular Florida (Neill 1957). The gopher mouse is so named because it utilizes burrows of the gopher turtle (Gopherus polyphemus) or the pocket gopher (Geomys pinetis) for home sites (Layne 1967). Layne (1963; 1966; 1967; 1969; 1970) has published much valuable information on the ontogeny, ethology, and parasites of P. floridanus.

Ochrotomys nuttalli Harlan (the golden mouse) was formerly included in the Genus *Peromyscus* (Hall and Kelson 1959). This species is characterized as a small cinnamon mouse with a short tail. It is found in most of the Southeast (Burt and Grossenheider 1976). The golden mouse is a good climber and nests above the ground. Linzey and Packard (1977) have reviewed the biology of this species. The subspecies in this area is *O. n. floridanus*.

Sigmodon (cotton rats) are compact, coarse-haired, short-eared rats represented by about 20 species in North and South America. Three of these species enter the U.S. *S. hispidus* Say and Ord is the only species in Florida (Blair et al. 1968). The subspecies in East Central Florida is *S. h. littoralis* (Hall and Kelson 1959). Cotton rats feed primarily on vegetation and sometimes construct surface runways in grassy habitats (Burt and Grossenheider 1976). Odum (1955) found that *Sigmodon hispidus* can have large population fluctuations similar to those described for microtine rodents (Krebs et al. 1973).

Rattus rattus Linnaeus (the roof rat) is a large, slender, long-tailed Old World species that has become commensal with humans in many parts of the U.S. and Mexico. Feral populations have been found in Texas and Florida (Blair et al. 1968). The specimens from Brevard County were medium gray with white bellies.

More complete information concerning the ecology of these species can be found in the references listed in Appendix Table 95.

Methods and Materials

Study Areas

Four areas which represented pine flatwoods, hammock, coastal dunes and coastal scrub were selected for study. These areas also were included among the reference stands for which a plant community analysis was completed.

Wisconsin Village Grid

The grid is located near the north end of the shuttle runway (Figure 3). A trapping grid of eight rows and eight columns was installed to yield 64 trapping stations, 15 meters apart (Appendix Figure 90). This grid is superimposed on the same area trapped by Ehrhart (1976) during 1972-75. Wetter areas of the western and southern margins of the original grid were excluded to make the study area as homogeneous as possible. The grid area is 1.44 hectares.

The vegetative cover of the grid may best be referred to as flatwoods without pines. The dominant element in the ground cover is wiregrass *Aristida stricta*. Smaller woody plant include St. John's wort

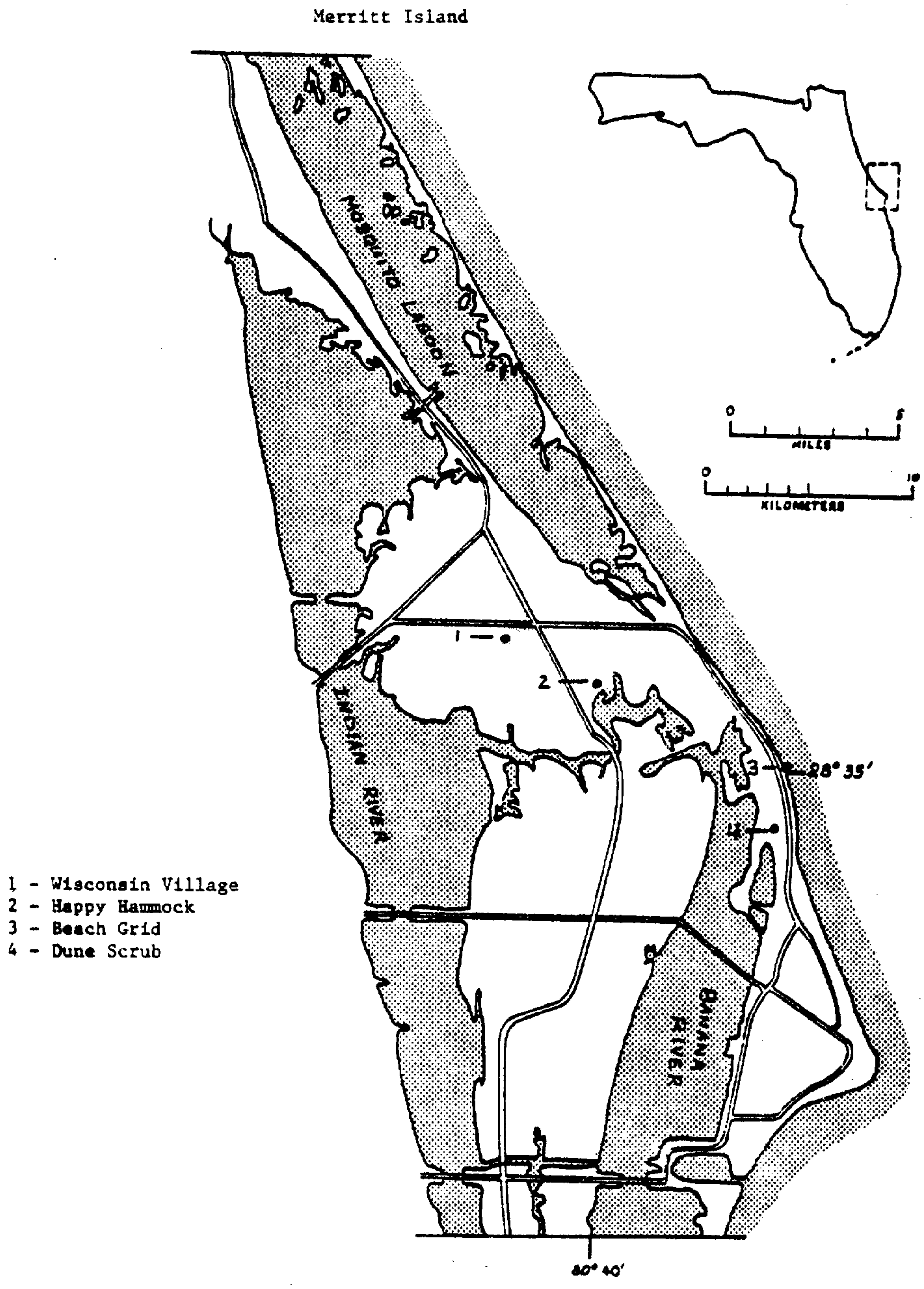

Figure 3. Location of small mammal population monitoring grids.

Hypericum reductum, Gaylussacia dumosa, and Vaccinium myrsinites. Taller shrubs (1-2 meters in height) are Quercus myrtifolia, Q. chapmanii, Lyonia lucida, L. fruticosa, Ilex glabra, Befaria racemosa, and Serenoa repens. A smaller oak Quercus minima is also very common. A more complete documentation of the plant community is included in the previous section of this report.

Happy Hammock Grid

The location of the grid is shown in Figure 3. The configuration of the study area is irregular, owing to the juxtaposition of the hammock and a hardwood swamp. Fifty trap stations were located at 15 meter intervals (Appendix Figure 91). The grid area is 1.12 hectares.

Large live oaks Quercus virginiana var. virginiana are scattered throughout the hammock. Other canopy dominants include Sabal palmetto, Quercus laurifolia, red maple Acer rubrum, and elm Ulmus americana var. floridana. Subcanopy trees include hackberry Celtis laevigata, mulberry Morus rubra and lancewood Nectandra coriacea. Common shrubs are coffee Psychotria nervosa and P. sulzneri, Myrsine guianensis and Ardisia escallonioides. The plant community is further described in the previous section of this report.

Beach Grid

The beach grid was established in June of 1975 to monitor small mammals during the Viking Launches from LC41 (Figure 3). A standard 8 x 8 grid, 1.44 hectares in area, is in place (Appendix Figure 90).

The grid extends inland from near the high tide line over two small dune lines, a major dune (six m above sea level), and 40 meters beyond the crest of the major dune line. Three obvious zones of vegetation run parallel with the beach and dune lines. The first zone and most seaward is covered with sea oats Uniola paniculata, Heterotheca subaxillaris, and Ipomoea stolonifera and I. pes-caprae. Some 14 other species of plants occur in zone 1. Zone 2 is between the beach and the major dune line. Much of this area is bare sand with clumps of palmetto Serenoa repens, occasional sea grape Coccoloba uvifera, and buckthorn Bumelia tenax. Gopher apple Licania michauxii forms extensive mats in some places. Zone 3, behind the main dune line, is covered with a dense shrub layer. Palmetto and sea grape are most abundant, while wax myrtle Myrica cerifera, buckthorn and Chiococca alba are common but scattered. Almost no ground cover exists beneath the shrubs, but a heavy litter is present. Additional details are to be found in the previous section of this report.

Dune Scrub Grid

The grid was established as a control grid during previous studies in 1975 (Figure 3). A standard 8 x 8 grid, 1.44 hectares in area, is in use (Appendix Figure 90).

This grid is found on an old dune area that appears to be quite uniform in terms of soil and relief. A dense shrub cover 1-2 meters in height covers the area. Essentially no ground level cover is present, but a heavy litter layer has developed beneath the shrubs. Rosemary *Ceratiola ericoides* forms extensive, almost pure stands. Three oaks, live oak *Quercus virginiana* var. *maritima*, Chapman oak and myrtle oak, are common. Spanish plum *Ximenia americana*, *Lyonia ferruginea*, and saw palmetto are scattered throughout the grid. Additional details are to be found in the previous section of this report.

Trapping and Processing Procedures

Trapping and processing procedures were standardized on all areas. Each intersection of the grid columns (designated by letters) and rows (designated by numbers) was marked with a wooden stake. Aluminum tags with the letter-number codes were attached to the stakes. Sherman live traps which measured 7.6 cm x 8.9 cm x 23.2 cm were placed within 1-2 m of the stakes and left in place throughout the year. When trap success was 50 percent or greater based on the original 64 traps, an additional 56 traps were added. These traps were placed on the columns halfway between the stakes, i.e., between A-1 and A-2, etc. The object of the additional traps was to maintain a sizeable surplus of empty traps available in the field, regardless of small mammal density (Krebs et al. 1976). All traps were baited with rolled oat flakes on the day before field processing of the mammals. Traps were opened to capture animals once per month or every four weeks.

The arrangement of traps in Happy Hammock is slightly modified. A regular grid of only 50 trap stations is in use (Appendix Figure 91). In addition, 25 so-called "up traps" are deployed. Twenty-five of the 50 possible trap sites were selected at random, and a wooden shelf with roof was attached to a large tree near the marker stake. Each "up trap" is approximately 1.5 m from the ground. These traps have permitted more adequate sampling of arboreal small mammals such as cotton mice and the golden mice *Ochrotomys nuttalli*.

Animals were processed in the field. Captured mice were handled in plastic bags which permitted easy removal from traps. Cotton rats and other larger animals were transferred from the traps into "critter" bags. During routine examinations each animal was held by the loose skin found in the interscapular region. All data were recorded on a standard form from which computer cards were punched (Appendix Figure 92). After species identification, untagged animals were ear tagged with numbered monel tags. Sex was determined. Males were classified as having testes in an abdominal, descended, or intermediate position. Females were noted as having imperforate or perforate vaginae. Other external characteristics of the female's reproductive state were recorded. The vulva was noted to be inactive, turgid, cornified or membranous, closed with a copulatory plug, or bloody. Mammary development was classified as small, large, or hairless and pigmented. Status of the symphysis pubis was indicated as closed notched, or open (can or nearly can place tip of finger between the points of bone). Any pregnant females were recorded and notes taken on their condition. The number of plantar pads on the hind feet of the Peromyscus species was recorded, because considerable variation has been discovered in the character. The foot length of each capture was recorded. Body weights were taken on 50, 100, or 300 gram Pesola spring balances. Pelage was classified as juvenile, subadult or adult. A minimum estimate of ectoparasite burden was ascertained (a complete count of ectoparasites would require that the animals be killed and examined under laboratory conditions). Individual ticks and botflies were counted. The number of fleas was estimated as none, from 1-5, and greater than 5 present. Mites were noted as present or absent. Chiggers were placed into three abundance categories, namely: none, from 1-50, and greater than 50. Condition of captures at the time of release was noted as good or poor.

Data Storage, Retrieval, and Analysis

A format statement for computer coding of the small mammal data was adapted from a similar document utilized by the members of the Grassland Biome Team of the International Biological Program, Ft. Collins, Colorado. Codes and designations are provided in Appendix Figure 92 and Appendix Table 96. Data were routinely keypunched, verified, and checked against the original field forms.

Routine sorting programs were adapted to suit the needs of the small mammal study. Eight such programs were operational.

Analysis of population levels of the various small mammals was fundamental to the monitoring program. Smith et al., (1975) have most recently reviewed the various ways to evaluate abundance of small mammals. Most non-removal methods were not applicable to this work owing to statistical assumptions not being satisfied (Otis et al. 1978). Accordingly, the calendar of captures procedure was adopted (Petrusewicz and Macfadyen 1970). The method yielded an enumeration of the minimum number of animals known to be alive during each trap period. This method is now widely used (Krebs 1966; Sullivan 1977; Tamarin 1977; Fairbairn 1977) and has been shown to provide reliable data when recapture rates were high (Hilborn et al. 1976).

Survival rates by species, based on four-week intervals, were calculated as the number of marked animals released at time 't' divided into the number of these marked animals recaptured in the next sample period (t + 1). Changes in survival rate may be correlated with population density, phase of population growth, and season.

Movements of small mammals were quantified by the calculation of the mean distance between successive recaptures (Brandt 1962; Wolfe 1968). Successive captures, a minimum of four, for a particular animal were determined, and distance in meters between successive captures was averaged. Data were stratified by species and sex. Differences among the groups were evaluated by use of t-tests.

Species diversity relationships among the small mammal communities were analyzed by two standard measures: Brillouin and Simpson. Both Peet (1974) and Goodman (1975) have written critical reviews of these diversity indices. The Brillouin measure provides an index to compare variation in species diversity in time and space. Its magnitude is influenced by both the number of species in the community and their individual relative abundances. The absolute value may vary from 0 to infinity, however most communities yield an index between 1.0 and 3.0. The Brillouin measure is sensitive to and correlated with the number of species present. Calculation was by the following (Lloyd et al., 1968):

$$\text{Brillouin Index} = \frac{1}{N} \log \left(\frac{N!}{n_1!n_2!\ldots n_i!} \right)$$

Where N = total number of individuals
n_i = total number of species

In contrast, the Simpson index is most sensitive to changes in the relative abundance of species and is claimed to measure the concentration of dominance within a community (Peet 1974). The value may range from 0 to 1.0 and indicates a strong concentration of dominance as it approaches 1.0. Calculation for the finite sample case is as follows (Pielou 1977):

$$\text{Simpson index} = \Sigma \frac{n_i(n_i - 1)}{N (N - 1)}$$

Where n_i = total number of species i
N = total number of individuals

Results

Each grid represented a point sample of an ecosystem type found to be wide-spread on Merritt Island. Accordingly, the results of 34 months of study of each site will be reported separately and then patterns of similar response will be examined.

Wisconsin Village Grid

The grid was representative of the pine flatwoods community type.

The Small Mammal Community

The number of species of small mammals captured on the grid varied from 2 to 5 per month and the seasonal average was 3.5. Typically cotton mice and cotton rats were present. Golden mice were not present in every month of the study, but were highly variable in their trappability. Florida mice were present in the early months of study, but appeared to have ceased to occur on the study area by mid-1977. An occasional rice rat was trapped when undergoing dispersal movements between neighboring wetland habitats.

Trends in species diversity and dominance are shown in Figure 4. Diversity was lowest (0.1) during fall of 1976 when cotton rat abundance was highest. In subsequent seasons, diversity was low (0.3 - 0.45) and relatively stable. Dominance tended to decrease from a high in 1976 (0.9) to a low (0.3) during the spring of 1979. The seasonal average of species trapped was constant over the last 15 months of study.

Trap Success

The number of small mammals captured per trap rose from 30 percent in June of 1976 to 75 percent in November (Appendix Figure 93). Capture success declined in early 1977, recovered slightly in June, and remained at 10-20 percent throughout the remaining months of study. Trappability of cotton rats was very high during 1976 and 1977 when densities were high. Over the fall-winter period of 1978-79, trappability varied from near 0 percent to 100 percent and was associated with a lower density of cotton rats. Owing to small sample sizes, trappability was not calculated for other rodent species.

Populations of Small Mammals

The trend in total captures of small mammals over the period of study is shown in Appendix Figure 94. Captures increased steadily during 1976 and subsequently declined in early 1977. Numbers caught in 1978 tended to be somewhat lower than in 1977 and ranged between 10 and 15 captures per month.

Minimum numbers of each species known to be alive on the grid are shown in Figure 5. Cotton rats have undergone a dramatic fluctuation in abundance over the 34 months. Minimum numbers increased from 15 in June

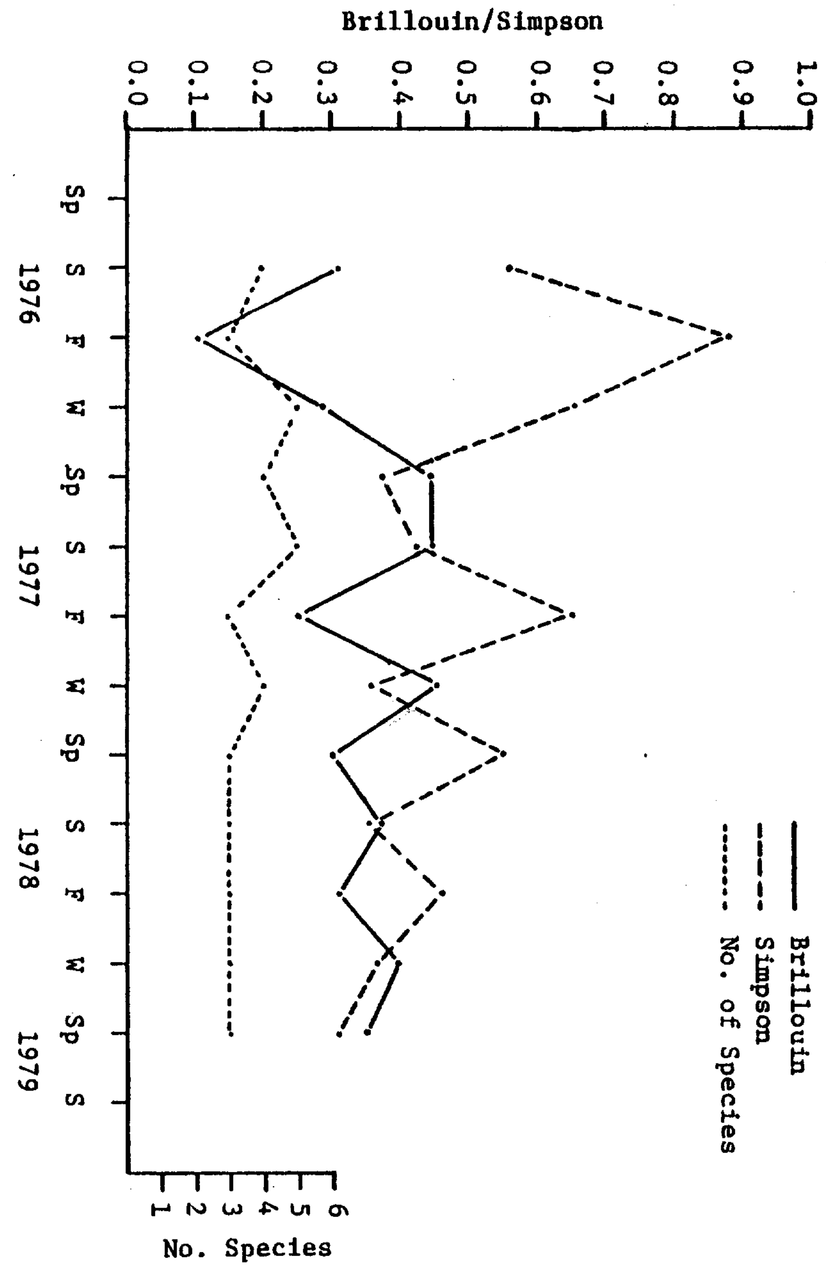

Figure 4. Species diversity (Brillouin measure), species dominance (Simpson index), and the number of species of small mammals observed according to season and year on the Wisconsin Village Grid, 1976-79.

to 90 in November of 1976. Coincidental with the unusually cold winter of 1976-77, numbers declined from January 1977 until April and approached the level of abundance observed the previous June. Cotton rats increased in late summer 1977, but started a steady decline in November which continued until April of 1978 (one animal known to be alive). The population recovered slightly during the summer and fall of 1978 and a minimum of 6 individuals were present in December. Numbers continued to be stable in early 1979.

Monthly variation in cotton rat minimum numbers is summarized over the study in Table 61. The average number of cotton rats known to be alive over the 34 months was 18.4 (SE = 2.9).

Numbers of cotton mice underwent 2 oscillations, with early spring highs in 1977 and 1978 to be followed by diminished numbers in summers (Figure 104). The overwintered population was modest in 1978-79. Monthly variation in abundance cotton mice has not been very great, and averaged 6.5 (SE = 2.1) (Table 61).

Numbers of Florida mice increased in November and December of 1976 and remained stable (5-6) from January to June of 1977. Since June 1977, a single capture has been made (August 1977) (Figure 5). The demise of the Florida mouse population was most puzzling; however, numbers were known to be very low in excellent habitats elsewhere in central Florida (Stout, personal observation).

Rice rats were captured on occasion, but did not appear to be permanent residents of the Wisconsin Village grid (Figure 5). In contrast, golden mice appeared to be permanent residents, but at very low numbers. Captures of golden mice increased in the summers of 1977 and 1978 and since December 1978.

Biomass of Small Mammals

Trends in biomass of the small mammals are shown in Appendix Figure 95. Cotton rats were the greatest contributors to biomass during 1976 and 1977. Biomass of mice was equal to or exceeded that of cotton rats in 1978 and 1979.

Trends in Body Weight

Trends in mean monthly body weight of male and female cotton rats during 1976 and 1977 are illustrated in Appendix Figures 96-99. Males were significantly larger than females ($p < .05$) in July and August 1976. Mean weight of both sexes averaged slightly over 60 g from October until February 1977. Males commenced to gain weight in March and April and increased in average body size until September (Appendix Figure 97).

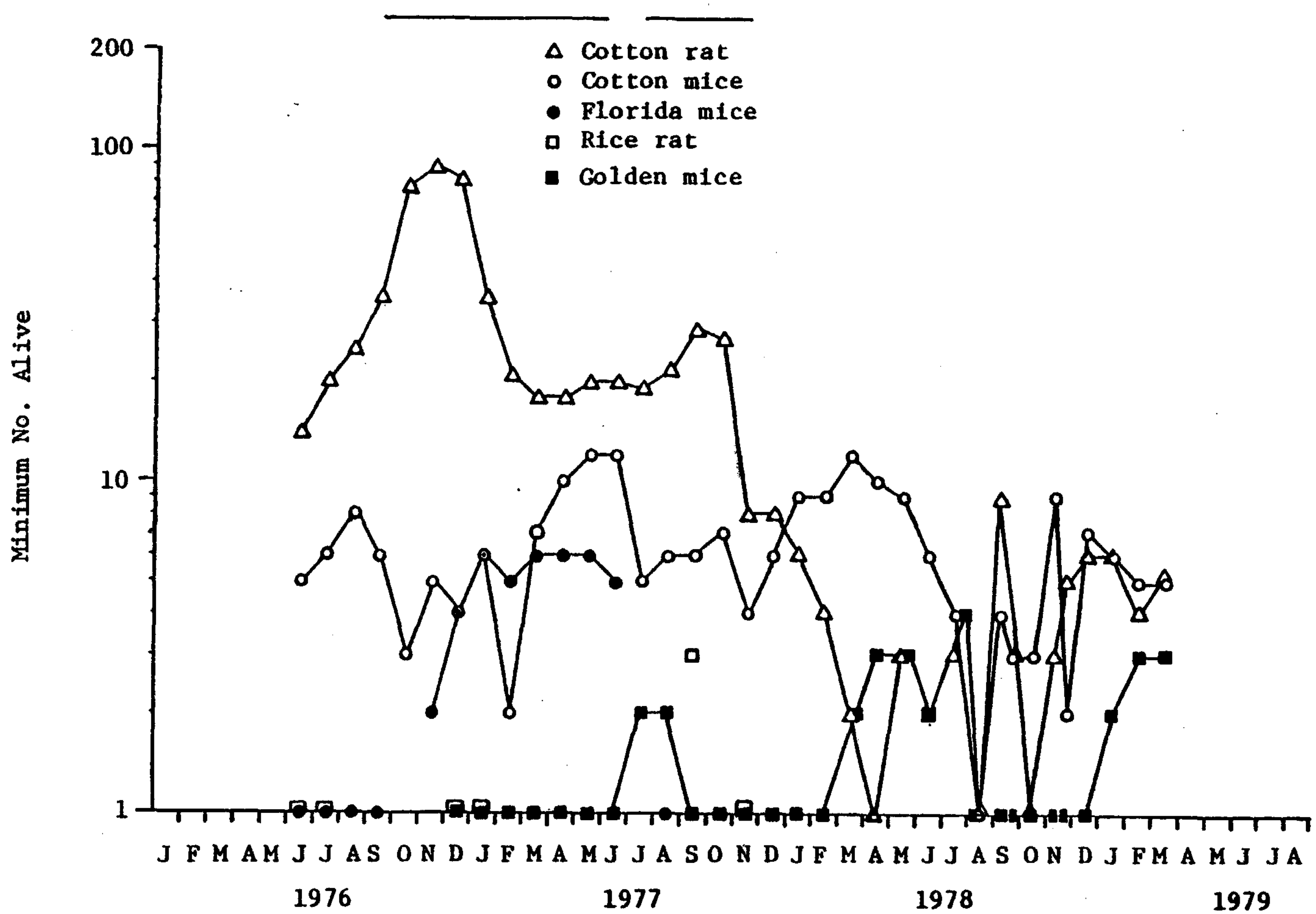

Figure 5. Minimum number of individuals known to be alive by species on the Wisconsin Village Grid. Solid line indicates when traps were doubled.

Table 61. Monthly average minimum numbers of cotton rats and mice on the Wisconsin Village Grid, 1976-1979. The grid was 1.44 hectares in area.

Month	n	Mean Minimum Numbers (1 SE)	
		Cotton Rat	Cotton Mice
January	3	16.0 (10.0)	7.0 (1.0)
February	3	9.6 (5.6)	5.3 (2.0)
March	3	8.3 (4.9)	8.0 (2.0)
April	2	9.5 (8.5)	10.0 (0.0)
May	2	11.5 (8.5)	10.5 (1.5)
June	3	11.3 (5.9)	7.6 (2.1)
July	3	14.0 (5.5)	5.0 (0.5)
August	3	16.0 (7.5)	5.0 (2.0)
September	3	23.6 (9.0)	5.3 (0.6)
October	3	36.0 (22.1)	4.3 (1.3)
November	3	33.3 (27.3)	4.6 (0.3)
December	3	32.0 (25.0)	5.6 (0.8)
Overall Average		18.4 (10.1)	6.5 (2.1)

Females in contrast, showed no significant ($p <.05$) changes in body weight from January through July of 1977 (Appendix Figure 99), but increased in average body weight thereafter. The presence of large males and females preceded the major increase in cotton rats in late 1976.

Data on monthly body weight of male and female cotton mice are shown in Appendix Figures 100-107). Males averaged between 20 and 30 grams in weight for all months in which three or more individuals were captured, with the exceptions of August and December of 1977, and January and November of 1978 when average weights exceeded 30 grams. Female cotton mice tended to be slightly smaller than males throughout the study, although not significantly ($p=.05$) smaller.

Cotton mice did not show a pronounced trend in body weight over the year. A slight tendancy for an increase from low values in winter to higher values in late summer was suggested for females during 1978 (Appendix Figure 106).

Survival Rates

The four-week survival rate of cotton rats declined over the period of rapid population increase (July-December) in 1976, reached a minimum in January, and steadily improved until May 1977 (Appendix Figure 108). Survival during the remainder of 1977 tended to decrease toward a low (20%) in November. Cotton rats survived well in early 1978, but very poorly during summer. Survival tended to be high during the last months of study, with five of nine months being 80% or better. These higher survival rates were associated with a low population.

Survival of cotton mice is summarized in Appendix Figure 109. Overall the survival rates were equal to or greater than 50% in 27 of 34 months. Very low survival (0%) was observed in August and September 1978. Similar but lesser declines in survival were noted in late summer of 1977 and 1978.

Survival of Florida mice is summarized in Appendix Figure 110.

Reproductive Activity

The reproductive status of male cotton rats of breeding size, i.e., greater than 60 g, is summarized in Appendix Table 97. Breeding size adults (descended testes) were present from July to October of 1976, from April to September of 1977, and from July to September of 1978. A single adult descended male was noted in March 1979, following a winter in which few cotton rats were trapped.

Female cotton rat reproductive activity is summarized in Appendix Figure 111. Activity was concentrated during the summers of 1976, 1977 and 1978. Some evidence of reproduction was present during the winter of 1978-79.

Male cotton mice had descended testes in August, September, November and December of 1976 (Appendix Table 98). This pattern was repeated in 1977. Breeding males were present in March and April of 1977 and 1978. Few descended males were observed during the early summer months prior to the fall onset of reproduction.

Female cotton mice were suckling young from September until December 1976 and in September and October of 1977 (Appendix Figure 112). Some breeding activity was observed in late winter and early spring of 1978 as well as late in the fall.

Male Florida mice had descended testes in December 1976 and March through June of 1977 (Appendix Table 99). The last male observed on the study area was descended (August 1977). Female Florida mice were reproductively active from August through December of 1976 (Appendix Figure 113). Reproduction ceased from January through March, but commenced again in April and continued through June of 1977.

Sex Ratio

The sex ratio of cotton rats showed considerable variation over the cycle of abundance from 1976 through 1979, but none of the ratios were significantly different (p=.05) from an hypothesized ratio of 1:1 (Appendix Table 100). Over the period of study, the sex ratio was approximately equal in 18 months; it favored females for 10 months and favored males for six months.

Sex ratios of cotton mice were not significantly different (p=.05) in any month (Appendix Table 101).

The sex ratio of Florida mice was at unity in five of 13 monthly samples since October 1976 (Appendix Table 102).

Age Structure

The age structure of live trapped cotton rats is summarized in Appendix Table 103. Greater than 58 percent of the population was adult (≥100 g) according to body weight during June-September of 1976. Juveniles (0-60 g in body weight) constituted between 44 and 57 percent of the population from October 1976 through February 1977. Few juveniles were present from April until October of 1977. The percentage of subadults (61-100 g in body weight) increased from 0 percent in June 1976 to 73 percent in April 1977. Large adults were present in August and September of 1977. Age structure shifted to favor juveniles in October (64%) and subadults in November (57%) and December (57%). Twenty-four of 36 cotton rats captured in 1978 were juvenile or subadult, according to body weight. Only adults and subadults were trapped in the first three months of 1979.

Based on pelage development, trapped cotton mice have been predominately adults over the period of study (Appendix Table 104). Captures of juveniles (gray pelage) have been limited (6). Most captures of juveniles and subadults occurred during fall and winter. As noted previously, reproductive activity was concentrated in the fall and winter.

The trappable Florida mouse population was composed of adults during the summer and fall of 1976 (Appendix Table 105). Subadults appeared during the winter months of 1976-77. Only adults were observed from May through August of 1977. No juveniles were captured on the grid.

Ectoparasite Burdens

Cotton rats were infested by ticks, fleas, mites, and chiggers (Appendix Table 106). Ticks, usually in small numbers, were observed in 31 of 34 months of study. Tick infestations were greatest in the January-April periods of 1978 and 1979. Flea, mite, and chigger infestations were routinely noted in all years. Botflies were observed only in one month.

In contrast to the cotton rat, cotton mice harbored few fleas, mites, and chiggers (Appendix Table 107). Tick infestations were very light during 1976, but were heavy from December to March in 1977-78 and 1978-79. Botflies were observed in 1977 and 1978.

Movements

Male cotton rats traveled an average of 34.4 m between successive recaptures (Appendix Table 108). Females traveled an average of 28.1 m between captures. The difference in movements between the sexes was significant ($p<.10$). Male cotton mice appeared to traverse a larger area than females ($p<.05$). However, no differences were apparent in the movements of male and female Florida Mice.

No seasonal changes in recapture distances were apparent, and the data were pooled for the analysis.

Happy Hammock Grid

The grid occupied a mature hammock (Figure 3).

The Small Mammal Community

The number of species of small mammals captured on the grid ranged from one to three per month. The seasonal average was 1.7. Cotton mice and golden mice were the species present in the hammock. Neither flying squirrels nor shrews were trapped.

Trends in species diversity and dominance measures are shown in Figure 6. Diversity was consistently low and dominance was high.

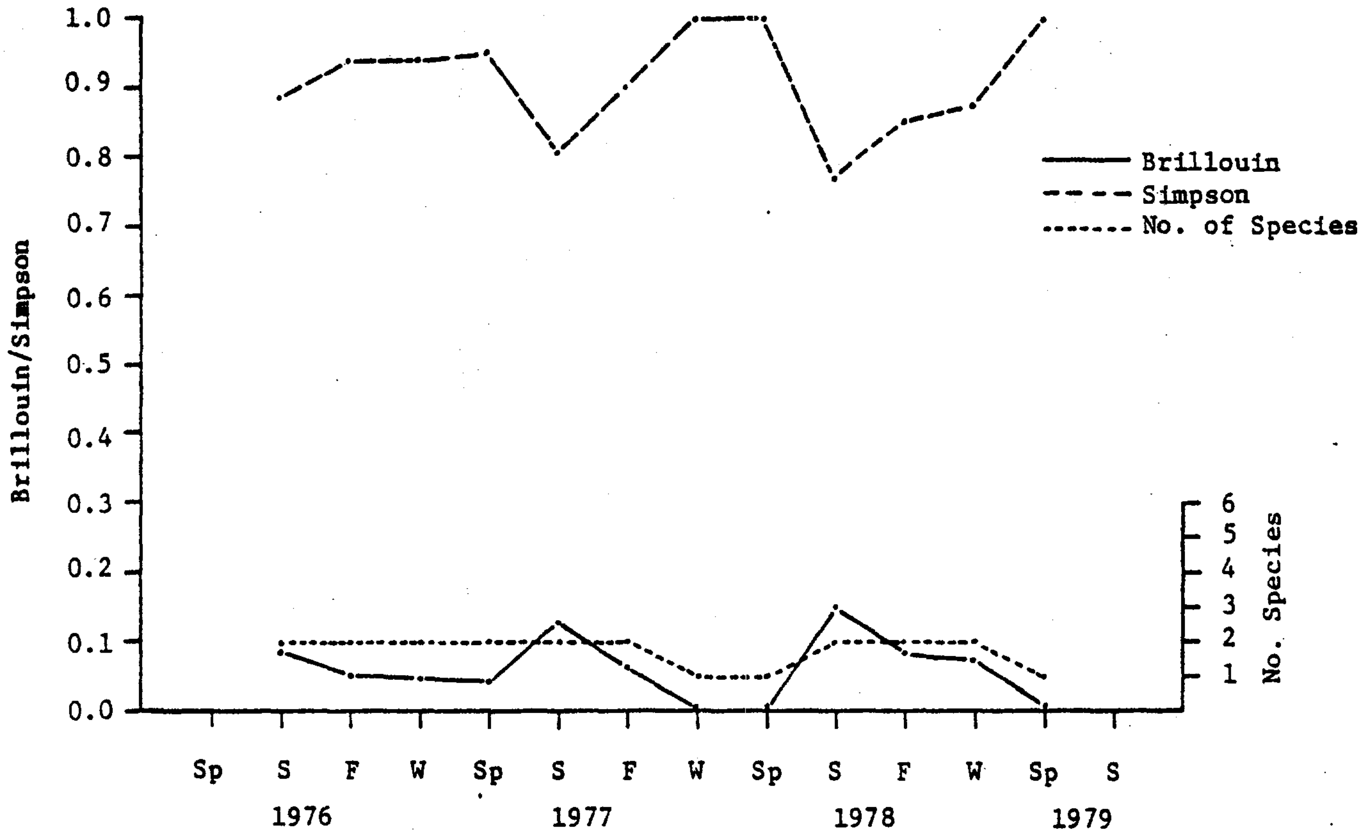

Figure 6. Species diversity (Brillouin measure), species dominance (Simpson index), and the number of species of small mammals observed according to season and year at Happy Hammock, 1976-1979.

Trap Success

Capture success never exceeded 45 percent during the study (Appendix Figure 114). A surplus of traps was always available. Trappability of cotton mice was variable over the period of study, and exceeded 50 percent in 23 of 34 months. Unusually low trappability was observed in November 1977 and February 1978. Availability of a heavy acorn crop may have accounted for the poor trap success in November.

Populations of Small Mammals

The number of captures of small mammals per month is shown in Appendix Figure 115. Captures were relatively stable over the first 12 months of study. They reached a low (1) in November 1977 and again in February (0) of 1978. The overall trend was for a reduction in captures per month from 1976 through 1979.

Minimum numbers of cotton mice, cotton rats and golden mice known to be alive on the grid are given in Figure 7. Cotton mice increased throughout 1976 and reached their greatest abundance in March of 1977, when a minimum of 40 were present. The population declined to five in November 1977. Over the next nine months (December 1977-August 1978) the population was composed of 10-15 individuals. An average of six individuals was present through the end of the study. The monthly average minimum number of cotton mice was 16.5 (SE=2.8) (Table 62).

On three occasions (June, October and December 1976), cotton rats appeared on the grid (Figure 7). These captures most likely were dispersing animals moving away from areas with high densities of cotton rats.

Golden mice were captured each year (Figure 7). An increase in captures occurred during the summers of 1977 and 1978; however individuals were captured throughout the winter of 1978-79.

Biomass of Small Mammals

Fluctuations in small mammal biomass on the Happy Hammock grid are shown in Appendix Figure 116. Biomass of cotton mice increased from June 1976 to a peak in October. Biomass of cotton mice diminished throughout 1977 and stabilized ini 1978 and 1979. Golden mice contributed very little to the trends.

Trends in Body Weight

Mean body weights of male cotton mice tended to increase from winter and spring to summer peaks (Appendix Figures 117-120). Summer animals in 1976, 1977 and 1978 often were significantly heavier ($p<.05$) than animals from preceding months. Males averaged more than 20 grams throughout the study, and generally averaged over 30 grams in September and October.

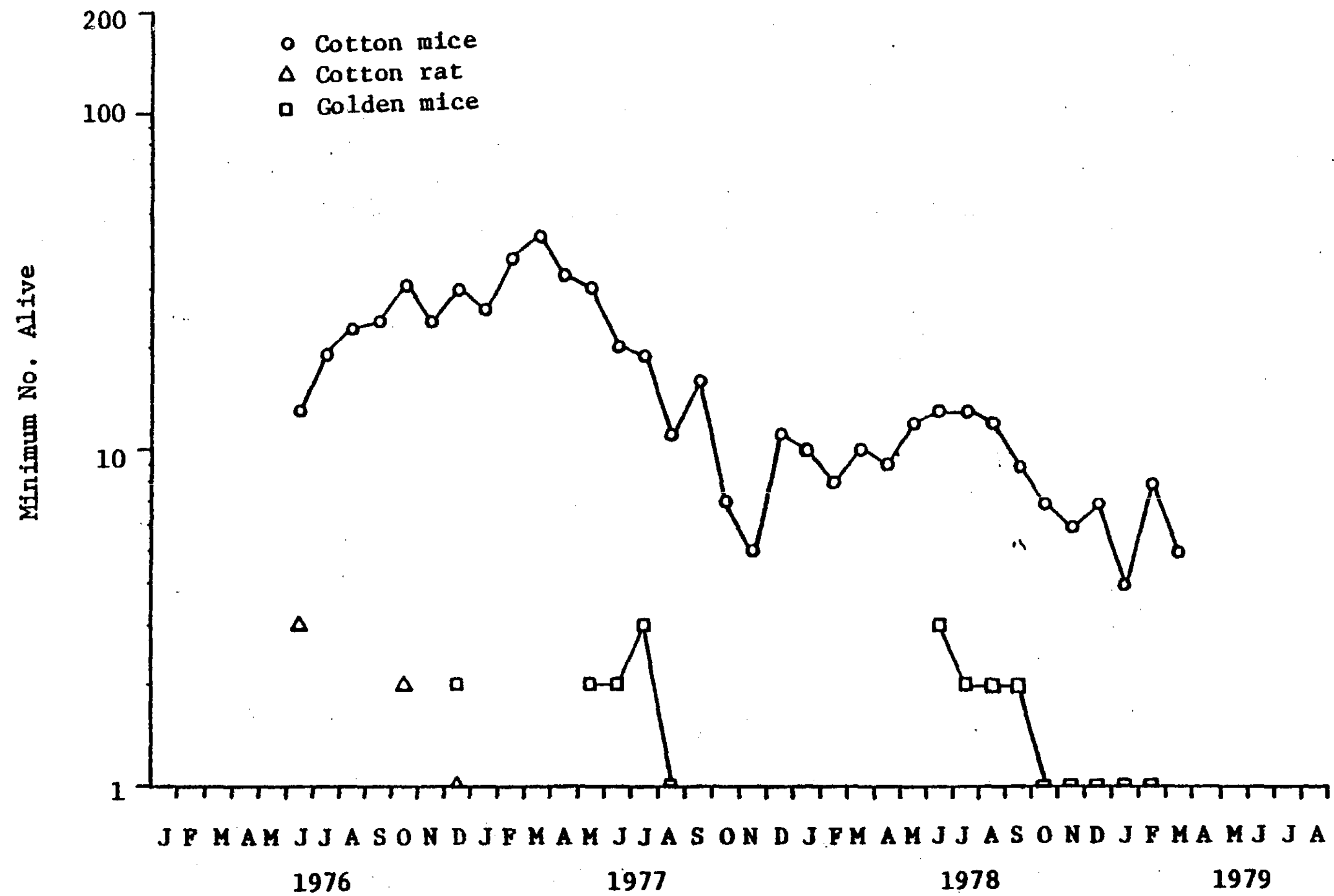

Figure 7. Minimum number of individuals known to be alive by species on the Happy Hammock Grid.

Table 62. Monthly average minimum numbers of cotton mice on the Happy Hammock Grid, 1976-1979. The grid was 1.12 hectares in area.

Month	n	Mean Minimum Numbers (1 SE)
		Cotton Mice
January	3	13.3 (6.5)
February	3	17.6 (9.6)
March	3	19.3 (11.9)
April	2	21.0 (12.0)
May	2	21.0 (9.0)
June	3	15.3 (2.3)
July	3	17.0 (2.0)
August	3	15.3 (3.8)
September	3	16.3 (4.3)
October	3	15.0 (8.0)
November	3	11.6 (6.1)
December	3	16.0 (7.0)
Overall Average		16.5 (2.8)

Female body weights reached a peak in October of 1976, but were not significantly different (p=.05) among the seven months (Appendix Figure 121). Trends in body weight for 1977 paralleled 1976, with the heaviest average sample observed in October (Appendix Figure 122). Owing to small sample sizes, female weights appeared highly variable in 1978-79 (Appendix Figures 123-4).

Male and female cotton mice were not significantly different in body weights (p=.05) within the same months and years.

Survival Rates

Survival of cotton mice exceeded 50 percent in 29 out of 33 months (Appendix Figure 125). Survival was quite high during the population increase in 1976 and early 1977. However, there was a steady decline in survivorship from February to August 1977. Following excellent survival over the winter of 1977-78, animals disappeared at an increasing rate beginning in September. Survival was variable over the winter 1978-79.

Reproductive Activity

Reproductive status of male cotton mice is summarized by month in Appendix Table 109. Males were predominately with abdominal testes from January through July in 1976, 1977 and 1978. Descended males were noted in March 1978 and February 1979. This indicated that early spring breeding may occur in some years. The major breeding period was concentrated from August to December.

Female cotton mice showed evidence of feeding young from September 1976 through February 1977 (Appendix Figure 126). Two small surges of reproduction were apparent during September and December 1977. Small numbers of females, however, were present. As noted earlier for the males, some reproductive females were observed in March 1978. Lactating females were not seen during the fall of 1978, though perforate females were recorded. Breeding commenced again in February and March 1979.

Sex Ratio

The sex ratio of cotton mice favored males in all months except November in 1976 (Appendix Table 110). None of the differences were significant (p=.05). The trend in 1977 and 1978 also favored males, but differences were not significant (p=.05). More females than males appeared in the samples taken in 1979.

Among cotton rats captured in Happy Hammock, five of six individuals were females (Appendix Table 111).

Age Structure

During 32 of the 34 months of study, adult cotton mice comprised 60 percent or more of the trappable population (Appendix Table 112). Exceptions were noted in November 1977 when a single subadult was captured, and again in February 1979 when one subadult and one adult were examined. Sporadic captures of juvenile mice were made in fall and winter months (January and February). Small numbers of subadults, in contrast to juveniles, appeared in most months, but rarely in August and September. The subadults captured in spring and early summer may have emigrated to Happy Hammock rather than being reared on the area.

Ectoparasite Burdens

Cotton mice from Happy Hammock were infested with ticks in every month except July 1976, July 1977, April 1978 and March 1979. Infestations by ticks were heaviest from October through January, when five or more ticks per mouse were reported (Appendix Table 113). Fleas, mites and chiggers were seldom found on the cotton mice. In contrast, botflies were present in most months except for January through March. The infestations peaked in mid-summer over the three years of study.

Movements

The mean distance between successive recaptures of male cotton mice averaged 32.3 m, while females averaged 24.9 m (Appendix Table 114). These distances were not significantly different (p=.05).

Beach Grid

The beach grid, located on Cape Canaveral, includes sea oats zone and coastal strand in its vegetative composition (Figure 3).

The Small Mammal Community

The number of species of small mammals captured on the grid varied from two to six per month, and the seasonal average was 3.5 (Figure 8). Beach mice were always present over the years of study. Since the fall of 1976, cotton mice were residents, though none were captured the summers of 1975 and 1976. Cotton rats appeared to be permanent inhabitants of the coastal strand portion of the grid. A few captures of roof rats, cottontail rabbits and spotted skunks contributed to the species diversity.

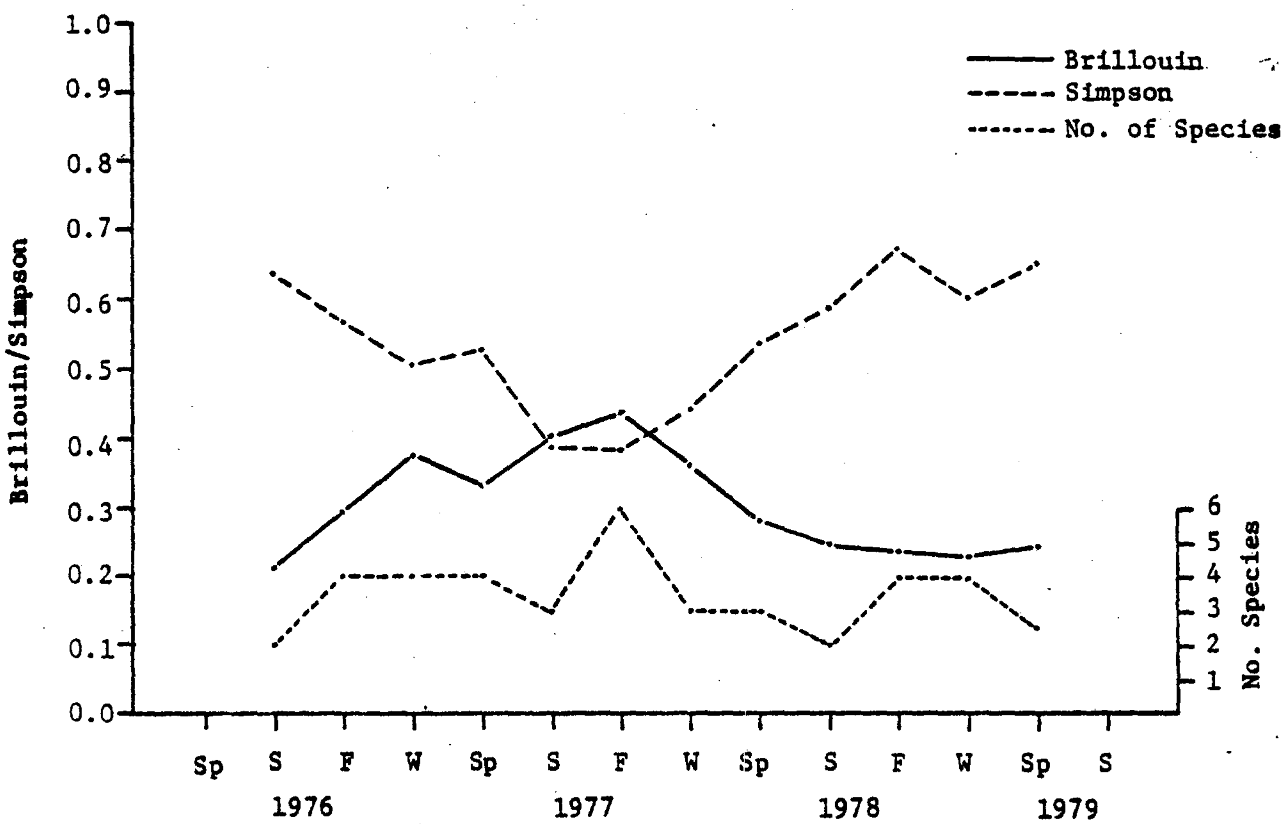

Figure 8. Species diversity (Brillouin measure), species dominance (Simpson index), and the number of species of small mammals observed according to season and year on the Beach Grid, 1976-1979.

Trends in species diversity and dominance are provided in Figure 8. Diversity peaked during the fall of 1977 and diminished in 1978 and 1979, as a result of the population explosion of beach mice and the decline of cotton rats. This result also is reflected by the rapid increase in the Simpson measure of dominance from 0.4 in the fall of 1977 to 0.7 in the fall of 1978.

Trap Success

Capture success expressed as animals caught per trap on the grid is summarized in Appendix Figure 127. During most months, capture success has been modest and many traps remained open. Success exceeded 50 percent in November 1976 and during 1979. At least 30 percent of the traps was not filled when mammal population was at a seasonal peak, and it is unlikely that trappable individuals were missed owing to shortage of open traps.

Trappability of beach mice showed considerable variation over the period of study (Appendix Figure 127). Maximum trappability was in December 1976 (ca. 92%), whereas minimum trappability occurred in May 1978 (ca. 25%). In general, beach mice were not highly trappable.

Populations of Small Mammals

Total captures on the beach slightly more than doubled from July 1976 to the winter peak (November-February 1976-77) (Appendix Figure 128). Captures tended to decline slightly in 1977, and increased over 1978. Captures on the grid peaked at ca. 90 in March 1979.

Minimum numbers of small mammals by species are shown in Figure 9. Beach mice consistently outnumbered the other species each month after July 1976. Their numbers increased to a high (ca. 30) in February 1977. Numbers subsequently declined, with minor exceptions, until March 1978 when the trend was reversed. Beach mice underwent an exponential increase from October 1978 to an apparent peak in March 1979. The overall average number of beach mice present per month was 24.5 (SE=9.2) (Table 63).

Cotton mice appeared on the grid in late 1976. From two to six individuals were present in 1977. Numbers of cotton mice declined in early 1978, increased in April, and declined to a minimum of two individuals in November. As with the beach mice, cotton mice increased rapidly through the fall and winter to a maximum of ca. 20 in March of 1979. The overall average minimum number of cotton mice was 4.9 per month (Table 63).

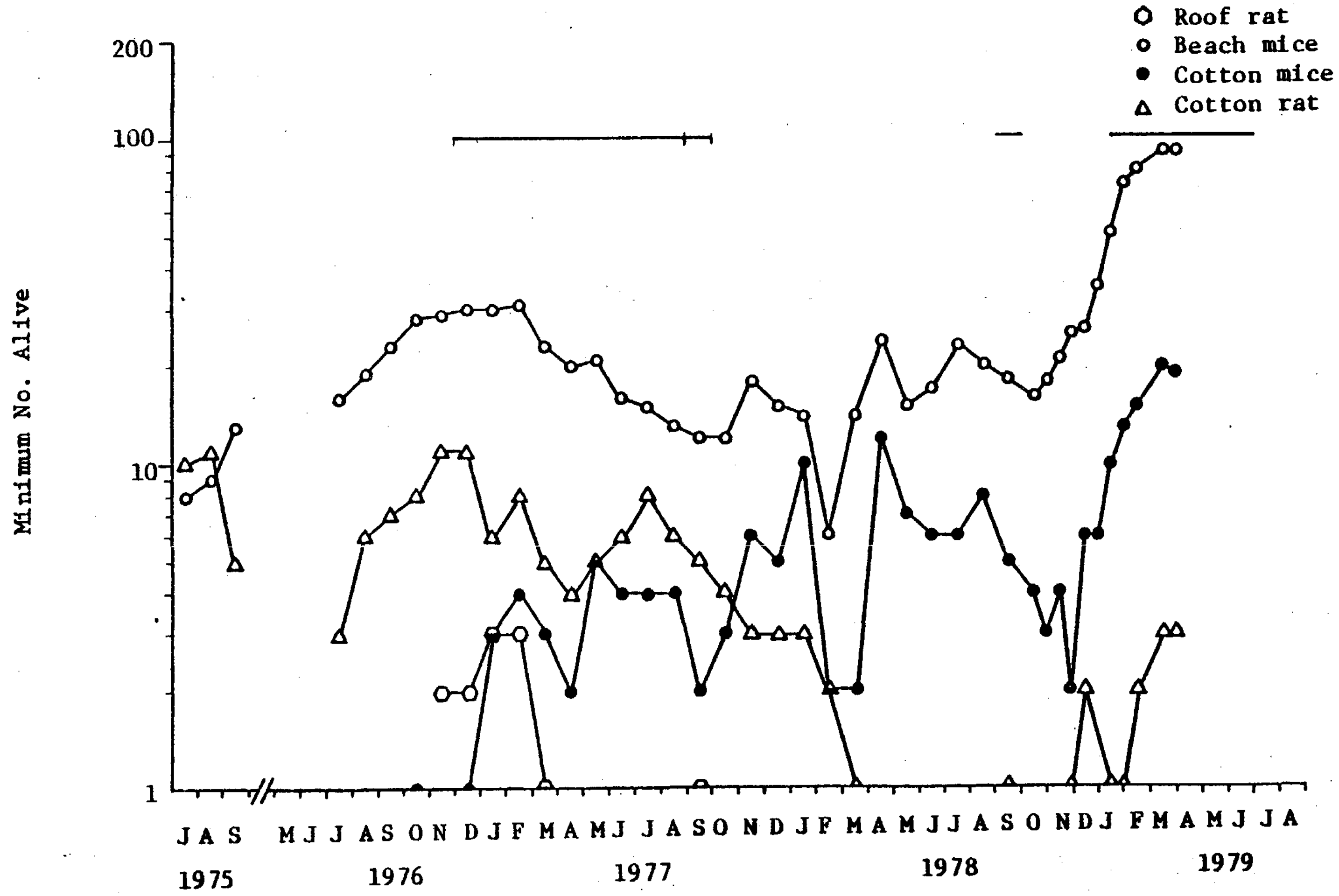

Figure 9. Minimum number of individuals known to be alive by species on the Beach Grid. Solid line indicates periods when traps were doubled.

Table 63. Monthly average minimum numbers of cotton rats and mice on the Beach Grid, 1976-1979. The grid was 1.44 hectares in area.

Month	n	Mean Minimum Numbers (1 SE)					
		Beach Mice		Cotton Mice		Cotton Rat	
January	3	35.3	(14.1)	7.3	(2.6)	3.3	(1.4)
February	3	39.0	(21.7)	7.0	(4.0)	4.0	(2.0)
March	3	42.6	(24.3)	8.3	(5.8)	3.0	(1.1)
April	2	22.0	(2.0)	7.0	(5.0)	2.0	(2.0)
May	2	18.0	(3.0)	6.0	(1.0)	2.5	(2.5)
June	2	16.5	(0.5)	5.0	(1.0)	3.0	(3.0)
July	3	18.0	(2.5)	3.3	(1.7)	3.6	(2.3)
August	3	17.3	(2.1)	4.0	(2.3)	4.0	(2.0)
September	3	17.6	(3.1)	2.3	(1.4)	4.3	(1.7)
October	3	19.0	(4.7)	2.6	(0.8)	4.0	(2.3)
November	3	23.3	(3.1)	3.0	(1.7)	5.0	(3.0)
December	3	25.3	(5.1)	4.0	(1.5)	5.0	(3.0)
Overall Average		24.5	(9.2)	4.9	(2.1)	3.6	(0.9)

Roof rats were temporary denizens of the beach grid in November and December of 1976, but they disappeared after March of 1977 (Figure 9).

Biomass of Small Mammals

Biomass dynamics of small mammals on the beach grid are shown in Appendix Figure 129. Cotton rats were the major contributors to the standing crop of small mammals during 1975, 1976 and until November 1977. Peaks of cotton rat biomass were recorded in August 1975, October 1976, and during July 1977. Beach mouse biomass increased during 1976 and peaked in February 1977. Biomass subsequently declined until October. During 1978, biomass was markedly variable until the population (and biomass) began to increase in the fall. Biomass peaked in February 1979 at ca. 1000 g. The biomass of cotton mice was somewhat less than that of the beach mouse, but the temporal dynamics were similar.

Trends in Body Weight

Male cotton rats were in the adult size range ($\geq$100 g) from July through October 1976 (Appendix Figure 130). Average weight of 60 g in December indicated the population was composed of juveniles and subadults. Body weights* were not significantly different (p=.05). Female cotton rats in 1976 followed a pattern similar to the males, but they did not continue to gain weight during winter and spring of 1977 (Appendix Figures 132 and 133). Average body weights of females peaked at ca. 150 g. in August of 1976 and 1977.

Male beach mice were remarkably consistent in body weight from month to month (Appendix Figures 134, 135, 136, and 137). Weights of males trapped in July 1976 and 1977 were signifantly larger than those recorded in 1978 ($p<.05$). Likewise, weights for December 1976 and 1977 were different ($p<.05$). Female beach mice peaked in body weight in September of 1976. December 1976 weights were significantly less ($p<.05$) than those for December 1977 (Appendix Figures 138 and 139). January 1977 weights were also smaller than those for January 1978 ($p<.05$) (Appendix Figure 140). Females increased in body weight from September through November of 1977 and 1978. No significant (p=.05) weight loss or gain was apparent during 1979 (Appendix Figure 141).

Trends in body weights of male cotton mice are indicated in Appendix Figures 142, 143, and 144. Most individuals trapped in 1977 and 1978 were greater than 20 g in body weight. Males in 1979 averaged less than 20 g. Female cotton mice averaged between 20 and 30 g during 1977 with no apparent trends. Their weights did, however, increase during the fall of 1978. Females were on the average several grams heavier then males in 1979, but none of the means were significantly different (p=.05) (Appendix Figures 145-147).

*increased through the winter (Appendix Figure 131), but winter and summer weights

Survival Rates

Survival of beach mice varied from 0.6 to 0.8 per month in 1975 and 1977 (Appendix Figure 148). Survival was variable in 1976. The lowest survival was recorded in February 1978 at ca. 0.38. From June 1978 through March 1979 survival exceeded 0.7. The high survival during this period was associated with a rapid population increase in late 1978 and early 1979.

Survival of cotton rats decreased from July 1976 to January 1977, in spite of the fact the population was increasing (Appendix Figure 149). Survival in 1977 was extremely variable and ranged from 0.3 to 0.8. Cotton rats that repopulated the grid in 1979 tended to survive well.

Cotton mouse survival exceeded 50 percent in 1977 (Appendix Figure 150), and tended to be lowest during the summer. Survival was extremely variable the first several months of 1978 and ranged from 1.0 to 0.3 After May 1978, survival dropped below 0.6 one month (December), and continued to be excellent in 1979.

Roof rat survival was consistently poor (Appendix Figure 151).

Reproductive Activity

Evidence on the reproductive status of male cotton rats is summarized in Appendix Table 115. Most males had descended testes from July through September. Active males were present in May of 1977 and as late as December 1977. In general, males in breeding condition were not observed in the winter months. Female breeding activity as determined from external characteristics followed the same seasonal patterns as the males (Appendix Figure 152).

Beach mice males with descended testes were present from July to September in 1975, 1976, 1977 and 1978 (Appendix Table 116). Scrotal males were noted during the winter months of 1978 and 1979. In contrast, no active males were trapped from November 1976 through March of 1977. Reproductive activity of female beach mice is summarized in Appendix Figure 153. Females with enlarged mammaries were notably missing in 1976, whereas sharp peaks of activity were apparent in 1975, 1977 and 1978. These peaks coincide with summer and fall reproduction which may continue into winter as in 1978 and 1979. Continued evidence of ongoing or past lacation in 1979, e.g., 50 percent in January and 20 percent in March, pointed to the role of reproduction in the beach mouse population increase in late 1978 and early 1979.

Cotton mice sample sizes were generally small, but some evidence of breeding is available. Only sexual inactive males were trapped from December 1976 until July 1977. All males examined from July to December of 1977 (n=9) were in the scrotal condition. Breeding males reappeared on the grid in August 1978 and continued to be present through March

1979. Female cotton mice were in reproductive condition on the beach grid during the summer and fall of 1977 (Appendix Figure 154). Breeding activity was intense the fall and winter of 1978-79.

Female roof rats also reproduced on the grid during the winter of 1977 (Appendix Figure 155).

Sex Ratio

The sex ratio of live trapped beach mice was extremely variable (Appendix Table 117). Ratios tended to favor males in 1975 and 1976 when significant deviations ($p<.05$) occurred in September of both years. Ratios favored females the first four months of 1977. During the remaining months of 1977, males frequently outnumbered females but the differences were not significant. Ratios in 1978 favored males in July-November, but not significantly so. During the population build-up in 1979, ratios tended to favor females, but none of the deviations were significant ($p=.05$).

Among cotton rats, the sex ratio was markedly in favor of males in 1975 (Appendix Table 118). During 1976 and 1977 the ratio favored females during eight months, males during four months, and was at unity during six months. None of these deviations from unity were satistically significant ($p=.05$). No significant deviations were noted in 1978 and 1979.

Age Structure

Subadult and adult animals comprised the trappable populations of beach mice in 1976 (Appendix Table 119). Three juveniles were captured in October 1976. The population was predominantly adult during 1977, with the exception of January when 48 percent of the sample was subadult in pelage. A single juvenile was trapped in July of 1977. Adults dominated the age structure in 1978, until November when juveniles began to be trapped. Substantial numbers of juveniles and subadults were present in 1979 while the population was at a high density.

Adult cotton rats dominated the age structure in the summer of 1975 (Appendix Table 120). This trend continued through the summer of 1976, but juveniles and subadults were most common from October 1976 to May 1977. Similar proportions of juveniles, subadults and adults were observed in fall 1977. Few captures of cotton rats were made in 1978 and 1979 ($n=10$), and 50 percent were adults.

Ectoparasite Burdens

Beach mice harbored few ectoparasites (Appendix Table 121). Fleas and chiggers were never recorded. Two individuals were infested with mites (December 1978 and February 1979). Very small tick infestations were noted in the late fall and winter each year. A limited number of botfly infestations were discovered in the last four months of study - none were seen in the prior 32 months.

Cotton rats were lightly infested with fleas, mites and chiggers (Appendix Table 122). No botflies were observed. Tick infestations were discovered in 1975, 1976 and 1977, but few ticks were present.

Movements

There was no significant difference (p=.05) between recapture distances of male and female beach mice in the period from July 1976 until September 1978 when trapping was done at monthly intervals (Appendix Table 123). Likewise, in the interval from October 1978 through March 1979, no differences were apparent. However, in the latter months, when trapping was done at two week intervals, the mean distance between successive recaptures was substantially reduced, e.g., in the case of males, from 21.3 m to 14 m.

Sample sizes were not sufficient to statistically evaluate movements of cotton mice and cotton rats (Appendix Table 123).

Dune Scrub Grid

The dune scrub grid is located, in vegetation classified as coastal scrub, on Cape Canaveral (Figure 3).

The Small Mammal Community

The number of small mammals captured on the grid varied from two to four per month. The seasonal average was 3.0 (Figure 10). Beach mice were present throughout the study. Cotton rats were abundant at times and not trappable (not present) in some years. Cotton mice were not known to be residents during all months, but generally were present. Interestingly, two other small mammals that could be expected to occur, viz., the Florida mouse and the golden mouse, were never trapped. Spotted skunks were present.

Trends in species diversity and dominance are shown in Figure 10. Diversity was low at the onset of study (0.15), but increased to ca. 0.4 during the winter of 1976-77. Species number, diversity and dominance were stable during 1977, 1978 and 1979.

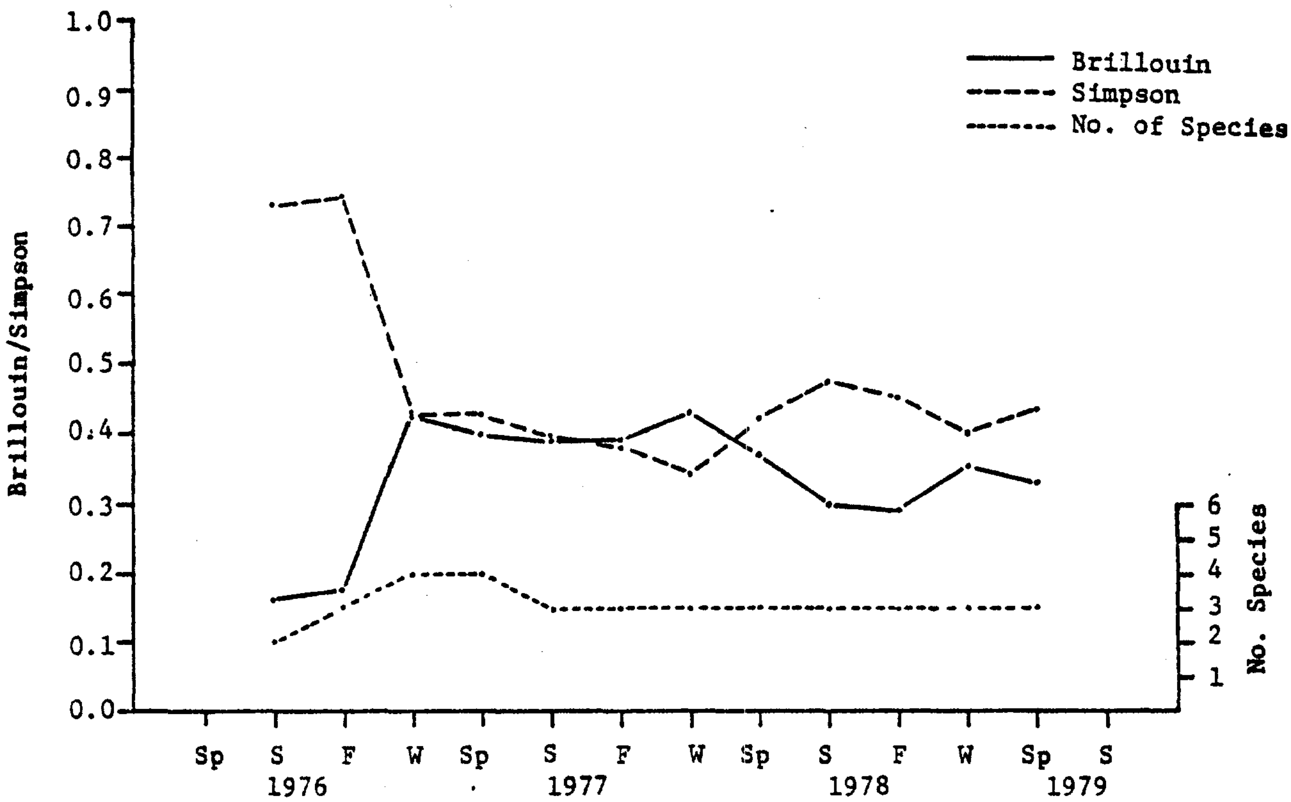

Figure 10. Species diversity (Brillouin measure), species dominance (Simpson index), and the number of species of small mammals observed according to season and year on the Dune Scrub Grid, 1976-1979.

Trap Success

Small mammal captures per trap are shown by month and year in Appendix Figure 156. Capture success exceeded 50 percent in May 1977, but was rather modest in other months. Traps were never doubled on the grid.

Trappability of beach mice was variable throughout the study with little evidence of trends (Appendix Figure 156). Beach mice on the beach grid were not very trappable.

Populations of Small Mammals

Monthly captures of small mammals are shown in Appendix Figure 157. The number of captures increased over the first several months of study, reaching an all time maximum (40) in May 1977. A decline in captures reached a minimum (10) in September 1977. Following a recovery over the winter of 1977-78, captures reached another minimum (1) in September-October 1978. The number of captures improved through the remainder of the study.

Cotton rats exhibited stable minimum numbers (12-15) for the eight months of study beginning in July 1976 (Figure 11). Numbers began to decline in March 1977, and only 2-3 cotton rats were known to be alive during the summer of 1977. A sharp increase occurred in the fall, and numbers peaked in December. Minimum numbers declined rapidly to a low (1) in April of 1978. No cotton rats were known to be alive on the grid from July 1978 until February 1979. The overall monthly average number of cotton rats on the grid was 6.2 (SE=2.5) (Table 64).

Beach mice abundance was low in the summers of 1975 and 1976 (Figure 11). However, the population increased steadily from October 1976 until a minimum of 30 were present in May 1977. Numbers of beach mice decreased in the summer and increased in the winter over the following three years. The overall monthly average number of beach mice on the grid was 10.0 (SE=5.2) (Table 64).

Cotton mice appeared on the grid in November 1976 and underwent a rapid population increase until March 1977 (Figure 11). After a brief decline, numbers reached a minimum of 11 known to be alive in July 1977. (Beach mice reached their greatest known abundance in May 1977). The cotton mouse population was fairly stable through 1977 and the first five months of 1978, but a sharp decline occurred during the summer. Only one animal was known to be alive in September and October of 1978. A population recovery followed in the winter of 1978-79. The monthly average of the cotton mouse minimum numbers was 4.9 (SE=2.1 (Table 64).

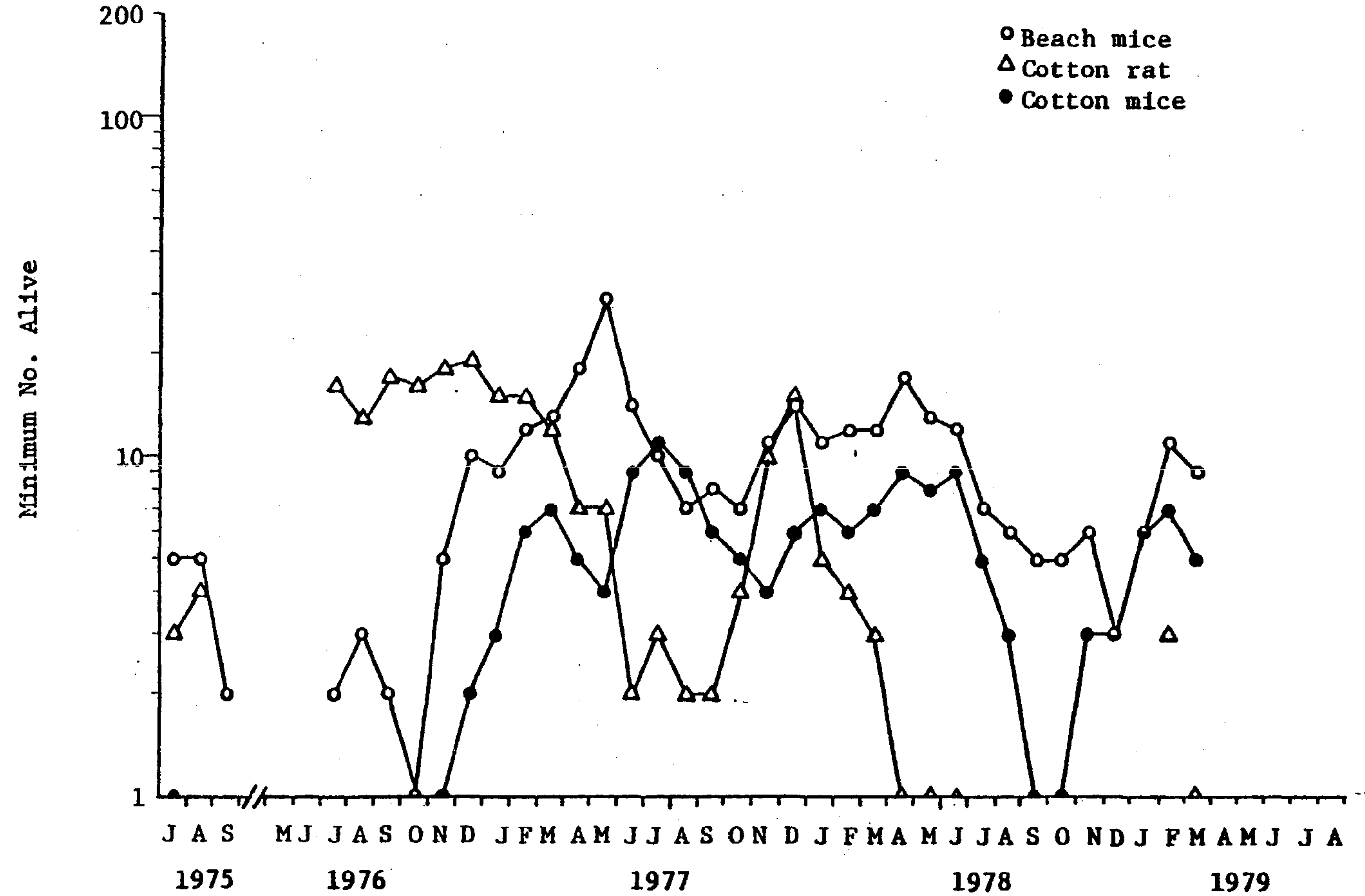

Figure 11. Minimum number of individuals known to be alive by species on the Dune Scrub Grid.

Table 64. Monthly average minimum numbers of beach mice, cotton mice and cotton rats on the Dune Scrub Grid, 1976-1979. The grid was 1.44 hectares in area.

Month	n	Mean Minimum Numbers (1 SE)					
		Beach Mice		Cotton Mice		Cotton Rat	
January	3	8.6	(1.4)	5.3	(1.2)	7.6	(6.6)
February	3	11.6	(0.3)	6.3	(0.3)	7.3	(3.8)
March	3	11.3	(1.2)	6.3	(0.6)	5.3	(3.3)
April	2	17.5	(0.5)	7.0	(2.0)	4.0	(3.0)
May	2	21.0	(8.0)	6.0	(2.0)	4.0	(3.0)
June	2	13.0	(1.0)	9.0	(0.0)	1.5	(0.5)
July	3	6.3	(2.3)	5.3	(3.1)	6.3	(4.9)
August	3	5.3	(1.2)	4.0	(2.6)	5.0	(4.0)
September	3	5.0	(1.7)	2.3	(1.8)	6.3	(5.3)
October	3	4.3	(1.7)	2.0	(1.5)	6.6	(4.8)
November	3	7.3	(1.8)	2.6	(0.8)	9.3	(5.2)
December	3	9.0	(3.2)	3.6	(1.2)	11.3	(5.7)
Overall Average		10.0	(5.2)	4.9	(2.1)	6.2	(2.5)

Biomass of Small Mammals

The trends in small mammal biomass are shown in Appendix Figure 158. In terms of biomass, cotton rats clearly dominated the study area from July 1976 until June 1977, and were important in the fall and winter of 1977-78. Biomass of the other rodents was relatively stable over the period of study.

Trends in Body Weight

Mean body weights of male cotton rats in the monthly samples are shown in Appendix Figures 159 and 160. Mean weights averaged between 120 and 150 g during the last five months of 1976. Males tended to be somewhat smaller during 1977; however average weights were in the adult range ($\underline{<>}$100 g) in most months. Female cotton rats were in the adult size range during 1976 (Appendix Figure 161). Male and female body weights were not significantly different (p=.05) in 1976 or 1977. Female cotton rats averaged somewhat smaller in the winter and spring of 1977 than animals from the previous fall (Appendix Figure 162). The cold winter of 1976-77 may have accounted for part of this difference. Scattered observations in 1978 suggested that most female cotton rats on the grid were in the juvenile and subadult size classes, i.e., less than 100 g in body weight (Appendix Figure 163).

Mean monthly body weights of male beach mice are summarized in Appendix Figures 164, 165, 166, and 167. Very little variation existed between months within a year or months among years. Males in April of 1977 were significantly smaller ($p<.05$) than males in April 1978. Female body weights are shown in Appendix Figures 168, 169, 170, and 171. Monthly comparisons of average body weights between 1977 and 1978 revealed no significant differences (p=.05).

Body weight data for male cotton mice are summarized in Appendix Figures 172, 173, and 174. Small sample sizes preclude critical comparisons among months and years. Monthly mean body weights of female cotton mice are summarized in Appendix Figures 175, 176, and 177. Female body weights were extremely variable, in part owing to pregnant females.

Survival Rates

Survival of cotton rats varied between 0.5 and 0.8 over the winter of 1976-77. It was extremely low in the summer of 1977 when all animals disappeared between trapping periods (Appendix Figure 178). Fall (September-November) 1977 survival was 1.0. Survival between months in 1978 was extremely variable, e.g., changing from 0.0 to 1.0, owing in part to the small number of animals that were trapped. The cotton rat population disappeared after July 1978.

Survival of beach mice between months exceeded 50 percent in 27 of 34 months (Appendix Figure 179). None the less, survival was highly variable, appearing to drop significantly in the summers of 1977 and 1978. The longest period of good (0.7) to excellent (1.0) survival was from September 1977 through April 1978. The trend in survival in January-March of 1979 (decreasing) reversed the trend in the same period of 1978.

Cotton mice sustained a survival rate of 80 percent or better during eight of twelve months in 1977 (Appendix Figure 180). Survival in 1978 was in excess of 0.5 in 10 to 12 months. Survivorship improved in 1979.

Reproductive Activity

Samples of breeding size male cotton rats from 1975 were too small to be reliable, but during 1976 descended males were in evidence from July to November (Appendix Table 124). A descended male was present in April 1977 and all the summer animals were descended. Descended males were still present in December 1977. Only one descended male was noted in 1978 (May). Female cotton rats with perforate vaginae were present from July through October of 1976 (Appendix Figure 181). Another reproductive effort apparently was under way in April 1977, but only one adult female was observed between May and October, and the extent of summer reproduction cannot be evaluated. Fall breeding activity was observed. No evidence of reproduction was obtained in 1978. Perforate females were present in February and March of 1979.

Descended male beach mice were observed during July 1975, July, August, September, November and December of 1976 (Appendix Table 125). During 1977, descended males appeared in June and were present throughout the remaining months of the year. A somewhat different pattern emerged in 1978 when descended males were present in January and April-August. Some males in breeding condition were observed in January and February of 1979. Reproductively active female beach mice were present in July-September 1975, but none were observed in breeding condition during the same period in 1976 (Appendix Figure 182). Thus, in 1976 reproduction was delayed until November and continued through February 1977. Females were lactating in July 1977 and continued to do so until March 1978. Some breeding females were present in April, May, August, November and December of 1978. Breeding continued into 1979.

Captures of cotton mice were not numerous, but some impression of reproductive activity can be inferred from them. Descended males were present from May 1977 through February 1978. Breeding males were observed in April (2), July (2), August (1), and November (1) of 1978. In 1979, five of six males were descended in the period January to March. Evidence of breeding by female cotton mice is shown in Appendix Figure

183. Some breeding occurred in each year of study. Based on incidence of lactation, fall and winter periods of reproduction were the rule.

Sex Ratio

The sex ratio of live trapped cotton rats on the dune scrub grid favored males during 1976, but none of the deviations were statistically significant (p=.05) (Appendix Table 126). The ratio was at unity in January 1977 and favored females from February through May. Slightly more males were captured in the remaining months of 1977. Sample sizes were too small in 1978 and 1979 to discern whether sex ratios were skewed from 1:1.

Sex ratios of beach mice are given in Appendix Table 127. Slight differences in the frequency of the sexes in monthly samples were apparent, but none of the departures were statistically significant (p=.05).

Age Structure

The age structure of cotton rats is summarized in Appendix Table 128. Only subadult and adults were captured in 1975. Juvenile cotton rats (0-60 g) were captured from September-December 1976, but the population was predominately adult. Many subadult cotton rats were present during five months of 1977 and again in the fall (October-December). Six juveniles were captured in 1977. No age class dominated the samples for 1978-79.

The age structure of beach mice was largely adult in the summer of 1976, but was comprised of juveniles, subadults and adults by December (Appendix Table 129). The age structure was heavily in favor of adults in 1977, when one juvenile was trapped. Likewise, adults predominated in 1978 and 1979. A single juvenile was taken in March 1979.

Ectoparasite Burdens

Cotton rats were infested with ticks each month of study except August in 1976 (Appendix Table 130). Tick infestations were observed in winter and fall of 1977 and again in the winters of 1978 and 1979. Fleas were more commonly noted than either mites or chiggers. Botflies were not found in any month of study.

Beach mice carried few ectoparasites (Appendix Table 131). Mites, chiggers and botflies were not discovered. Fleas were noted on only two individuals through the course of study. Very light tick infestations were observed.

Movements

The mean distance between successive recaptures of male (22.0 m) and female beach mice (34.2 m) was significant at $p<0.20$ (Appendix Table 132). Movements of cotton mice were not statistically different ($p=.05$). However, male cotton rats moved farther between captures than did females ($p<.10$).

Discussion

The fundamental variable in population studies of small mammals is density (numbers per unit area) of some index of it. If density is known with reasonable confidence, the explanation for changes in density, either over time in the same space, or between areas, must come from data on variation among births, deaths, immigration and emigration. A single equation for population change might be stated as: change in numbers of species x over time is the result of births minus deaths plus immigration minus emigration.

An immediate goal of this research was to document the variation in population attributes of small mammals from natural communities on Merritt Island. Data on variation in survival, for example, was employed to look retrospectively for an explanation of change in abundance of species of small mammals. In the future, experience with these populations and their behavior will be necessary to detect non-natural changes which might be related to extrinsic perturbations.

Area Comparisons

Small Mammal Communities

Species composition of small mammals was relatively stable within the areas. The resident species at Wisconsin Village included cotton mice, cotton rats and golden mice. Florida mice were found on a limited portion of the area for approximately one year, after which they disappeared. The most likely explanation for their demise was subtle increases in the density of plant cover that rendered the habitat unsuitable. A limited number of rice rats was trapped at Wisconsin Village, but it is not likely that these individuals were residents. Rice rats prefer the vegetative cover of wetlands and the interface between wetlands and open water (Birkenholz 1963). In summary, Wisconsin Village was a three-species grid where the maximum species diversity (Brillouin measure) reached 0.45 and dominance (Simpson index) 0.9.

In contrast to the other areas, Happy Hammock was dominated by one species, cotton mice. Small numbers of golden mice were trapped on occasion. Dispersing cotton rats were observed in 1976. In summary, Happy

Hammock was a one-species grid where the maximum species diversity reached 0.15 and dominance 1.0.

The beach grid had three resident species of small mammals, viz., beach mice, cotton mice and cotton rats. Roof rats (Rattus rattus) were present only briefly. In summary, the beach area was a three-species grid where the maximum species diversity reached 0.45 and dominance 0.7.

The dune scrub grid had three resident species, viz., beach mice, cotton mice and cotton rats. The species composition of this area was unusual in that resident populations of beach mice have not previously been reported at a substantial distance from the sea oats zone of coastal dunes (Bowen 1968). Also, the presence of cotton rats was unusual because no ground cover of vegetation was available. Previous work has shown that cotton rats select habitats with heavy ground cover (Goertz 1964 and reference cited therein). Finally, it was unusual that Florida mice were not present. The grid was part of an extensive rosemary scrub very similar to mainland sites regarded as primary habitat for the species (Layne 1963). Florida mice live in gopher tortoise burrows and these were common on the grid. In summary, the dune scrub was a three-species grid where the maximum species diversity was 0.43 and dominance 0.75.

Cotton mice were present on all four study areas and in terms of the habitat dimension occupied the broadest niche. Cotton rats were resident on three areas and would be considered as habitat generalists. The golden mouse was a habitat specialist and required woody thickets with or without a tree overstory (Dueser and Shugart 1979). Similarily, the beach mouse is a habitat specialist and must have sandy soils suitable for its elaborate burrow systems (Hayne 1936; Smith 1968a). Thus, the latter two species were present on only two of the four study sites.

Species composition of the Cape Canaveral sites may reflect the isolation of the cape from the mainland. That is, habitats suitable for Florida mice and golden mice were available, yet none were trapped in the three-year effort. Additional trapping elsewhere on the Cape failed to reveal their presence. With respect to the Florida mouse, viable populations existed along the Happy Creek road and adjacent to Route 3 north of Banana Creek (Ehrhart 1976; Stout personal observation). Perhaps these areas mark the eastern and southern limits of Florida mice on Merritt Island. Almost surely, the golden mouse is to be found in the older, extensive stands of slash pine south of Banana Creek on the main island.

Numbers of small mammals reported from selected habitats in Florida are summarized in Table 65.

Table 65. Number and relative abundance of trappable small mammal species in Florida habitats (adapted from Layne, 1974: 32).

Habitat	No. of Examples Studies	No. of species (mean and range)
Mesic hammock	3	2.7 (2-3)
Coastal hammock	1	1
Live oak hammock	1	1
Hydric hammock	2	2 (1-3)
Flatwoods	7	2.3 (1-5)
Sand pine scrub	2	2.5 (1-4)
Palmetto-oak scrub	1	2
Oldfield	1	3
Marginal thicket	2	5 (3-7)
Pond border	1	5

Population Dynamics

The cotton rat on Merritt Island underwent a complete cycle of abundance from 1976 to the end of 1978. Komarek (1937) Odum (1955) and Haines (1963; 1971) have described the cycle of abundance of cotton rats as varying from two to five years in length from extremes of low and high densities. Krebs and Myers (1974) recognized the population fluctuations of voles (e.g., Microtus sp.) and other cycling small mammals as having four distinct phases: increase, peak, decline, and low.

The increase phase of growth was most clearly shown on Wisconsin Village where cotton rat numbers increased exponentially from June until October (Figures 5 & 12). The peak phase of the cycle was of short duration and lasted from October until January 1977. Approximately 90 animals were known to be alive at that time (62/hectare; 25/acre). Layne (1974), based on an intensive literature review, concluded that 9-10 cotton rats per acre were the highest population levels known from Florida flatwoods habitats. In Kansas, Fleharty et al. (1972) followed a population cycle from a low of 0.2 per hectare to a high of 20.6 per hectare. In summary, both the increase and peak phases of the cotton rat cycle were unusual in that growth was extremely rapid, very high densities were achieved, and the duration of the peak was short. Similar patterns were apparent elsewhere on Merritt Island (Figure 12).

The decline phase of the cotton rat cycle was typical of what has been referred to in the literature as a Type H decline, so named after Hamilton who first described it from a meadow vole (Microtus pennsylvanicus) population cycle in New York (Krebs and Myers 1974). A Type H decline is characterized as having a partial recovery following a peak and a subsequent continuation of the decline. Such declines have been reported for Microtus californicus (Krebs 1966), Clethrionomys rufocanus (Kalela 1957), and Microtus ochrogaster (Gaines and Krebs 1971), but not for cotton rats.

Cotton rats on Merritt Island, as represented by population behavior on three study sites, increased in the fall of 1976, declined in early 1977, recovered in the summer or fall of 1977, and declined to minimum numbers the spring of 1978 (Figure 12). Low and variable numbers of cotton rats were observed on the three study sites during the remainder of 1978 and into early 1979.

Population theory and empirical evidence on cotton rat population from Merritt Island (Ehrhart 1976; this study) strongly suggested a recovery and likely resumption of the increase phase of the cycle in the summer and fall of 1979.

Cotton mice were found on all four study areas on Merritt Island. The population trends were markedly different on each area (Figure 13). Numbers at Happy Hammock increased from June 1976 until March 1977 when a

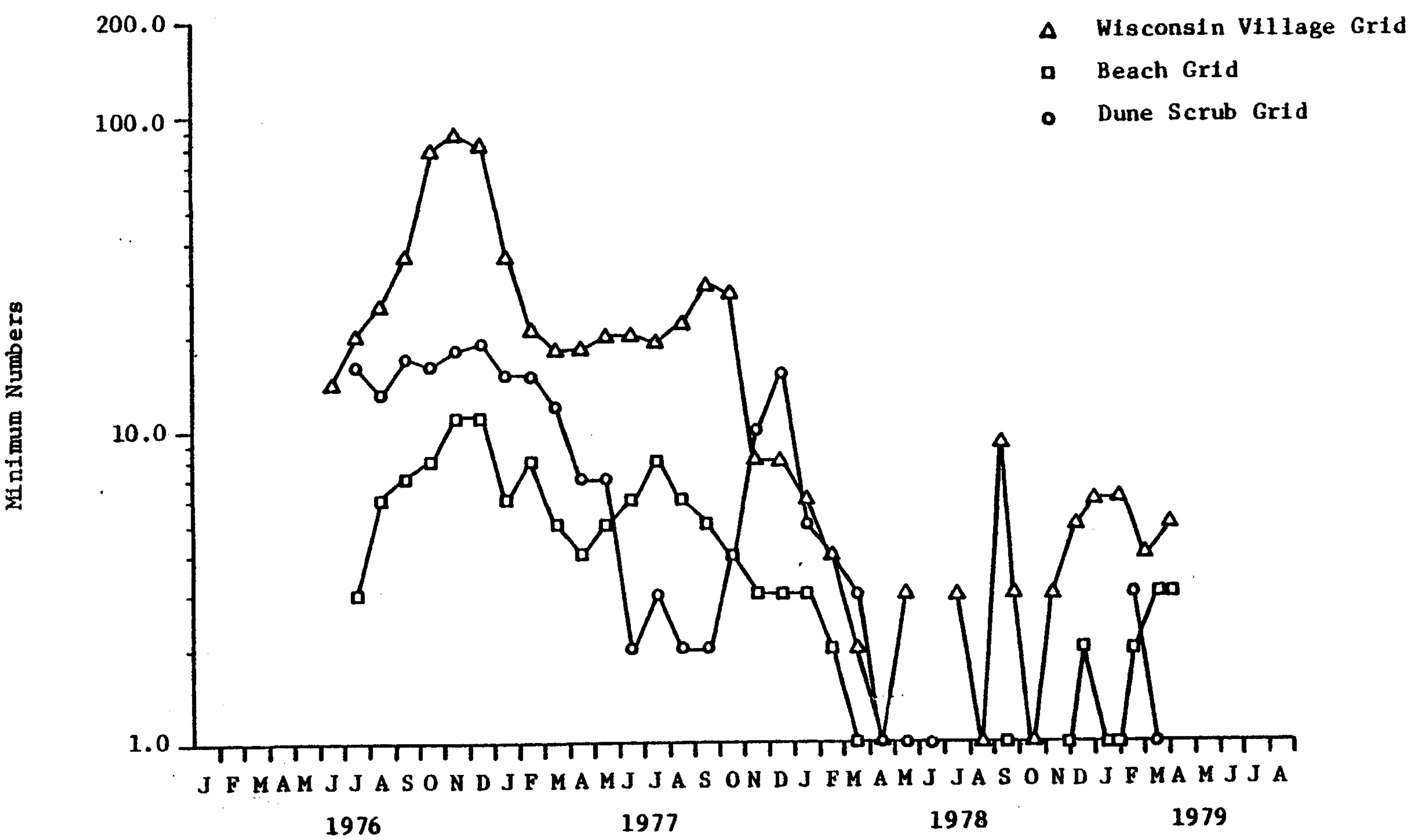

Figure 12. Trend in numbers of cotton rats on the 3 study areas, 1976-79.

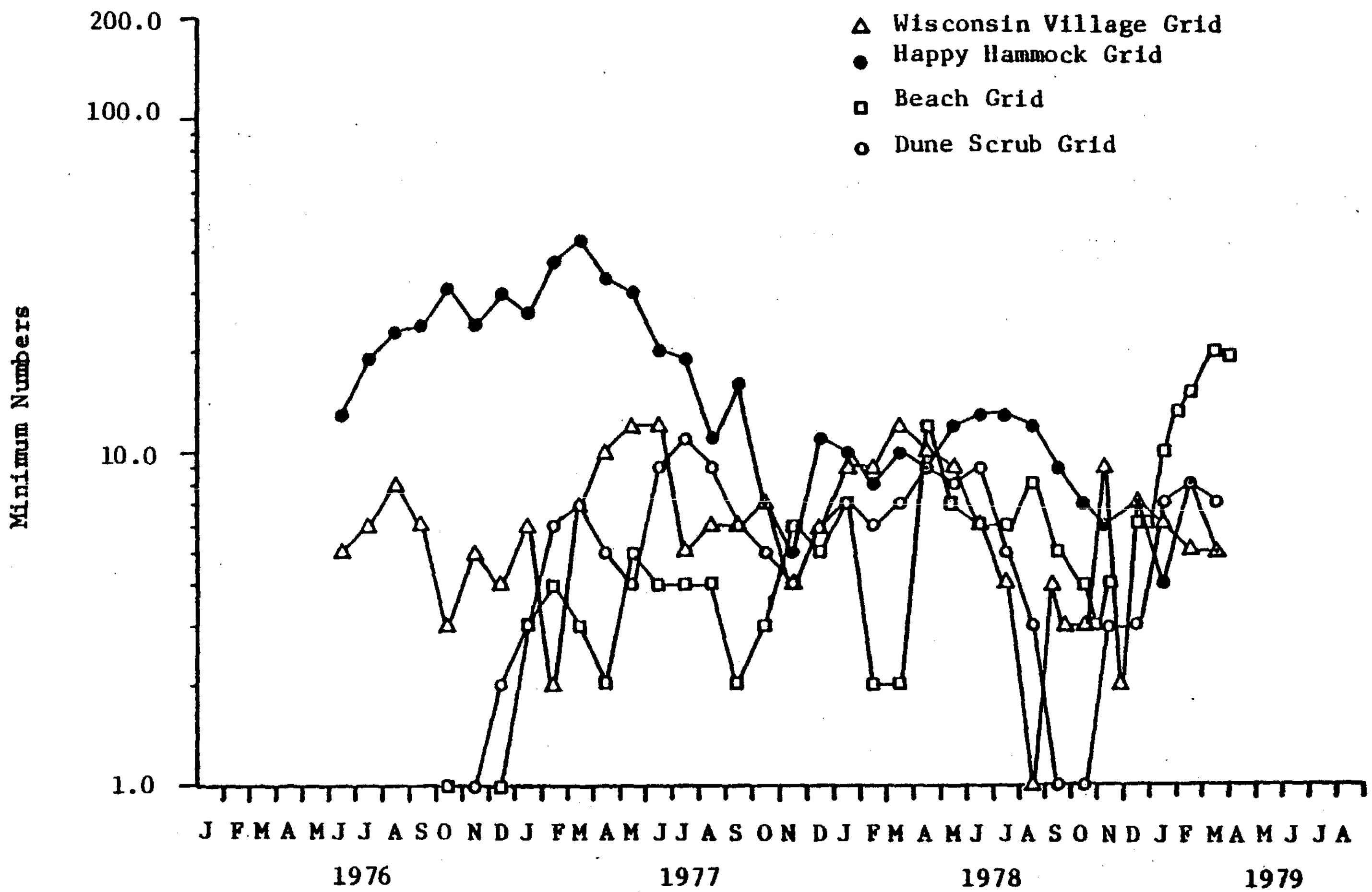

Figure 13. Trend in numbers of cotton mice on the four study areas, 1976-79.

minimum of 35 per hectare was present (Figure 7). Cotton mice, as is characteristic of the genus Peromyscus (Terman 1968), tend to occur at rather low densities with a few unusual increases in abundance. For example, French et al. (1975) indicated the seasonal variation to be 3.7-6.7 cotton mice per hectare. Clearly, an unusual population growth was observed at Happy Hammock. Survival during the period of increase was not notably better than at other times (Appendix Figure 125); however, the intensity of breeding appeared to be responsible for the changes (Appendix Figure 126). Following the decline of cotton mice from peak numbers, minimum numbers remained at 8-11 per hectare for several months. These levels exceeded those reported by McCarley (1954) in east Texas (5.6-6.6 per hectare in January and February). The number of cotton mice (4-5 per hectare) on the Happy Hammock area at the end of study, although reduced relative to previous years, still remained within the range of seasonal variation as reported by French et al. (1975).

Numbers of cotton mice known to be alive, were substantially higher on the Happy Hammock grid than on the other study areas during 1976 and the first half of 1977 (Figure 13). Also, abundance of cotton mice at Happy Hammock was greater than on the other grids each summer of the study. The overall trend in cotton mouse abundance at Happy Hammock was very similar to the data provided by Pearson (1953) from a live trapping study of Gulf Hammock, Florida.

Densities of cotton mice at the Wisconsin Village grid (flatwoods) exceeded 7 per hectare in May-June 1977 and again in March 1978 (Figures 7 and 5). These densities were similar to those reported by Layne (1974) from flatwoods near Gainesville, Florida where cotton mice peaked at 7 per hectare.

The performance of cotton mice populations on Cape Canaveral (dune scrub and beach grids) was similar to the Wisconsin Village data (Figure 13). Numbers on the dune scrub ranged from 3-6 per hectare and exceeded 7 per hectare in July 1977. Cotton mice on the beach grid exceeded 7 per hectare only once prior to January 1979 (Figure 9). The population peaked at ca. 14 per hectare and was substantially below the maximum of 35 per hectare reported for Happy Hammock (Figure 7). No data were discovered on cotton mice densities or population trends in habitats comparable to those studies on Cape Canaveral.

The beach mouse was restricted to the two Cape Canaveral study sites. Literature on beach mice suggested that the populations would be restricted to coastal dunes, i.e., areas with sea oats (Bowen 1968) and the presence of "beach" mice at the dune scrub area (1 km from the coastline) was unexpected.

A comparison of population trends of beach mice over the years of study indicated greater numbers (densities) were usually present on the beach grid than on the dune scrub (Figure 14). A marked divergence in the populations was evident in 1976 and early 1977, and again in late 1978 and early 1979. During these periods, populations on the dune scrub were considerably higher than those on the beach. Beginning in October 1978, mice on the beach grid exhibited an exponential increase which peaked at ca. 64 animals per hectare. This density exceeded any previously reported for beach mice. (This is a minimum estimate because of the modest trappability of this subspecies [Appendix Figure 127]). For example, Blair (1951) reported ca. 3 individuals per hectare of the subspecies leucocephalus on Santa Rosa Island. Rand and Host (1942) reported 19.5 per hectare of the subspecies rhoadsi near Lake Placid. No long-term grid studies have been done on the subspecific form of beach mouse found on Cape Canaveral.

A combination of high survival (Appendix Figure 148) and reproduction apparently contributed to the high densities of beach mice on the beach site in the last months of study. An extra trapping effort (Extine and Stout, unpublished) around the beach grid failed to demonstrate either immigration or emigration as important factors in the population growth.

Demographic Patterns

Survival time (residency) of small mammals on the trapping grids provided an indication of how long these animals might be expected to remain in the trappable population. Losses represented either death on the grid or emigration from the area.

Cotton rats, cotton mice and beach mice survived an average of 2-3 months after their initial capture (Table 66). Cotton rats were the shorter lived of the small mammals. Males survived an average of 2.0 months, whereas females survived 2.4 months. Layne (1974) indicated little difference in residency time among sex and age groups of cotton rats. Their average survival time was approximately 3 months.

Female cotton mice survived 3.5 months as compared to 3.0 months for males. These survival times appeared similar to those indicated in the literature. For a flatwoods habitat, Layne (1974) reported an average of 1.7 months. On the other hand, McCarley (1954), in lowland forests in eastern Texas, found cotton mice survived on the average of 4-5 months.

In contrast to cotton rats and mice, male beach mice survived better (3.29 months) than females (2.96 months). No other comparable data for the subspecies are known to exist.

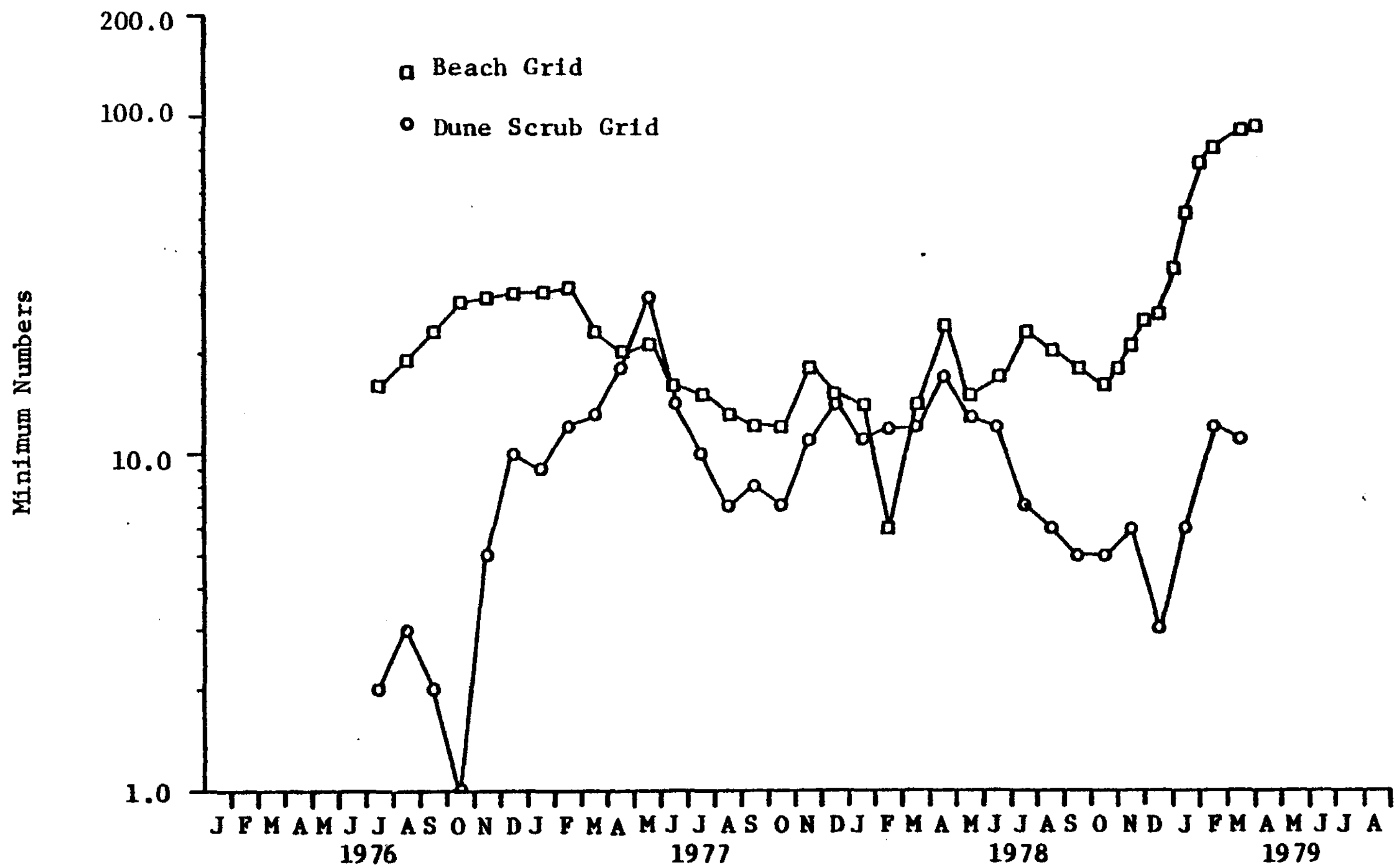

Figure 14. Trend in numbers of beach mice on the two study areas, 1976-79.

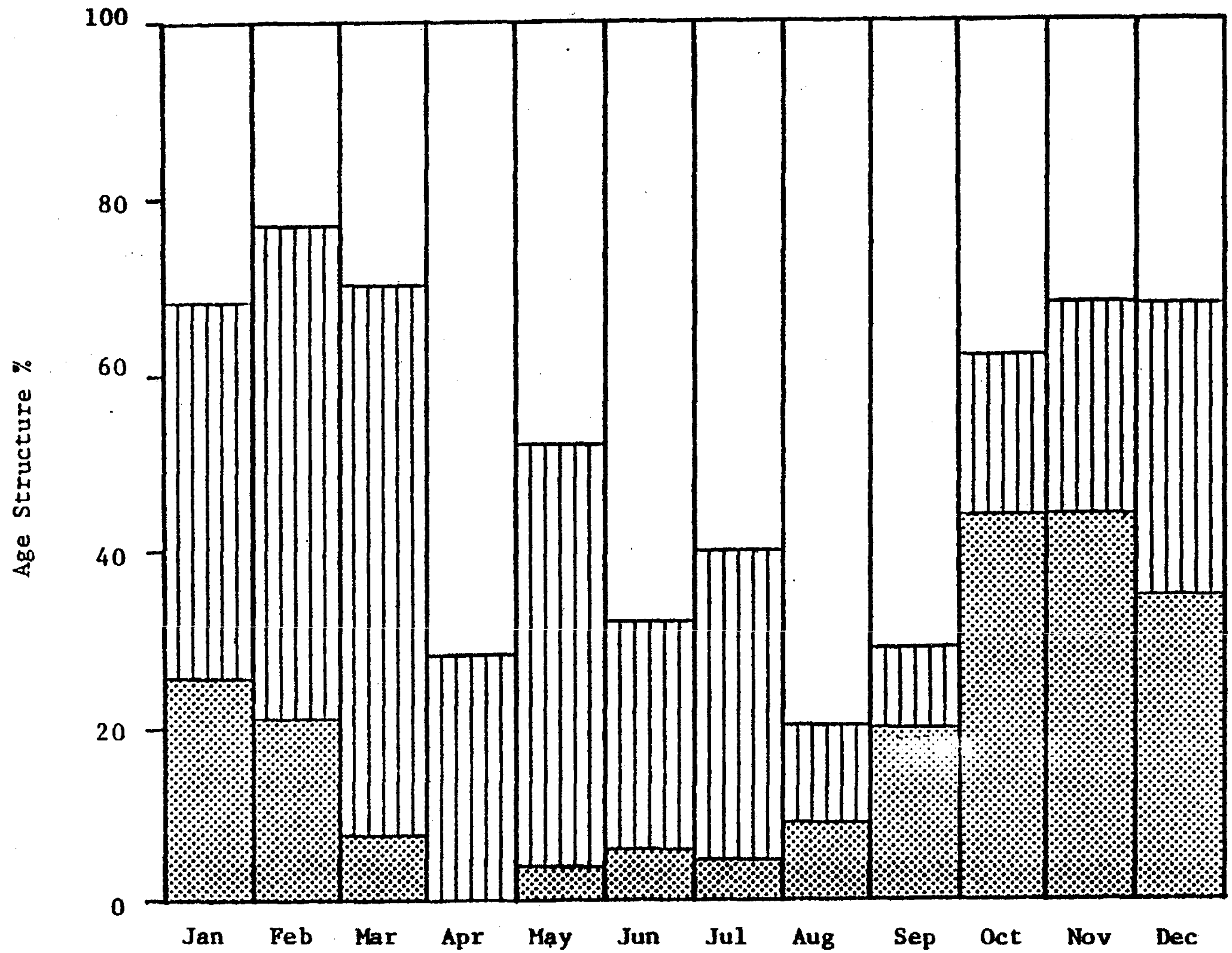

Figure 15. Monthly variation in age structure of cotton rat (Sigmodon hispidius) populations on Merritt Island, 1976-79. Monthly samples from Wisconsin Village, beach and dune scrub grids were averaged over the complete study. Juveniles are indicated by stippled bars; subadults by lined bars; and adults by open bars.

Table 66. Survival time in months of small mammals on the trapping grids, Merritt Island, 1976-79. All age classes are pooled by sex, species, and trapping grid.

	Average number of months survived per individual			
	Female	n	Male	n
Cotton Rat (*Sigmodon hispidus*)	2.96	(159)	3.29	(159)
Cotton Mice (*P. gossypinus*)	3.56	(122)	3.03	(158)
Beach Mice (*Peromyscus polionotus*)	2.45	(180)	2.00	(226)

Age structure of small mammals follows a typical pattern of change from month to month, and reflects survival and reproductive success. The live trapping studies reported here did not provide a direct measure of reproductive success as might be obtained from autopsy of breeding females. Rather, captured animals were classified into relative age classes by body weight or pelage features. All the age structure data for cotton rats, cotton mice and beach mice were summarized to provide a composite age structure for a typical year.

Juvenile cotton rats were a very small proportion of the population from March to September (Figure 15). The proportion of juveniles increased to about 42 percent in October and November and diminished to 20 percent by February. Subadults were present throughout the year and dominated the age structure in February and March. Adults composed 60 percent or more of the individuals from April through September. Survival of and successful reproduction by adult cotton rats during the summer months are necessary to ensure recruitment of young animals into the population during October and November.

Adult cotton mice dominated the age structure of the population throughout the year (Figure 16). After the peak recruitment of juveniles in October and November, 64 percent of the population was classified as adult. Trappable juveniles were not present from March through July. Subadults composed from 21 to 31 percent of the age structure from November through February. Layne (1974) did not provide a monthly breakdown of the age structure of the cotton mice in his study; however, he indicated 80 percent of the population was adult. Juveniles were probably inadequately sampled in Layne's work as well as in the trapping on Merritt Island.

Juvenile and subadult beach mice were present throughout the year, but in greatest proportions from August until January (Figure 17). More than 80 percent of the population was adult between January and August. As in the case of cotton mice, juveniles were probably not trapped in proportion to their relative abundance in the field populations.

Based on the information on age structure of cotton rats, cotton mice and beach mice, it appeared that the live trapping underestimated the abundance of juveniles. Bias against trapping juveniles was probably greatest for beach mice, less so for cotton mice, and least for cotton rats.

Proportions of males and females in the trappable populations were near unity when pooled over the entire study (Table 67). The only exception was the cotton rat on the dune scrub where significantly more males were captured ($X^2 = 4.38$; 1 df; $p < .05$).

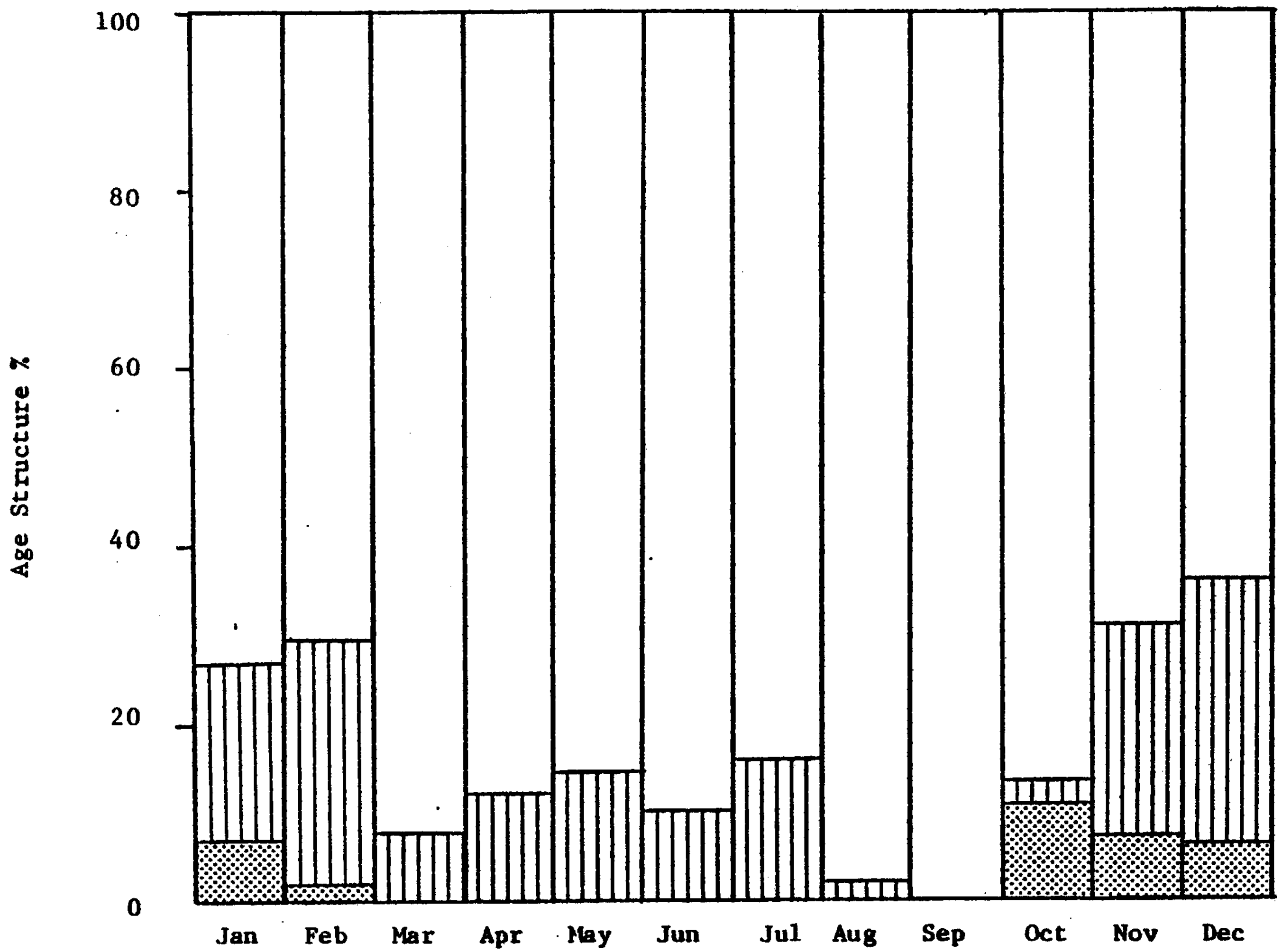

Figure 16. Monthly variation in age structure of cotton mice (*Peromyscus gossypinus*) populations on Merritt Island, 1976-79. Monthly samples from Wisconsin Village and Happy Hammock were averaged over the complete study. Juveniles are indicated by stippled bars; subadults by lined bars; and adults by open bars.

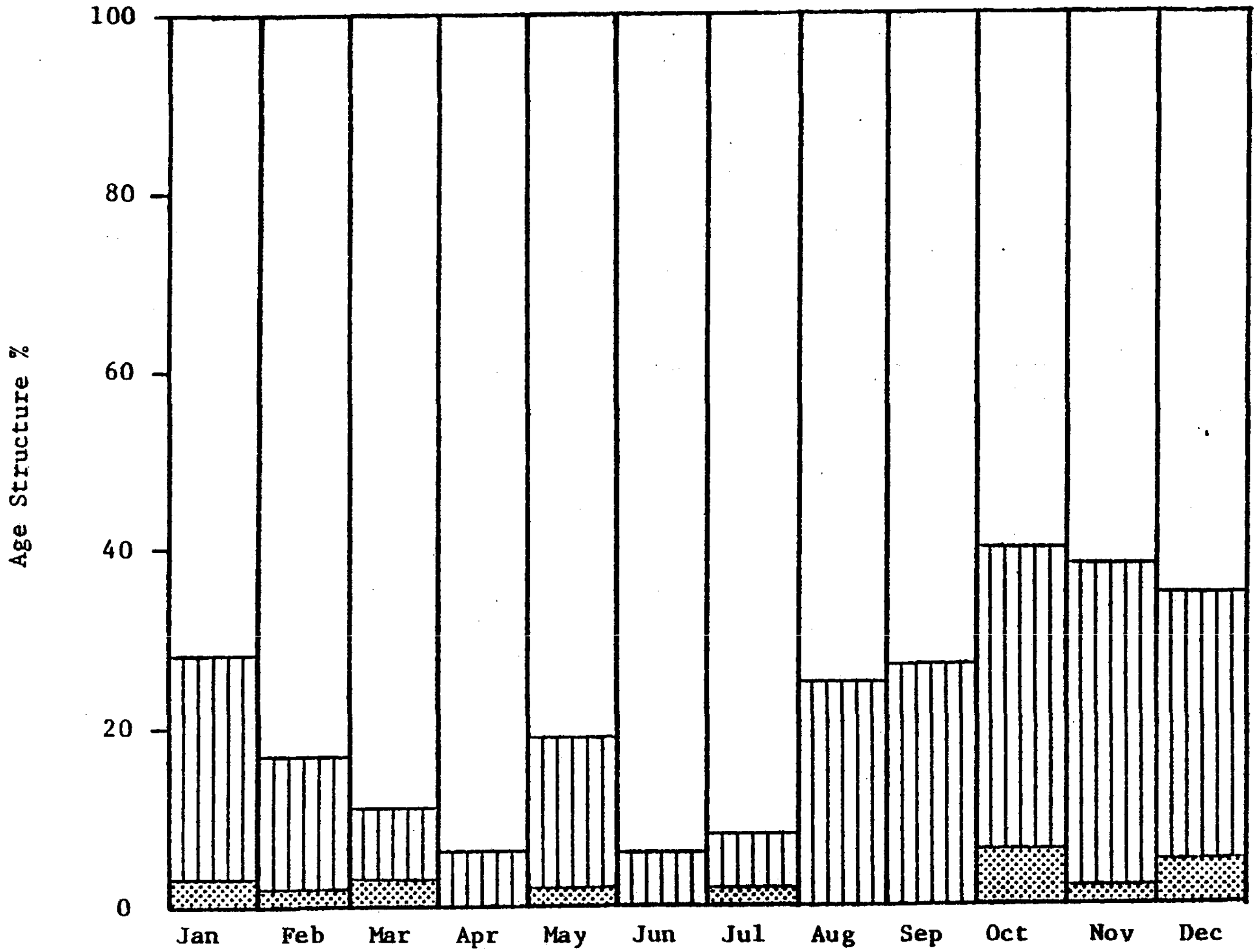

Figure 17. Monthly variation in age structure of beach mice (Peromyscus polionotus) populations on Cape Canaveral, Merritt Island, 1976-79. Monthly samples from the beach and dune scrub grids were averaged over the complete study. Juveniles are indicated by stippled bars; subadults by lined bars; and adults by open bars.

Table 67. Sex ratio of major small mammal species based on pooled trap-recapture data, June 1976 - March 1979.

Site	Species	Males	Females	Males: Females	Chi-Square
Wisconsin Village	Cotton Rat	293	305	.96	.24
	Cotton Mouse	99	87	1.14	.77
Happy Hammock	Cotton Mouse	237	197	1.20	3.70
Beach Grid	Beach Mouse	401	406	.98	.03
	Cotton Rat	74	64	1.16	.72
Dune Scrub	Beach Mouse	135	119	1.13	1.00
	Cotton Rat	117	85	1.31	4.38*

*Significant at $p < .05$

Reproduction is the major population force for increase in "normal" populations. It is seasonal in occurrence and intensity among mammals (Smith 1974). An external character, enlarged nipples, was recorded as an index of immediate past, present, or pending lactation. The small mammals were found to follow somewhat similar seasonal patterns with respect to the prevalence of this character (Figure 18). A late spring and early summer depression in female reproductive activity was apparent for the three species. Female beach mice showed a pronounced breeding effort during July and August. Cotton mice, in contrast, peaked in September and October and again in December. Female cotton rats with enlarged nipples were notable in that the proportion in the population was low (20-24 percent) during the height of breeding season in August and September and from December through March. Cotton rats were not found to lactate during the winter at Gainesville (Layne 1964).

The incidence of breeding males among the small mammals showed a major peak in late summer (Figure 19). Cotton rats and beach mice peaked in August (77 percent with descended testes); whereas, cotton mice peaked in September. The proportion of potentially breeding males among the beach mice never decreased below 10 percent in any month. Both cotton rats (January) and cotton mice (May and June) appeared to cease production at some time during the annual cycle.

Small Mammals as Indicators of Ecosystem Change

The objective of this work was to document the species composition and seasonal dynamics of small mammal populations in four of the plant community types identified in the baseline habitat inventory. A vertebrate group was included because habitat inventories focused on plant community analysis allow only partial assessment of the ecological status of landscapes. Change is inherent and expected in ecological status of landscapes. Change is inherent and expected in ecosystems, and the impact of changes should be interpreted at various levels in the trophic structure. Small mammals were selected as indicators of change in habitat quality because of their sensitivity to environmental conditions, e.g., rainfall and primary production (Whitford 1976; Tast and Kalela 1971) and vegetative cover (Goertz 1964). Because of their local abundance, sedentary nature, and trappability, small mammals are useful in continuous inventory programs.

Results of monthly live-trapping beginning in July 1976 suggested certain conclusions with respect to habitat evaluation and environmental monitoring on Merritt Island.

Monitoring small mammals to evaluate change in habitat quality should concentrate on variation in number and composition of the suite of species in a particular habitat, and on the variation in population size of the dominant species. In the Merritt Island studies, we believe that a shift in the number

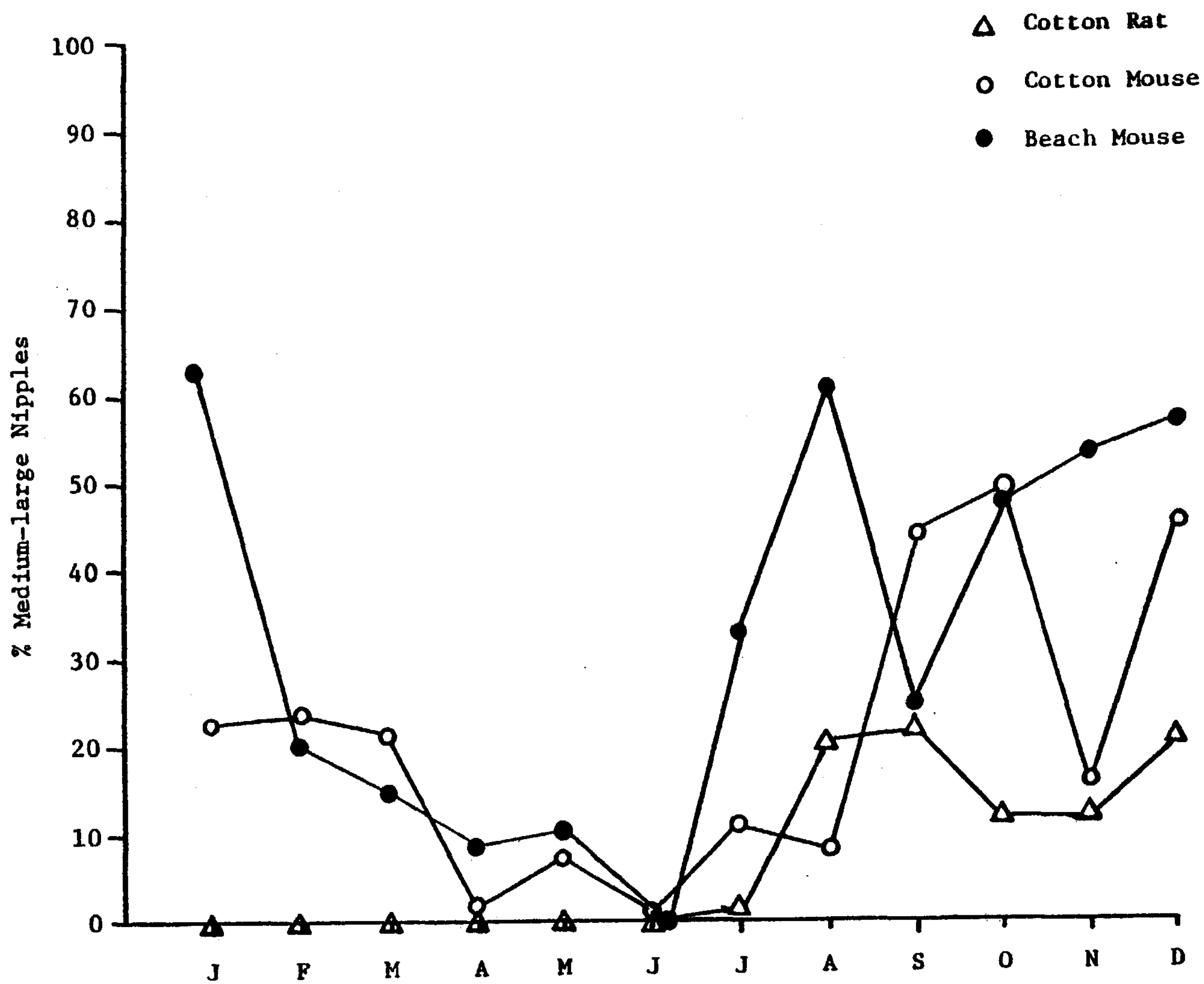

Figure 18. Monthly variation in reproductive activity of female small mammals as indicated by the occurrence of enlarged nipples. Samples were averaged over all months and grids, 1976-1979.

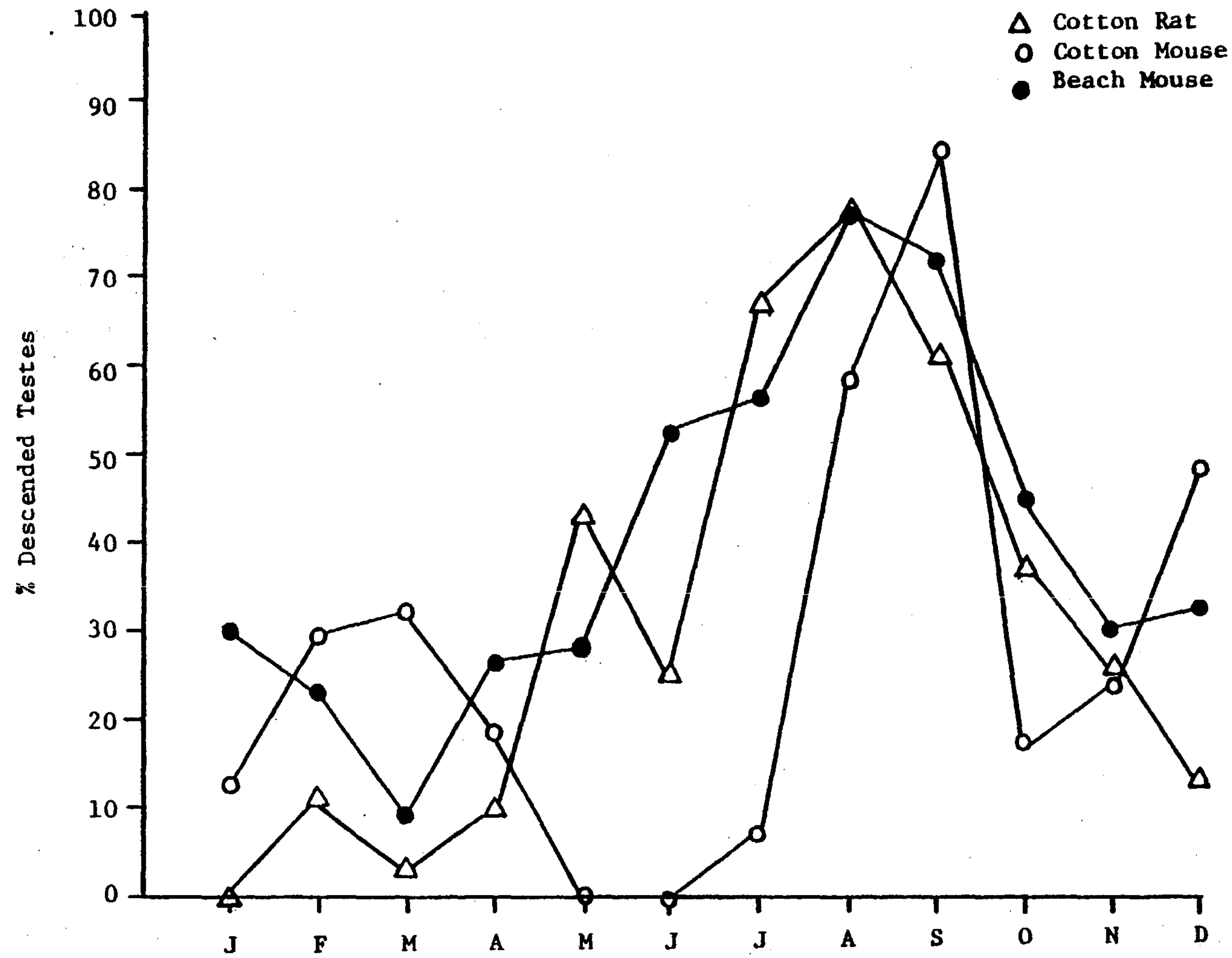

Figure 19. Monthly variation in reproductive activity of male small mammals as indicated by the presence of descended testes. Samples were averaged over all months and grids, 1976-1979.

of species trapped within a month or season may provide an early sign of ecosystem level stress, when compared with past trends. Another indicator of concern is the status of the dominant species. (A habitat may support more than one.) Dominance in this context implies a species that is neither cyclic in its population fluctuations nor typically rare or near the limit of its tolerance for the prevailing habitat conditions. We believe that evaluation of the population status of subordinate species usually is problematical because of sample variation. A shift in species number may indicate random changes in habitat quality; while a change in the status of a dominant species that is coupled with a shift in species diversity will be indicative of fundamental change in habitat quality.

Concurrent trapping in contrasting vegetation types provides valuable insight into spatial and temporal dynamics of small mammal populations not available from a single habitat type study (Figure 12 and 14). For example, the fact that cotton rat abundance diminished to very low levels in March and April of 1978, could be termed a general phenomenon because the decline occurred in three plant community types. Local perturbations would not lead to such population behavior. In addition, data from different combinations of dominant small mammals facilitates analysis of change and causal relations. This consideration is especially important when man-induced stresses may be chronic and local in occurrence.

Agencies with limited resources cannot be expected to carry out long-term intensive trapping to augment baseline studies. An alternative might be to sample during one season per year. Seasonal patterns in minimum numbers of dominant small mammals on Merritt Island reveal considerable variation (Table 68). Moreover, it appears that the optimal season for trapping varies with both habitat type and species of dominant rodent.

Summary

The number of species routinely trapped on the study areas ranged from one to three. Cotton rats (Sigmodon hispidus) and cotton mice (Peromyscus gossypinus) were the dominant species on the Wisconsin Village grid. Golden mice (Ochrotomys nuttalli), Florida mice (Peromyscus floridanus), and occasionally rice rats (Oryzomys palustris) were also captured. Variation in cotton rat abundance between years was substantial. In contrast, the cotton mouse was very stable in abundance.

Cotton mice predominated on the Happy Hammock grid, with occasional captures of golden mice. Between year variation in abundance of cotton mice was greater than on the Wisconsin Village grid.

Beach mice (Peromyscus polionotus), cotton mice, and cotton rats were the resident rodents on the beach grid. A few roof rats (Rattus rattus) were captured. Beach mice were most abundant, followed by cotton mice and cotton rats.

Table 68. Seasonal variation in minimum numbers of the dominant rodent species in four habitat types on Merritt Island, Florida, 1976-79. The trapping areas are 3.5 acres (1.4 ha) with the exception of the hammock which is 2.7 acres (1.1 ha).

Habitat Type (Rodent)	Mean minimum numbers (coefficient of variation x 100) and sample size			
	Spring[a]	Summer	Fall	Winter
Pine Flatwoods (*Peromyscus gossypinus*)	10(19)6	6(50)9	5(29)9	6(41)7
Hammock (*Peromyscus gossypinus*)	23(63)6	16(27)9	14(70)9	18(68)7
Coastal Scrub (*Peromyscus polionotus*)	17(37)6	7(55)8	5(54)9	10(35)7
Coastal Dunes (*Peromyscus polionotus*)	19(21)6	17(18)8	20(31)7	22(46)7

[a]Spring: March-May; Summer: June-August; Fall: September-November; Winter: December-February.

Beach mice, cotton rats, and cotton mice were found on the dune scrub grid. Abundance of the three species was relatively similar. Year-to-year variation in numbers was not very great.

During the period of study, three of the species reached unusually high population densities. Cotton rats underwent a population increase to peak numbers on all areas except the hammock during the fall and early winter of 1976-77. Numbers tended to decline in early 1977 and never recovered to previous levels. Cotton rats declined to minimum levels on all three study areas in early spring of 1978. They appeared to be recovering in abundance as the study ended.

Cotton mice were unusually abundant on the Happy Hammock grid in late 1976 and the first several months of 1977. This population never again reached the density observed in the winter of 1976-77. Nonetheless, cotton mouse abundance during the last two years of study was comparable to densities reported in the literature from elsewhere in the species range. It is noteworthy that the cotton mouse did not achieve exceptional densities on the other three study areas (i.e., Wisconsin Village, beach grid and dune scrub).

Beach mice exhibited an exponential increase in numbers on the beach grid near the end of the study. The increase started in October, 1978 and continued through March, 1979. A parallel increase was not observed on the dune scrub grid.

Survival time of rodents on the trapping grids was from 2-3 months. Female cotton rats and cotton mice survived slightly longer than males. In contrast, male beach mice outlived females. Among the species cotton mice survived in the trappable population for the longest time.

The age structure of cotton rat populations typically included juveniles, subadults, and adults. Adults composed 60 percent of the population from June to September. Juveniles were present in all months except April and represented 44 percent of the population in October and November. Few subadults were observed in late summer, but they were fairly common in other months.

Adults dominated the age structure of cotton mice populations. Juveniles were present from October until February, and subadults were trapped in all months except September.

Adults composed 80 percent or more of beach mice populations from February to July. Juveniles were poorly represented in the population in all months. Nearly 40 percent of the beach mice were subadult or juvenile in October, November and December.

Sex ratios of most rodent species tended to be near unity. However, the sex ratio of cotton rats on the dune scrub grid was significantly ($p<.05$) skewed toward males.

Breeding biology was studied by observation of external characteristics of reproductive organs. Female cotton rats were in reproductive conditions in every month, however, breeding did not occur in every month every year. The major period of reproduction (as indicated by enlarged mammaries) was from August through December. Female cotton mice were in reproductive condition in every month, but not in every month every year. Cotton mice tended to delay their major breeding until September and to continue through March. Female beach mice bred from July until May, with peaks of activity in August and January.

The potential of males to breed was determined by the presence of descended testes. The proportion of male cotton rats with descended testes increased from 0 percent in January to nearly 80 percent in August and declined thereafter. Male beach mice followed a similar pattern, but did not decline to complete inactivity in the winter months. Cotton mice were more variable than the other species. Males showed a major peak of activity in August and September, a secondary peak in December, and a minor period of activity in February and March.

Conclusions

1. The species of small mammals studied are not equally adapted to the four plant community types. Cotton rats achieve their greatest abundance, both monthly and overall average, on the pine flatwoods site. Smaller numbers are to be expected on the dune scrub (coastal scrub) and beach (coastal dunes). Cotton mice are most abundant in the hammock; however, they are ubiquitous in other community types on Merritt Island. The most habitat specific, or specialized, rodent for which data exist is the beach mouse. Substrate and vegetation preferences limit the distribution of this species to coastal dunes on Merritt Island, except for Cape Canaveral, where it is widespread.

2. Small mammal populations on the Merritt Island study sites underwent considerable variation in abundance from year-to-year. This variation is normal and well documented by previous work on Merritt Island (Ehrhart, 1976) and elsewhere in the southeastern U.S. (Odum, 1955; Layne, 1974; Smith et al., 1974). Of the species studied, cotton rats are capable of the most extreme population oscillations. However, any of these rodent species are able, on occasion, to increase to high densities. Variation in minimum numbers of the dominant species is described as the mean number expected per month with the associated standard error. Any future determinations of small mammal abundance should be interpreted with reference to this baseline.

3. Structural attributes of small mammal populations are a valuable source of correlative information which often proves helpful in understanding variation in density. Age structure of cotton rat populations in the live trapped samples appears to be representative. However, juveniles are underestimated by live trap captures of cotton mice and particularly beach mice. Shifts in age structure are, then, features to be monitored and correlated with other population attributes. Likewise, equal numbers of males and females are indicated among the small mammals at present and trends away from unity may be regarded as unusual.

   Any unusual mortality affecting small mammal populations in spring and early summer may have a pronounced influence on population dynamics in ensuing months. This is because breeding by the various species is concentrated between August and December. If live trapping in the early summer suggests a few adults are present, a modest increase or even declining numbers of small mammals may be anticipated.

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APPENDIX TABLES

PLANT COMMUNITY ANALYSIS

Table 1. Names, locations, and activities underway at reference stands.

Reference Stand	Location Coordinates	Master Plan Sheet No.	Monitoring Activity		Small Mammal Sampling
			Plant Sampling	Nutrient Studies	
Happy Hammock	x = 80 39 46 y = 28 37 41	F3	x	x	x
Juniper Hammock	x = 80 48 20 y = 28 47 4	J4	x	x	
Dune Scrub	x = 80 34 32 y = 28 32 41	D2	x	x	x
Happy Creek Scrub	x = 80 40 56 y = 28 37 8	F3	x	x	
Wisconsin Village	x = 80 42 45 y = 28 38 19	F4	x	x	x
Headquarters Pineland	x = 80 39 44 y = 28 31 46	D5	x	x	
Pine Flatwoods	x = 80 50 13 y = 28 49 41	K4	x	x	
Beach Grid	x = 80 34 29 y = 28 34 47	E1	x	x	x
Rt. 3 Hammock	x = 80 42 23 y = 28 39 34	G3	x	x	
39B Scrub	x = 80 39 21 y = 28 37 21	F2	x	x	

Table 2. Coverage, relative coverage, frequency and relative frequency of the herbaceous layer, Happy Hammock, Summer, 1976. Values are percentage based on 49 plots. 2 x 5 dm each.

Species	Coverage	Relative Coverage %	Frequency	Relative Frequency %
Oplismenus setarius	0.41	2.8	0.06	8.1
Toxicodendron radicans	0.25	1.7	0.10	13.5
Panicum joorii	0.05	0.3	0.02	2.6
Mikania scandens	0.05	0.3	0.02	2.6
Ponthieva racemosa	0.03	0.2	0.02	2.6
Arisaema triphyllum	0.81	5.6	0.04	5.4
Nephrolepis cordifolia	12.91	88.8	0.49	64.9

Table 3. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Happy Hammock, Summer, 1976. Data are from 49 plots 1 m^2 in area.

Species	No. per m^2	Relative Density (%)	Frequency	Relative Frequency %
Persea palustris	0.02	0.1	0.02	0.5
Psychotria nervosa	5.69	35.6	0.82	22.1
Psychotria sulzneri	1.59	9.9	0.06	1.6
Nectandra coriacea	2.67	16.7	0.73	19.9
Myrsine guianensis	3.36	21.1	0.75	20.4
Acer rubrum	0.10	0.6	0.10	2.7
Citrus sinensis	0.08	0.5	0.08	2.2
Toxicodendron radicans	0.67	4.2	0.28	7.7
Myrcianthes fragrans	0.92	5.7	0.30	8.3
Quercus virginiana var. virginiana	0.06	0.3	0.06	1.6
Ulmus americana var. floridana	0.08	0.5	0.08	2.2
Sabal palmetto	0.12	0.7	0.08	2.2
Parthenocissus quinquefolia	0.16	1.0	0.10	2.7
Mikania scandens	0.16	1.0	0.04	1.0
Ipomoea alba	0.02	0.1	0.02	0.5
Celtis laevigata	0.10	0.6	0.06	1.6
Morus rubra	0.04	0.2	0.02	0.5
Ampelopsis arborea	0.02	0.1	0.02	0.5
Smilax bona-nox	0.04	0.2	0.02	0.5
Matelea suberosa	0.02	0.1	0.02	0.5

Table 4. Density, frequency and basal area of tree species in Happy Hammock, Summer, 1976.

Species	No. per 100 m^2	Frequency %	Basal Area (cm^2) per 100 m^2
Morus rubra	2.8	30.6	225
Sabal palmetto	7.0	69.3	4,918
Nectandra coriacea	8.5	65.3	188
Citrus sinensis	0.2	6.1	6
Myrsine guianensis	3.4	36.7	42
Myrcianthes fragrans	0.8	10.2	21
Ulmus americana var. floridana	0.5	10.2	75
Forestiera segregata	0.1	2.0	1
Bumelia reclinata	0.1	2.0	1
Celtis laevigata	0.8	8.1	56
Acer negundo	0.1	2.0	56
Ficus aurea	0.1	2.0	70
Quercus virginiana var. virginana	0.4	6.1	3,182
Persea palustris	0.1	2.0	1

Table 5. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Happy Hammock, Summer, 1976.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Morus rubra	11.0	12.1	2.54	25.6	5
Sabal palmetto	27.0	27.4	55.57	110.0	1
Nectandra coriacea	33.0	25.8	2.13	60.9	2
Citrus sinensis	1.0	2.4	0.07	4.10	8
Myrsine guianensis	13.0	14.5	0.48	27.9	4
Myrcianthes fragrans	3.0	4.0	0.24	7.2	6
Ulmus americana var. floridana	2.0	4.0	0.84	6.8	7
Forestiera segregata	0.5	0.8	0.02	0.2	11
Bumelia reclinata	0.5	0.8	0.02	0.2	11
Celtis laevigata	3.0	3.2	0.64	6.8	7
Acer negundo	0.5	0.8	0.64	0.8	10
Ficus aurea	0.5	0.8	0.79	0.9	9
Quercus virginiana var. virginiana	1.5	2.4	35.95	39.8	3
Persea palustris	0.5	0.8	.00	0.1	12

Table 6. Coverage, relative coverage, frequency and relative frequency of the herbaceous layer, Indian River Hammock, Summer, 1976. Values are percentage based on 30 plots 2 x 5 dm each.

Species	Coverage	Relative Coverage %	Frequency	Relative Frequency %
Nephrolepis cordifolia	30.00	56.25	6.0	33.33
Oplismenus setarius	17.50	32.81	6.0	33.33
Thelypteris normalis	5.00	9.37	3.0	16.66
Panicum joorii	0.83	1.55	3.0	16.66

Table 7. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Indian River Hammock, Summer, 1976. Data are from 30 plots 1 m^2 in area.

Species	No. Per m^2	Releative Density %	Frequency	Relative Frequency %
Sambucus simpsonii	0.03	0.2	3.0	1.0
Quercus laurifolia	0.63	4.8	43.0	14.8
Sabal palmetto	4.66	35.8	66.0	22.7
Zanthoxylum clava-herculis	0.06	0.4	6.0	2.0
Nectandra coriacea	2.16	16.5	46.0	15.8
Smilax bona-nox	0.06	0.4	6.0	2.0
Acer rubrum	1.40	10.7	33.0	11.4
Toxicodendron radicans	0.73	5.6	13.0	4.5
Psychotria nervosa	0.73	5.6	20.0	6.9
Psychrotria sulzneri	0.06	0.4	6.0	2.0
Itea virginica	0.06	0.4	3.0	1.0
Rivina humilus	0.23	1.7	3.0	1.0
Rubus trivialis	0.03	0.2	3.0	1.0
Ardisia escallonioides	1.36	10.4	10.0	3.4
Celtis laevigata	0.46	3.5	23.0	7.9
Myrcianthes fragrans	0.33	2.5	3.0	1.0
Parthenocissus quinquefolia	0.03	0.2	3.0	1.0

Table 8. Density, frequency and basal area of tree species in Indian River Hammock, Summer, 1976.

Species	No. Per 100 m^2	% Frequency	Basal Area (cm^2) Per 100 m^2
Sabal palmetto	3.13	73.0	1747
Fraxinus tomentosa	3.84	70.0	2066
Acer rubrum	1.31	33.0	1669
Ulmus americanus	0.60	16.0	139
Quercus laurifolia	1.62	40.0	771
Myrcianthes fragrans	0.20	6.0	10
Nectandra coriacea	0.70	10.0	8
Carya glabra	0.40	6.0	19
Celtis laevigata	0.10	3.0	1
Morus rubra	0.10	3.0	1
Zanthoxylum clava-herculis	0.10	3.0	0.40

Table 9. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Indian River Hammock, Summer, 1976.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Sabal palmetto	25.86	27.75	27.15	80.76	2
Fraxinus tomentosa	31.73	26.61	32.10	90.44	1
Acer rubrum	10.82	12.54	25.94	49.30	3
Ulmus americanus	4.95	6.08	2.16	13.19	5
Quercus laurifolia	13.38	15.20	11.98	40.56	4
Myrcianthes fragrans	1.65	2.28	0.16	4.09	8
Nectandra coriacea	8.26	3.80	0.12	12.18	6
Carya glabra	3.30	2.28	0.30	5.88	7
Celtis laevigata	0.82	1.14	0.02	1.98	9
Morus rubra	0.82	1.14	0.01	1.97	10
Zanthoxylum clava-herculis	0.82	1.14	0.006	1.98	9

Table 10. Coverage, relative coverage, frequency and relative frequency of the herbaceous layer, Juniper Hammock, Summer, 1976. Values are percentage based on 30 plots 2 x 5 dm each.

Species	Coverage	Relative Coverage %	Frequency	Relative Frequency %
Cyperus sp. (1)	5.00	14.64	3.0	9.0
Unknown Sedge	5.00	14.64	3.0	9.0
Blechnum serrulatum	5.83	17.07	6.0	18.0
Cyperus sp. (2)	1.66	4.86	6.0	18.0
Andropogon virginicus var. *glomeratus*	5.00	14.64	3.0	9.0
Oplismenus setarius	1.66	4.86	6.0	18.0
Panicum sp.	5.00	14.64	3.0	9.0
Chasmanthium sesseliflorum	5.00	14.64	3.0	9.0

Table 11. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Juniper Hammock, Summer, 1976. Data are from 30 plots 1 m^2 in area.

Species	No. Per m^2	Relative Density %	Frequency	Relative Frequency %
Ilex vomitoria	3.10	33.51	0.66	25.58
Erythrina herbacea	0.03	0.32	0.03	1.16
Sabal palmetto	1.76	19.02	0.70	27.13
Parthenocissus quinquefolia	0.23	2.48	0.13	5.03
Ulmus americana var. *floridana*	0.03	0.32	0.03	1.16
Vitus rotundifolia	0.06	0.64	0.03	1.16
Serenoa repens	0.33	3.56	0.23	8.91
Quercus virginiana var. *virginiana*	1.70	18.37	0.26	10.07
Smilax bona-nox	0.16	1.72	0.16	6.20
Callicarpa americana	0.03	0.32	0.03	1.16
Carya glabra	0.06	0.64	0.06	2.32
Toxicodendron radicans	1.76	19.02	0.26	10.07

Table 12. Density, frequency and basal area of tree species in Juniper Hammock, Summer, 1976.

Species	No. Per 100 m^2	Frequency %	Basal Area (cm^2) Per 100 m^2
Ilex vomitoria	3.01	83.33	44.57
Carya glabra	0.60	23.33	560.50
Carya aquatica	0.08	3.33	38.52
Quercus virginiana var. virginia	1.29	40.00	1472.85
Sabal palmetto	4.48	93.33	2246.18
Juniperus silicicola	0.77	30.00	369.03

Table 13. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Juniper Hammock, Summer, 1976.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Ilex vomitoria	29.11	30.48	0.94	60.53	2
Carya glabra	5.80	8.53	11.84	26.17	5
Carya aquatica	0.77	1.21	0.81	2.79	6
Quercus virginiana var. virginiana	12.47	14.63	31.12	58.22	3
Sabal palmetto	43.32	34.14	47.47	124.93	1
Juniperus silicicola	7.44	10.97	7.79	26.20	4

Table 14. Coverage, relative coverage, frequency and relative frequency of the herbaceous layer, Ross' Hammock, Summer, 1976. Values are percentage based on 30 plots, 2 x 5 dm each.

Species	Coverage	Relative Coverage %	Frequency	Relative Frequency %
Ipomoea tuba	2.5	33.3	.03	33.3
Vernonia gigantea	2.5	33.3	.03	33.3
Andropogon virginicus var. *glomeratus*	2.5	33.3	.03	33.3

Table 15. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Ross' Hammock, Summer, 1976. Data are from 30 plots 1 m^2 in area.

Species	No. Per m^2	Relative Density %	Frequency	Relative Frequency %
Serenoa repens	0.60	6.2	26.6	10.2
Ilex vomitoria	1.43	14.8	16.6	6.4
Vitis rotundifolia	0.50	5.2	26.6	10.2
Quercus laurifolia	2.53	26.2	60.0	23.1
Carya glabra	0.23	2.4	20.0	7.7
Sabal palmetto	2.43	25.1	56.6	21.8
Magnolia grandiflora	0.03	0.3	3.3	1.3
Myrica cerifera	0.06	0.6	3.3	1.3
Amorpha fruticosa	0.03	0.3	3.3	1.3
Smilax bona-nox	1.10	11.4	20.0	7.6
Parthenocissus quinquefolia	0.06	0.6	6.6	2.5
Asimina parviflora	0.10	1.0	6.6	2.5
Valeriana scabra	0.03	0.3	3.3	1.3
Galactia elliottii	0.53	5.5	6.6	2.5

Table 16. Density, frequency and basal area of tree species in Ross' Hammock, Summer, 1976.

Species	No. Per 100 m^2	Frequency %	Basal Area (cm^2) Per 100 m^2
Quercus laurifolia var. *hemispherica*	2.19	76.66	1993.31
Sabal palmetto	2.26	73.33	1314.12
Carya glabra	1.03	50.00	596.63
Juniperus silicicola	0.12	6.66	58.81
Quercus virginiana var. *virginiana*	0.38	13.33	718.16
Magnolia grandiflora	0.97	30.00	95.86
Osmanthus americanus	0.12	6.66	4.49
Ilex vomitoria	0.58	13.33	4.15
Morus rubra	0.06	3.33	1.21

Table 17. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Ross' Hammock, Summer, 1976.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Quercus laurifolia var. hemispherica	28.33	29.04	41.64	99.01	1
Sabal palmetto	29.16	26.83	27.45	83.44	2
Carya glabra	13.33	50.00	12.46	75.79	3
Juniperus silicicola	1.66	2.43	1.22	5.31	7
Quercus virginiana var. virginiana	5.00	4.87	15.00	24.87	5
Magnolia grandiflora	12.50	10.97	2.00	25.47	4
Osmanthus americanus	1.66	2.43	0.09	4.18	8
Ilex vomitoria	7.50	4.87	0.08	12.45	6
Morus rubra	0.83	1.21	0.02	2.06	9

Table 18. Coverage, relative coverage, frequency and relative frequency of the herbaceous layer, Route 3 Hammock, Summer 1976. Values are percentages based on 30 plots 2 x 5dm each.

Species	Coverage	Relative Coverage	Frequency	Relative Frequency %
Oplismenus setarius	7.08	64. 0	0.45	64.0
Pteridium aquilinum	2.25	20.0	0.10	14.0
Asplenium platyneuron	0.50	4.0	0.03	4.0
Mikania scandens	0.50	4.0	0.03	4.0
Ipomoea alba	0.08	0.7	0.03	4.0
Blechnum serrulatum	0.50	4.0	0.03	4.0
Boehmeria cylindrica	0.08	0.7	0.03	4.0

Table 19. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Route 3 Hammock, Summer 1976. Data are from 30 plots 1 m^2 in area.

Species	No. Per m^2	Relative Density (%)	Frequency	Relative Frequency (%)
Psychotria nervosa	4.06	16.0	0.36	7.0
Psychotria sulzneri	6.66	27.0	0.73	16.0
Myrsine guianensis	0.23	0.9	0.10	2.0
Toxicodendron radicans	2.13	8.0	0.43	9.0
Quercus virginiana	0.86	3.0	0.26	5.0
Sabal palmetto	3.46	14.0	0.80	17.0
Parthenocissus quinquefolia	1.70	7.0	0.30	6.0
Celtis laevigata	0.03	0.1	0.03	0.6
Smilax bona-nox	0.40	1.0	0.20	4.0
Matelea suberosa	0.10	0.4	0.03	0.6
Myrica cerifera	0.13	0.5	0.06	1.0
Ardisia escallanioides	1.23	5.0	0.30	6.0
Rubus trivialis	1.33	5.0	0.36	7.0
Vitis rotundifolia	1.13	4.0	0.40	8.0
Prunus caroliniana	0.73	3.0	0.10	2.0
Ampelopsis arborea	0.06	0.2	0.03	0.6
Persea palustris	0.03	0.1	0.03	0.6

Table 20. Density, frequency and basal area of tree species in Route 3 Hammock, Summer, 1976

Species	No. Per 100 m^2	Frequency %	Basal Area (cm^2) per 100 m^2
Sabal palmetto	11.29	90.0	7,388
Quercus virginiana	6.96	70.0	2,155
Myrica cerifera	0.24	6.0	36
Ulmus americana var. *floridana*	1.20	16.0	29
Celtis laevigata	0.72	13.0	6
Myrsine guianensis	0.72	10.0	4
Morus rubra	1.20	20.0	14
Persea palustris	0.19	3.0	1
Prunus caroliniana	0.48	6.0	8
Citrus sinensis	0.19	3.0	2

Table 21. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Route 3 Hammock, Summer, 1976.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Sabal palmetto	47.0	38.0	76.57	161.57	1
Quercus virginiana	29.0	29.0	22.33	80.33	2
Myrica cerifera	1.0	2.0	0.37	3.37	8
Ulmus americana var. *floridana*	5.0	6.0	0.30	11.03	4
Celtis laevigata	3.0	5.0	0.06	8.06	5
Myrsine guianensis	3.0	4.0	0.05	7.05	6
Morus rubra	5.0	8.0	0.15	13.15	3
Persea palustris	0.8	1.0	0.01	1.81	10
Prunus caroliniana	2.0	2.0	0.09	4.09	7
Citrus sinensis	0.8	1.0	0.02	1.82	9

Table 22. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Indian Mound Hammock, Summer, 1976. Data are from 30 plots $1m^2$ in area.

Species	No. Per m^2	Relative Density(%)	Frequency	Relative Frequency(%)
Eugenia axillaris	0.57	5.5	0.23	6.8
Ardisia escallonioides	2.40	23.3	0.60	17.9
Quercus virginiana var. virginiana	0.80	7.7	0.20	5.9
Sabal palmetto	0.20	1.9	0.20	5.9
Prunus caroliniana	2.50	24.3	0.76	22.7
Psychotria nervosa	1.47	14.3	0.46	13.7
Persea borbonia	0.33	3.2	0.23	6.8
Vitis rotundifolia	0.30	2.9	0.23	6.8
Rivina humilis	0.03	0.3	0.03	0.9
Serenoa repens	0.07	0.7	0.06	1.8
Myrcianthes fragrans	1.00	9.7	0.23	6.8
Smilax bona-nox	0.07	0.7	0.06	1.8
Quercus nigra	0.53	5.1	0.03	0.9
Krugiodendron ferreum	0.03	0.3	0.03	0.9

Table 23. Density, frequency and basal area of tree species in Indian Mound Hammock, Summer, 1976.

Species	No. Per 100 m^2	Frequency %	Basal Area (cm^2) Per 100 m^2
Prunus caroliniana	1.4	26.6	23
Ardisia escallonioides	2.1	33.3	15
Persea borbonia	9.4	93.3	1,747
Sabal palmetto	1.2	26.6	978
Eugenia axillaris	0.8	16.6	9
Eugenia foetida	0.1	3.3	1
Chiococca alba	0.1	3.3	1
Ficus aurea	0.1	3.3	227
Quercus virginiana var *virginiana*	0.8	20.0	541
Bursera simaruba	0.3	6.6	232
Quercus nigra	0.1	3.3	13
Bumelia tenax	0.1	3.3	20
Carya floridana	0.3	6.6	33

Table 24. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Indian Mound Hammock, Summer, 1976.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Prunus caroliniana	8.0	10.0	6.50	24.0	5
Ardisia escallonioides	11.0	13.0	3.90	27.9	3
Persea borbonia	53.0	38.0	45.44	136.4	1
Sabal palmetto	6.0	10.0	25.44	41.4	2
Eugenia axillaris	4.0	6.0	0.24	10.2	6
Eugenia foetida	0.7	1.0	0.02	1.7	12
Chiococca alba	0.7	1.0	0.03	1.7	12
Ficus aurea	0.7	1.0	5.92	7.6	8
Quercus virginiana var. virginiana	4.0	8.0	14.08	26.0	4
Bursera simaruba	1.0	2.0	6.04	9.0	7
Quercus nigra	0.7	1.0	0.34	2.0	11
Bumelia tenax	0.7	1.0	0.53	2.2	10
Carya floridana	1.0	2.0	0.87	3.8	9

Table 25. Coverage, relative coverage, frequency and relative frequency of the herbaceous layer, Black Hammock, fall, 1977. Values are based on 30 plots, 2 x 5 dm each.

Species	Coverage	Relative Coverage %	Frequency	Relative Frequency %
Oplismenus setarius	5.00	17.14	.03	9.04
Nephrolepis biserrata	0.83	2.84	.03	9.04
Dennstaedia bipinnata	17.50	59.99	.06	18.08
Cynanchum scoparium	1.67	5.73	.06	18.08
Mikania scandens	4.17	14.30	.16	45.75

Table 26. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Black Hammock, fall, 1977. Data are from 30 plots $1 m^2$ in area.

Species	No. Per m^2	Relative Density %	Frequency	Relative Frequency %
Celtis laevigata	1.32	35.7	30.0	30.3
Sabal palmetto	0.46	12.4	13.0	13.1
Sambucus simpsonii	0.32	8.6	13.0	0.1
Psychotria nervosa	0.46	12.4	6.0	0.0
Rhapidophyllum hystrix	0.26	7.0	13.0	13.1
Citrus sinensis	0.06	1.6	3.0	3.0
Momordica charantia	0.06	1.6	3.0	3.0
Magnolia virginiana	0.06	1.6	3.0	3.0
Acer rubrum	0.12	3.2	3.0	3.0
Ulmus americana	0.12	3.2	3.0	3.0
Toxicodendron radicans	0.40	10.8	6.0	6.0
Persea palustris	0.06	1.6	3.0	3.0

Table 27. Density, frequency and basal area of tree species in Black Hammock, fall, 1977.

Species	No. Per 100 m^2	Frequency %	Basal Area (cm^2) Per 100 m^2
Sabal palmetto	4.6	83.0	2,811
Nyssa sylvatica var. biflora	0.3	10.0	216
Celtis laevigata	0.7	17.0	730
Ulmus americana	0.1	3.0	195
Fraxinus tomentosa	0.9	30.0	934
Morus rubra	0.5	17.0	175
Magnolia virginiana	0.9	23.0	931
Acer rubrum	0.9	27.0	1,478
Quercus laurifolia	0.6	20.0	674
Sambucus simpsonii	0.8	17.0	42
Liquidambar styraciflua	0.3	7.0	31
Persea palustris	0.3	7.0	195

Table 28. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Black Hammock, fall, 1977.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Sabal palmetto	41.69	31.80	33.41	106.90	1
Nyssa sylvatica var. *biflora*	2.54	3.83	2.57	8.94	9
Celtis laevigata	6.72	6.51	8.68	21.91	5
Ulmus americana	0.82	1.15	2.32	4.29	12
Fraxinus tomentosa	8.27	11.49	11.10	30.86	3
Morus rubra	5.00	6.51	2.08	13.59	8
Magnolia virginiana	8.27	8.54	11.07	27.88	4
Acer rubrum	8.27	10.35	17.56	36.18	2
Quercus laurifolia	5.81	7.66	8.02	21.49	6
Sambucus simpsonii	7.54	6.51	0.50	14.55	7
Liquidambar styraciflua	2.54	2.68	0.37	5.59	11
Persea palustris	2.54	2.68	2.32	7.54	10

Table 29. Coverage, relative coverage, frequency and relative frequency of the herbaceous layer, Castle Windy Hammock, Fall, 1977. Values are percentage based on 30 plots, 2 x 5 dm each.

Species	Coverage	Relative Coverage %	Frequency	Relative Frequency %
Pavonia spinifex	5.00	74.07	0.23	71.87
Salvia coccinea	1.25	18.51	0.06	18.75
Mikania scandens	0.50	7.40	0.03	9.37

Table 30. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Castle Windy Hammock, fall, 1977. Data are from 30 plots 1 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency(%)
Quercus virginiana var. virginiana	2.23	7.2	0.16	3.2
Ardisia escallonioides	6.73	21.6	1.00	19.8
Sabal palmetto	1.00	3.2	0.56	11.1
Myrcianthes fragrans	2.46	7.9	0.43	8.5
Psychotria nervosa	13.43	43.2	0.80	15.9
Zanthoxylum fagara	0.16	0.5	0.16	3.2
Prunus caroliniana	0.56	1.8	0.30	5.9
Ilex vomitoria	2.30	7.3	0.50	9.9
Eugenia axillaris	0.70	2.2	0.23	4.6
Toxicodendron radicans	0.16	0.5	0.06	1.2
Persea borbonia	0.86	2.7	0.43	8.5
Myrsine guianensis	0.16	0.5	0.06	1.2
Serenoa repens	0.03	0.1	0.03	0.6
Celtis laevigata	0.03	0.1	0.03	0.6
Sageretia minutiflora	0.20	0.6	0.16	3.2
Citrus sinensis	0.03	0.1	0.03	0.6
Rivina humilis	0.02	0.0	0.06	1.
Smilax bona-nox	0.03	0.1	0.03	0.

Table 31. Density, frequency and basal area of tree species in Castle Windy Hammock, fall, 1977.

Species	No. Per 100 m^2	Frequency %	Basal Area (cm^2) Per 100 m^2
Quercus virginiana var. virginiana	1.96	50.00	3,252.95
Sabal palmetto	3.91	80.00	2,615.52
Forestiera segregata	0.47	16.67	41.70
Myrcianthes fragrans	0.93	23.33	93.12
Zanthoxylum fagara	0.37	13.33	47.46
Quercus laurifolia	0.09	3.33	1.73
Juniperus silicicola	0.37	13.33	225.20
Persea borbonia	0.75	20.00	373.45
Ilex vomitoria	1.77	40.00	20.44
Celtis laevigata	0.28	10.00	52.17
Morus rubra	0.19	6.67	58.99
Citrus sinensis	0.09	3.33	8.03

Table 32. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Castle Windy hammock, fall, 1977.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Quercus virginiana var. virginiana	17.53	17.86	47.90	83.29	2
Sabal palmetto	34.97	28.57	38.52	102.06	1
Forestiera segregata	4.20	5.95	0.61	10.76	7
Myrcianthes fragrans	8.32	8.33	1.37	18.02	5
Zanthoxylum fagara	3.31	4.76	0.70	8.77	8
Quercus laurifolia	0.81	1.19	0.03	2.03	12
Juniperus silicicola	3.31	4.76	3.32	11.39	6
Persea borbonia	6.71	7.14	5.50	19.35	4
Ilex vomitoria	15.83	14.28	0.30	30.41	3
Celtis laevigata	2.50	3.57	0.77	6.84	9
Morus rubra	1.70	2.38	0.87	4.95	10
Citrus sinensis	0.81	1.19	0.12	2.12	11

Table 33. Coverage, relative coverage, frequency and relative frequency of the herbaceous layer, Jerome Road Hammock, fall, 1977. Values are percentage based on 30 plots, 2 x 5 dm each.

Species	Coverage	Relative Coverage %	Frequency	Relative frequency %
Elephantopus elatus	0.083	2.8	0.033	6.21
Cyperus tetragonus	0.083	2.8	0.033	6.21
Cladium jamaicense	0.500	16.7	0.033	6.21
Panicum joorii	0.083	2.8	0.033	6.21
Panicum polycaulon	1.083	36.1	0.100	18.83
Ipomoea acuminata	0.083	2.77	0.033	6.21
Hedyotis procumbens	0.083	2.77	0.033	6.21
Rhus copallina	0.583	19.45	0.067	12.62
Eryngium prostratum	0.167	5.57	0.067	12.62
Scleria triglomerata	0.083	2.77	0.033	6.21
Phoebanthus grandiflora	0.083	2.77	0.033	6.21
Habenaria odontopetala	0.083	2.77	0.033	6.21

Table 34. Density, relative density, frequency and relative frequency of shrubs, tree seedlings and vines in Jerome Road Hammock, fall, 1977. Data are from 30 plots 1 m^2 in area.

Species	No. Per m^2	Relative Density %	Frequency	Relative Frequency %
Toxicodendron radicans	2.46	35.4	0.6	19.8
Quercus laurifolia	0.33	4.7	0.0	10.4
Sabal palmetto	0.63	9.0	0.4	15.0
Quercus virginiana var. *virginiana*	1.56	22.4	0.5	16.4
Psychotria sulzneri	0.60	8.6	0.3	9.4
Schinus terebinthefolius	0.10	1.4	0.0	1.0
Serenoa repens	0.16	2.3	0.1	4.5
Rubus trivialis	0.06	0.8	0.0	1.
Myrsine guianensis	0.40	5.7	0.2	8.0
Vitis rotundifolia	0.20	2.9	0.1	4.5
Myrica cerifera	0.30	4.3	0.1	4.5
Rhus copallina	0.03	0.4	0.0	1.0
Ampelopsis arborea	0.03	0.4	0.0	1.0
Kostelyzkya virginica	0.06	0.8	0.0	2.1
Pinus elliottii var. *densa*	0.03	0.4	0.0	1.0

Table 35. Density, frequency and basal area of tree species in Jerome Road Hammock, fall, 1977.

Species	No. Per 100 m^2	Frequency %	Basal Area (cm^2) Per 100 m^2
Pinus elliottii var. *densa*	1.88	20.00	1,637.08
Sabal palmetto	10.34	96.66	7,375.31
Quercus virginiana var. *virginiana*	1.34	23.33	801.93
Myrica cerifera var. *cerifera*	1.34	20.00	13.13
Myrsine guianensis	0.26	6.66	1.99
Ilex cassine	0.13	3.33	0.79
Quercus laurifolia	0.53	10.00	69.89
Rhus copallina	0.26	3.33	1.69

Table 36. Importance values (IV = relative density + relative frequency + relative dominance) of tree species in Jerome Road Hammock, fall, 1977.

Species	Relative Density	Relative Frequency	Relative Dominance	IV	IV Rank
Pinus elliottii var. densa	11.69	10.91	16.53	39.13	2
Sabal palmetto	64.30	52.73	74.48	191.51	1
Quercus virginiana	8.33	12.72	8.09	29.14	3
Myrica cerifera var. cerifera	8.33	10.91	0.13	19.37	4
Myrsine guianensis	1.61	3.63	0.02	5.26	6
Ilex cassine	0.80	1.81	0.007	2.62	8
Quercus laurifolia	3.29	5.45	0.70	9.44	5
Rhus copallina	1.61	1.81	0.01	3.43	7

Table 37. Coverage, relative coverage, frequency, relative frequency and importance value of plants on the Wisconsin Village grid, Summer, 1976. Values are based on 15 line transects each of which were 10 m in length.

Species	Absolute Coverage %	Relative Coverage %	Absolute Frequency %	Relative Frequency %	IV
Quercus minima	12.7	10.5	100.0	9.2	19.7
Serenoa repens	24.6	20.3	100.0	9.2	29.5
Lyonia lucida	24.5	20.1	100.0	9.2	29.3
Aristida stricta	32.5	26.7	100.0	9.2	35.9
Galactia elliottii	0.3	0.3	13.3	1.2	1.5
Hypericum reductum	0.3	0.3	26.6	2.4	2.7
Solidago microcephala	0.06	0.05	6.6	0.6	0.65
Gaylussacia dumosa	2.5	2.0	86.6	7.9	9.9
Panicum patentifolium	0.1	0.08	26.6	2.4	2.5
Vaccinium myrsinites	0.9	0.7	66.6	6.1	6.8
Befaria racemosa	2.0	1.7	53.3	4.9	6.6
Lyonia fruticosa	2.0	1.7	86.6	7.9	9.6
Ilex glabra	5.1	4.2	53.3	4.9	9.1
Andropogon virginicus	0.4	0.3	33.3	3.0	3.3
Myrica cerifera var. *pumila*	6.1	5.0	93.3	8.5	13.5
Asimina reticulata	0.5	0.4	26.6	2.4	2.8
Quercus myrtifolia	5.7	4.7	40.0	3.7	8.4
Satureja rigida	0.5	0.4	53.3	4.9	5.3
Lachnocaulon anceps	0.01	0.01	6.6	0.6	0.61
Sericocarpus bifoliatus	0.02	0.01	6.6	0.6	0.61
Pteridium aquilinum	0.5	0.4	13.3	1.2	1.6

Table 38. Coverage, relative coverage, frequency, relative frequency, and importance values of understory plants in Headquarters Pine Flatwoods (July, 1977). Values are based on 15 line transects each of which was 15m in length.

Species	Absolute Frequency	Relative Frequency	Absolute Coverage (cm)	Relative Coverage	I.V.	I.V. Rank
Serenoa repens	1.000	8.4	8460	35.3	43.7	1
Lyonia lucida	1.000	8.4	3224	13.4	21.8	2
Quercus myrtifolia	.533	4.5	2626	10.9	15.4	4
Quercus virginiana var. maritima	1.000	8.4	3099	12.9	21.3	3
Quercus chapmanii	.267	2.2	662	2.8	5.0	11
Vaccinium myrsinites	.933	7.9	1045	4.4	12.3	5
Befaria racemosa	.867	7.3	809	3.4	10.7	7
Aristida stricta	.867	7.3	718	3.0	10.3	8
Galactia elliottii	.400	3.4	153	0.6	4.0	12
Myrica cerifera var. pumila	.933	7.9	909	3.8	11.7	6
Lyonia fruticosa	.800	6.7	754	3.1	9.8	9
Ilex glabra	.200	1.7	257	1.1	2.8	15
Asimina reticulata	.400	3.4	149	0.6	4.0	12
Gaylussacia dumosa	.200	1.7	20	0.1	1.8	16
Smilax auriculata	.333	2.8	191	0.8	3.6	13
Pteridium aquilinum	.267	2.2	275	1.1	3.3	14
Vitis rotundifolia	.667	5.6	352	1.5	7.1	10
Panicum patentifolium	.133	1.1	4	0.0	1.1	19
Hypericum reductum	.067	0.6	15	0.1	0.7	21
Baccharis halimifolia	.133	1.1	61	0.3	1.4	17
Ximenia americana	.067	0.6	20	0.1	0.7	21
Solidago fistulosa	.133	1.1	7	0.0	1.1	19
Tillandsia usneoides	.133	1.1	18	0.1	1.2	18
Ludwigia maritima	.067	0.6	3	0.0	0.6	22
Rhus copallina	.067	0.6	30	0.1	0.7	21
Saturja rigida	.133	1.1	8	0.0	1.1	19
Lechea torreyi	.067	0.6	10	0.0	0.6	22
Heterotheca graminifolia	.067	0.6	4	0.0	0.6	22
Quercus minima	.067	0.6	35	0.1	0.7	21
Andropogon virginicus	.067	0.6	73	0.3	0.9	20

Table 39. Coverage, relative coverage, frequency, relative frequency, and importance values of understory plants on the UCF Pine Flatwoods (August, 1977). Values are based on 15 line transects each of which was 15m in length.

Species	Absolute Frequency	Relative Frequency	Absolute Coverage (cm)	Relative Coverage	I.V.	I.V. Rank
Serenoa repens	1.000	6.1	9398	37.7	43.8	1
Aristida spiciformes	1.000	6.1	5223	20.9	27.0	2
Aristida stricta	1.000	6.1	4716	18.9	25.0	3
Lyonia fruticosa	.733	4.5	538	2.2	6.7	6
Carphephorus corymbosus	.533	3.2	109	0.4	3.6	12
Asimina reticulata	1.000	6.1	440	1.8	7.9	5
Andropogon virginicus	.867	5.3	656	2.6	7.9	5
Panicum ciliatum	.600	3.6	167	0.7	4.3	11
Lechea sp.	.133	0.8	9	0.0	0.8	26
Lachnocaulon anceps	.333	2.0	61	0.2	2.2	17
Panicum webberianum	.933	5.7	216	0.9	6.6	7
Panicum ensifolium	.800	4.9	322	1.3	6.2	8
Schrankia nuttallii	.600	3.6	193	0.8	4.4	10
Quercus minima	.933	5.7	989	4.0	9.7	4
Hypericum tetrapetalum	.400	2.4	18	0.1	2.5	15
Aster squarrosus	.667	4.1	100	0.4	4.5	9
Hypericum reductum	.267	1.6	7	0.0	1.6	21
Amphicarpum sp.	.333	2.0	17	0.1	2.1	18
Rhynchospora plumosa	.133	0.8	6	0.0	0.8	26
Aster reticulatus	.333	2.0	191	0.8	2.8	14
Rhynchospora fascicularis	.067	0.4	46	0.2	0.6	27
Richaradia sp.	.067	0.4	2	0.0	0.4	29
Eupatorium recurvans	.067	0.4	2	0.0	0.4	29
Solidago microcephala	.133	0.8	16	0.1	0.9	25
Rhexia nuttalli	.133	0.8	11	0.0	0.8	26
Ilex glabra	.200	1.2	139	0.6	1.8	19
Phoebanthus grandiflorus	.333	2.0	38	0.2	2.2	17
Vaccinium myrsinites	.267	1.6	113	0.5	2.1	18
Pterocaulon pycnostachyum	.533	3.2	65	0.3	3.5	13
unknown mint	.067	0.4	1	0.0	0.4	29
Heterotheca trichophylla	.133	0.8	5	0.0	0.8	26

Table 39. Coverage, relative coverage, frequency, relative frequency, and importance values of understory plants on the UCF Pine Flatwoods (August, 1977). Values are based on 15 line transects each of which was 15m in length. (Continued)

Species	Absolute Frequency	Relative Frequency	Absolute Coverage (cm)	Relative Coverage	I.V.	I.V. Rank
Agalinis fasciculatus	.133	0.8	85	0.3	1.1	24
Euphorbia polyphylla	.200	1.2	29	0.1	1.3	23
Myrica cerifera var. pumila	.200	1.2	129	0.5	1.7	20
Lyonia lucida	.200	1.2	389	1.6	2.8	14
Helianthus radula	.200	1.2	34	0.1	1.3	23
Quercus pumila	.133	0.8	366	1.5	2.3	16
Smilax auriculata	.067	0.4	5	0.0	0.4	29
Galactia elliotti	.067	0.4	7	0.0	0.4	29
Ludwigia maritima	.067	0.4	18	0.1	0.5	28
Palafoxia integrifolia	.067	0.4	5	0.0	0.4	29
Elephantopus elatus	.200	1.2	47	0.2	1.4	22
Hedyotis uniflora	.067	0.4	5	0.0	0.4	29
Gaylussacia dumosa	.067	0.4	10	0.0	0.4	29
Helianthemum corymbosum	.067	0.4	6	0.0	0.4	29
Stillingia sylvatica	.067	0.4	5	0.0	0.4	29
Liatris sp.	.067	0.4	2	0.0	0.4	29

Table 40. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (>2.54cm diam.) in UCF Pine Flatwoods (August, 1977).

Species	No per $100m^2$	Frequency	Basal Area(cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Pinus palustris	1.75	1.00	509.27	97.8	92.0	99.4	289.2	1
Pinus serotina	0.04	.09	2.96	2.2	8.0	0.6	10.8	2

Table 41. Coverage, relative coverage, frequency, and relative frequency of herbaceous layer of UCF Pond Pine site (August, 1977). Values are percentages based on 20 plots 2 x 5 dm each.

Species	Coverage	Relative Coverage	Frequency	Relative Frequency
Osmunda cinnamomea	3.625	53.7	.250	45.5
Aster reticulatus	1.875	27.8	.050	9.1
Rhexia nuttallii	.125	1.9	.050	9.1
Rhynchospora ciliaris	.125	1.9	.050	9.1
Mitchellia repens	.125	1.9	.050	9.1
Woodwardia virginica	.875	13.0	.100	18.2

Table 42. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) for shrubs, tree seedlings, and vines (<2.54 cm dbh) on UCF Pond Pine site (August, 1977). Data are from 20 plots 1.0 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Ilex glabra	8.97	50.2	.667	32.8	83.0	1
Myrica cerifera	0.50	2.8	.167	8.2	11.0	5
Smilax laurifolia	0.33	1.8	.200	9.8	11.6	4
Serenoa repens	0.73	4.1	.300	14.7	18.8	3
Lyonia fruticosa	0.23	1.3	.067	3.3	4.6	8
Lyonia lucida	5.93	33.2	.300	14.7	47.9	2
Persea palustris	0.03	0.2	.033	1.6	1.8	12
Gaylussacia frondosa	0.43	2.4	.100	4.9	7.3	6
Lyonia ligustrina	0.10	0.6	.033	1.6	2.2	10
Magnolia virginiana	0.07	0.4	.067	3.3	3.7	9
Aster reticulatus	0.47	2.6	.067	3.3	5.9	7
Pyrus communis	0.07	0.4	.033	1.6	2.0	11

Table 43. Densitv, frequency, basal area, and importance values (I.V. = relative desity + relative frequency + relative dominance) of tree species (>2.54cm dbh) on UCF pond pine (August, 1977).

Species	No per $100m^2$	Frequency	Basal Area(cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Pinus serotina	16.02	1.00	2448.5	90.8	76.0	98.9	265.7	1
Gordonia lasianthus	0.23	0.05	1.2	1.3	4.0	0	5.3	5
Magnolia virginiana	0.93	0.16	7.5	5.3	12.0	0.3	17.6	2
Ilex cassine	0.23	0.05	6.2	1.3	4.0	0.3	5.6	4
Nyssa sylvatica var. *biflora*	0.23	0.05	12.2	1.3	4.0	0.5	5.8	3

Table 44. Coverage, relative coverage, frequency, relative frequency, and importance values of understory plants in the Volusia Pine Flatwoods (July, 1977). Values are based on 15 line transects each of which was 15m in length.

Species	Absolute Frequency	Relative Frequency	Absolute Coverage (cm)	Relative Coverage	I.V.	I.V. Rank
Aristida stricta	.933	12.2	2844	12.6	24.8	3
Serenoa repens	.867	11.3	5192	23.1	34.4	2
Centrosema virginica	.133	1.7	13	0.1	1.8	15
Galactia elliottii	.200	2.6	29	0.1	2.7	14
Lyonia lucida	.533	6.9	1725	7.7	14.6	5
Andropogon virginicus	.133	1.7	3	0.0	1.7	16
Quercus myrtifolia	.800	10.4	7928	35.2	45.6	1
Lyonia ferruginea	.333	4.3	125	0.6	4.9	9
Quercus virginiana var. maritima	.400	5.2	651	2.9	8.1	6
Lechea torreyi	.067	0.9	16	0.1	1.0	18
Vaccinium myrsinites	.267	3.5	87	0.4	3.9	11
Gaylussacia dumosa	.333	4.3	416	1.8	6.1	8
Hypericum reductum	.267	3.5	110	0.5	4.0	10
Quercus chapmanii	.667	8.7	2163	9.6	18.3	4
Licania michauxii	.067	0.9	30	0.1	1.0	18
Ilex glabra	.133	1.7	416	1.8	3.5	12
Carphephorus odoratissimum	.267	3.5	93	0.4	3.9	11
Rhynchosia cinerea	.067	0.9	12	0.1	1.0	18
Myrica cerifera var. pumila	.400	5.2	292	1.3	6.5	7
Ximenia americana	.200	2.6	152	0.7	3.3	13
Smilax auriculata	.067	0.9	28	0.1	1.0	18
Tragia urens	.067	0.9	4	0.0	0.9	19
Heterotheca trichophylla	.067	0.9	6	0.0	0.9	19
Pterocaulon pycnostachyum	.067	0.9	8	0.0	0.9	19
Lachnocaulon anceps	.067	0.9	27	0.1	1.0	18
Liatris tenuifolia var. tenuifolia	.067	0.9	5	0.0	0.9	19
Paronychia americana	.067	0.9	2	0.0	0.9	19
Persea borbonia var. humilis	.067	0.9	60	0.3	1.2	17
Befaria racemosa	.067	0.9	64	0.3	1.2	17

Table 45. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (>2.54 cm dbh) in Volusia Pine Flatwoods (July, 1977).

Species	No per $100m^2$	Frequency	Basal Area (cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Pinus elliottii var. densa	0.99	1.00	576	100	100	100	300	1

Table 46. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on UCF Sand Pine Scrub, September, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Bumelia reclinata	0.67	3.7	.067	2.1	5.8	9
Persea borbonia var. humilis	0.13	0.7	.067	2.1	2.8	12
Lyonia ferruginea	1.47	8.2	.200	6.3	14.5	6
Quercus myrtifolia	7.20	40.1	.700	22.1	62.2	1
Vaccinium stamineum	0.33	1.8	.067	2.1	3.9	10
Vaccinium myrsinites	0.07	0.4	.033	1.0	1.4	13
Galactia elliottii	1.67	9.3	.533	16.8	26.1	2
Quercus v. var. maritima	2.33	13.0	.400	12.6	25.6	3
Gaylussacia dumosa	1.00	5.6	.300	9.5	15.1	5
Quercus chapmanii	1.47	8.2	.267	8.4	16.6	4
Palafoxia feayi	0.47	2.6	.200	6.3	8.9	7
Osmanthus americanus	0.20	1.1	.067	2.1	3.2	11
Smilax auriculata	0.07	0.4	.033	1.0	1.4	13
Rhynchospora megalocarpa	0.60	3.3	.100	3.2	6.5	8
Licania michauxii	0.07	0.4	.033	1.0	1.4	13
Opuntia compressa	0.07	0.4	.033	1.0	1.4	13
Panicum patentifolium	0.07	0.4	.033	1.0	1.4	13
Lyonia lucida	0.07	0.4	.033	1.0	1.4	13

Table 47. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on UCF Sand Pine Scrub, September, 1977.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Osmanthus americanus	14.30	.167	7.7	4.2	11.9	6
Lyonia ferruginea	51.06	.300	13.9	15.0	28.9	2
Quercus chapmanii	36.76	.267	12.3	10.8	23.1	4
Serenoa repens	45.27	.267	12.3	13.3	25.6	3
Quercus myrtifolia	150.44	.800	36.9	44.2	81.1	1
Quercus virginiana var. *maritima*	28.25	.233	10.8	8.3	19.1	5
Befaria racemosa	5.79	.033	1.5	1.7	3.2	7
Lyonia lucida	2.72	.033	1.5	0.8	2.3	8
Garberia heterophylla	2.72	.033	1.5	0.8	2.3	8
Ceratiola ericoides	2.72	.033	1.5	0.8	2.3	8

Table 48. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (>2.54cm dbh.) on UCF Sand Pine Scrub. (September, 1977).

Species	No. per $100m^2$	Frequency	Basal Area(cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Lyonia ferruginea	2.19	.667	15.9	22.5	26.3	1.7	50.5	2
Quercus myrtifolia	2.02	.533	20.8	20.8	21.0	2.3	44.1	3
Quercus virginiana var. *maritima*	0.89	.333	27.1	9.2	13.1	3.0	25.3	4
Pinus clausa	4.30	.867	852.1	44.2	34.2	92.8	171.2	1
Quercus chapmanii	0.32	.133	2.4	3.3	5.3	0.3	8.9	5

Table 49. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Debary Scrub, November, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Quercus myrtifolia	9.80	51.2	.933	35.9	87.1	1
Andropogon virginicus	0.87	4.5	.133	5.1	9.6	6
Vaccinium stamineum	0.40	2.1	.167	6.4	8.5	8
Quercus chapmanii	0.60	3.1	.167	6.4	9.5	7
Galactia mollis	1.53	8.0	.133	5.1	13.1	3
Quercus v. var. *maritima*	0.60	3.1	.167	6.4	9.5	7
Lyonia ferruginea	1.07	5.6	.167	6.4	12.0	4
Panicum nitidum	0.20	1.0	.067	2.6	3.6	13
Ilex ambigua	0.27	1.4	.067	2.6	4.0	12
Persea borbonia var. *humilis*	0.93	4.9	.167	6.4	11.3	5
Licania michauxii	1.80	9.4	.100	3.8	13.2	2
Smilax auriculata	0.40	2.1	.100	3.8	5.9	9
Serenoa repens	0.20	1.0	.100	3.8	4.8	10
Rhynchospora megalocarpa	0.13	0.7	.067	2.6	3.3	14
Smilax pumila	0.33	1.7	.067	2.6	4.3	11

Table 50. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Debary Scrub, November, 1977.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus myrtifolia	179.79	.933	42.4	62.5	104.9	1
Persea borbonia var. humilis	28.77	.267	12.1	10.0	22.1	2
Quercus chapmanii	12.08	.167	7.6	4.2	11.8	4
Vaccinium stamineum	4.89	.067	3.0	1.7	4.7	6
Serenoa repens	21.57	.267	12.1	7.5	19.6	3
Lyonia ferruginea	12.08	.133	6.1	4.2	10.3	5
Ilex ambigua	4.89	.067	3.0	1.7	4.7	6
Osmanthus americanus	4.89	.067	3.0	1.7	4.7	6
Quercus v. var. maritima	12.08	.133	6.1	4.2	10.3	5
Vaccinium myrsinites	2.30	.033	1.5	0.8	2.3	7
Sabal etonia	2.30	.033	1.5	0.8	2.3	7
Asimina obovata	2.30	.033	1.5	0.8	2.3	7

Table 51. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (>2.54cm dbh) on Debary Scrub, November, 1977.

Species	No. per $100m^2$	Frequency	Basal Area(cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Pinus clausa	15.07	.933	3600.68	58.3	42.4	95.7	196.4	1
Quercus myrtifolia	4.32	.400	92.92	16.7	18.2	2.5	37.4	2
Quercus chapmanii	2.79	.367	28.01	10.8	16.7	0.7	28.2	4
Persea borbonia var. *humilis*	0.44	.067	4.69	1.7	3.0	0.1	4.8	5
Lyonia ferruginea	2.79	.367	32.48	10.8	16.7	0.9	28.4	3
Quercus v. var. *maritima*	0.21	.033	1.81	0.8	1.5	0.0	2.3	7
Ilex ambigua	0.21	.033	2.39	0.8	1.5	0.1	2.4	6

Table 52. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Route 50 Scrub, November, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Selaginella arenicola	1.33	7.6	.233	8.4	16.0	4
Gaylussacia dumosa	4.60	26.3	.400	14.5	40.8	2
Vaccinium myrsinites	0.67	3.8	.033	1.2	5.0	9
Quercus myrtifolia	3.53	20.2	.600	21.7	41.9	1
Lyonia ferruginea	0.47	2.7	.167	6.0	8.7	8
Quercus v. var. maritima	0.87	5.0	.267	9.6	14.6	5
Euphorbia polyphylla	0.40	2.3	.067	2.4	4.7	10
Andropogon virginicus	0.13	0.7	.067	2.4	3.1	13
Aristida stricta	0.27	1.5	.067	2.4	3.9	11
Palafoxia integrifolia	0.20	1.1	.100	3.6	4.7	10
Serenoa repens	0.47	2.7	.200	7.2	9.9	7
Liatris tenuifolia	0.20	1.1	.067	2.4	3.5	12
Quercus chapmanii	1.40	8.0	.233	8.4	16.4	3
Panicum nitidum	1.33	7.6	.067	2.4	10.0	6
Galactia elliottii	1.33	7.6	.067	2.4	10.0	6
Heterotheca graminifolia	0.07	0.4	.033	1.2	1.6	14
Rhynchospora megalocarpa	0.07	0.4	.033	1.2	1.6	14
Licania michauxii	0.07	0.4	.033	1.2	1.6	14
Smilax auriculata	0.07	0.4	.033	1.2	1.6	14

Table 53. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Route 50 Scrub, November, 1977.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus chapmanii	21.46	.267	11.1	10.8	21.9	4
Lyonia ferruginea	39.74	.500	20.8	20.0	40.8	2
Quercus myrtifolia	86.04	.900	37.5	43.3	80.8	1
Serenoa repens	29.81	.433	18.1	15.0	33.1	3
Osmanthus americanus	1.59	.033	1.4	0.8	2.2	8
Ceratiola ericoides	3.38	.067	2.8	1.7	4.5	6
Quercus v. var. *maritima*	9.94	.133	5.6	5.0	10.6	5
Lyonia lucida	4.97	.033	1.4	2.5	3.9	7
Vaccinium myrsinites	1.59	.033	1.4	0.8	2.2	8

Table 54.. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (>2.54cm dbh) on Route 50 Scrub, November, 1977.

Species	No. per $100m^2$	Frequency	Basal Area(cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Lyonia ferruginea	1.44	.600	13.95	17.5	20.0	3.9	41.4	5
Quercus v. var. *maritima*	1.85	.600	55.01	22.5	20.0	15.5	58.0	3
Quercus chapmanii	1.51	.567	21.54	18.3	18.9	6.1	43.3	4
Quercus myrtifolia	2.27	.767	27.10	27.5	25.6	7.6	60.7	2
Pinus clausa	1.17	.467	238.29	14.2	15.6	67.0	96.8	1

Table 55. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Route 405 Sandpine Scrub, April, 1978. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Quercus virginiana var. maritima	1.33	8.1	.100	6.7	14.8	4
Quercus myrtifolia	11.13	67.6	.933	62.2	129.8	1
Vaccinium stamineum	0.33	2.0	.067	4.5	6.5	6
Lyonia ferruginea	0.87	5.3	.167	11.1	16.4	3
Quercus chapmanii	1.80	10.9	.167	11.1	22.0	2
unknown	0.73	4.5	.033	2.2	6.7	5
Licania michauxii	0.27	1.6	.033	2.2	3.8	7

Table 56. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Route 405 Scrub, April, 1978.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus virginiana var. maritima	20.28	.133	7.3	6.7	14.0	3
Quercus myrtifolia	166.45	.767	41.8	55.0	96.8	1
Serenoa repens	7.57	.067	3.6	2.5	6.1	6
Vaccinium stamineum	12.71	.100	5.5	4.2	9.7	4
Pinus clausa	9.99	.100	5.5	3.3	8.8	5
Quercus chapmanii	37.83	.267	14.5	12.5	27.0	2
Lyonia ferruginea	37.83	.267	14.5	12.5	27.0	2
Carya floridana	5.14	.067	3.6	1.7	5.3	7
Ximenia americana	5.14	.067	3.6	1.7	5.3	7

Table 57. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (> 2.54cm dbh) on Route 405 Scrub, April, 1978.

Species	No. per $100m^2$	Frequency	Basal Area (cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Pinus clausa	24.87	1.000	1860.8	82.5	65.2	95.6	243.3	1
Carya floridana	1.27	.100	49.1	4.2	6.5	2.5	13.2	4
Lyonia ferruginea	1.75	.167	15.0	5.8	10.9	.8	17.5	2
Quercus chapmanii	1.27	.133	9.1	4.2	8.7	.5	13.4	3
Quercus myrtifolia	0.75	.100	11.4	2.5	6.5	.6	9.6	5
Quercus virginiana var. maritima	0.24	.033	1.9	0.8	2.2	.1	3.1	6

Table 58. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Rockledge Scrub, November, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Quercus chapmanii	0.87	6.9	.300	12.3	19.2	3
Panicum sp.	0.13	1.0	.067	2.8	3.8	8
unk. grass	0.13	1.0	.067	2.8	3.8	8
Quercus virginiana var. virginiana	4.33	34.6	.700	28.8	63.4	1
Ximenia americana	0.13	1.0	.067	2.8	3.8	8
Lyonia ferruginea	1.33	10.6	.100	4.1	14.7	4
Palafoxia integrifolia	0.07	0.6	.033	1.4	2.0	9
Serenoa repens	0.20	1.6	.100	4.1	5.7	6
Quercus myrtifolia	3.47	27.7	.500	20.6	48.3	2
unk. sedge	0.60	4.8	.133	5.5	10.3	5
Lyonia lucida	0.33	2.6	.067	2.8	5.4	7
Pinus clausa	0.60	4.8	.133	5.5	10.3	5
Vitis rotundifolia	0.07	0.6	.033	1.4	2.0	9
Smilax auriculata	0.20	1.6	.100	4.1	5.7	6
Galactia elliottii	0.07	0.6	.033	1.4	2.0	9

Table 59. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Rockledge Scrub, November, 1978.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus chapmanii	24.88	.267	11.9	11.7	23.6	3
Quercus myrtifolia	74.43	.633	28.4	35.0	63.4	1
Myrica cerifera	1.70	.033	1.5	0.8	2.3	9
Quercus virginiana var. *virginiana*	63.80	.600	26.9	30.0	56.9	2
Serenoa repens	15.95	.233	10.4	7.5	17.9	4
Lyonia ferruginea	15.95	.200	9.0	7.5	16.5	5
Ximenia americana	7.02	.133	6.0	3.3	9.3	6
Lyonia lucida	5.32	.067	3.0	2.5	5.5	7
Carya floridana	3.62	.067	3.0	1.7	4.7	8

Table 60. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (2.54cm diam.) on Rockledge Scrub, November, 1978.

Species	No. per $100m^2$	Frequency	Basal Area(cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Pinus clausa	6.24	.933	2236.9	58.3	45.2	95.1	198.6	1
Quercus myrtifolia	1.07	.267	22.7	10.0	12.9	1.0	23.9	3
Carya floridana	1.16	.233	20.6	10.8	11.3	0.9	23.0	4
Quercus virginiana var. *virginiana*	1.96	.533	66.8	18.3	25.8	2.8	46.9	2
Quercus chapmanii	0.27	.100	4.1	2.5	4.8	0.2	7.5	5

Table 61. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Wekiva Sand Pine Scrub, December, 1978. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Quercus myrtifolia	3.60	29.2	.567	19.3	48.5	1
Quercus chapmanii	1.00	8.1	.333	11.4	19.5	4
Quercus virginiana var. maritima	1.60	13.0	.233	7.9	20.9	3
sedge	1.60	13.0	.467	15.9	18.9	5
Smilax auriculata	2.20	17.8	.533	18.2	36.0	2
Ilex ambigua	0.13	1.1	.033	1.1	2.2	11
Lyonia ferruginea	0.13	1.1	.067	2.3	3.4	10
Garbaria heterophylla	0.07	0.6	.033	1.1	1.7	12
unk. Legume	0.80	6.5	.300	10.2	16.7	6
Panicum sp.	0.13	1.1	.067	2.3	3.4	10
Gaylussacia frondosa	0.33	2.7	.100	3.4	6.1	7
Pinus clausa	0.20	1.6	.100	3.4	5.0	8
Gaylussacia dumosa	0.07	0.6	.033	1.1	1.7	12
unk. vine Legume	0.07	0.6	.033	1.1	1.7	12
Licania michauxii	0.40	3.2	.033	1.1	4.3	9

Table 62. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Wekiva Sand Pine Scrub, December, 1978.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Vaccinium stamineum	2.50	.067	2.7	1.7	4.4	8
Quercus chapmanii	22.10	.467	18.7	15.0	33.7	3
Quercus myrtifolia	72.48	.867	34.7	49.2	83.9	1
Serenoa repens	23.27	.500	20.0	15.8	35.8	2
Quercus virginiana var. *maritima*	7.37	.200	8.0	5.0	13.0	4
Ilex ambigua	3.68	.067	2.7	2.5	5.2	7
Unknown shrub	1.18	.033	1.3	0.8	2.1	9
Garbaria heterophylla	7.37	.167	6.7	5.0	11.7	5
Lyonia ferruginea	6.19	.100	4.0	4.2	8.2	6
Pinus clausa	1.18	.033	1.3	0.8	2.1	9

Table 63. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (>2.54cm dbh) on Wekiva Sand Pine Scrub, (December, 1978).

Species	No. per $100m^2$	Frequency	Basal Area(cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Quercus chapmanii	3.96	.600	72.51	24.2	25.4	3.8	53.4	3
Quercus virginiana var. maritima	1.92	.333	163.80	11.7	14.1	8.6	34.4	4
Quercus myrtifolia	7.09	.833	234.75	43.3	35.2	12.3	90.8	2
Pinus clausa	2.18	.333	1394.85	13.3	14.1	73.4	100.8	1
Lyonia ferruginea	1.10	.233	34.11	6.7	9.9	1.8	18.4	5
Ilex ambigua	0.13	.033	1.04	0.8	1.4	0.1	2.3	6

Table 64. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on the Dune Scrub, fall, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Quercus virginiana var. maritima	3.87	27.4	53.3	20.7	48.1	2
Quercus myrtifolia	5.07	35.8	73.3	28.5	64.3	1
Quercus chapmanii	0.47	3.3	13.3	5.2	8.5	7
Ximenia americana	0.40	2.8	16.7	6.5	9.3	6
Licania michauxii	1.00	7.1	6.7	2.6	9.7	5
Lyonia ferruginea	2.00	14.1	26.7	10.4	24.5	4
Vaccinium myrsinites	1.20	8.5	60.0	23.3	31.8	3
Serenoa repens	0.13	0.9	6.7	2.6	3.5	8

Table 65. Density, frequency, relative frequency, relative density, and importance values (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Dune Scrub, October, 1977.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus myrtifolia	83.83	.667	24.1	28.3	52.4	2
Lyonia ferruginea	41.92	.400	14.5	14.2	28.7	4
Serenoa repens	56.89	.600	21.7	19.2	40.9	3
Ceratiola ericoides	83.83	.700	25.3	28.3	53.6	1
Quercus virginiana var. maritima	23.95	.300	10.8	7.5	18.3	5
Quercus chapmanii	5.99	.067	2.4	1.7	4.1	6
Ximenia americana	2.40	.033	1.2	0.8	2.0	7

Table 66. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Happy Creek Scrub, June, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Lyonia lucida	2.67	6.9	.367	6.4	13.3	6
Gaylussacia dumosa	9.27	24.1	.833	14.5	38.6	2
Quercus myrtifolia	9.87	25.7	.867	15.1	40.8	1
Vaccinium myrsinites	4.53	11.8	.733	12.8	24.6	3
Myrica cerifera var. *pumila*	0.87	2.3	.233	4.1	6.4	9
Quercus v. var. *maritima*	3.27	8.5	.700	12.2	20.7	4
Aristida stricta	2.40	6.2	.667	11.6	17.8	5
Befaria racemosa	0.20	0.5	.067	1.2	1.7	12
Smilax auriculata	0.07	0.2	.033	0.6	0.8	16
Serenoa repens	0.13	0.3	.067	1.2	1.5	14
Lyonia fruticosa	1.53	4.0	.300	5.2	9.2	7
Carphephorus corymbosus	0.07	0.2	.033	0.6	0.8	16
Vaccinium stamineum var. *caesium*	0.20	0.5	.067	1.1	1.6	13
Galactia elliottii	1.13	2.9	.300	5.2	8.1	8
Panicum patentifolium	0.27	0.7	.133	2.3	3.0	11
Rhynchospora megalocarpa	0.07	0.2	.033	0.6	0.8	16
Licania michauxii	0.27	0.7	.133	2.3	3.0	11
Quercus chapmanii	1.40	3.6	.133	2.3	5.9	10
Lyonia ferruginea	0.20	0.5	.033	0.6	1.1	15

Table 67. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Happy Creek Scrub, June, 1977.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus myrtifolia	179.82	.800	31.2	39.2	70.4	1
Quercus chapmanii	42.20	.267	10.4	9.2	19.6	5
Quercus v. var. *maritima*	49.54	.300	11.7	10.8	22.5	4
Lyonia lucida	68.81	.367	14.3	15.0	29.3	3
Serenoa repens	88.07	.567	22.1	19.2	41.3	2
Myrica cerifera var. *pumila*	7.80	.067	2.6	1.7	4.3	7
Befaria racemosa	7.80	.067	2.6	1.7	4.3	7
Lyonia ferruginea	15.14	.133	5.2	3.3	8.5	6

Table 68. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Route 3 Scrub, fall, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Quercus myrtifolia	10.20	29.9	.900	17.2	46.4	1
Gaylussacia dumosa	4.00	11.7	.600	11.5	23.2	4
Myrica cerifera var. pumila	2.60	7.6	.533	10.2	17.8	5
Galactia elliottii	1.13	3.3	.367	7.0	10.3	7
Vaccinium myrsinites	6.80	20.0	.900	17.2	37.2	2
Quercus v. var. maritima	3.60	10.6	.700	13.4	24.0	3
Aristida spiciformis	0.80	2.3	.267	5.1	7.4	8
Rhynchospora megalocarpa	0.33	1.0	.133	2.5	3.5	10
Panicum nitidum	0.07	0.2	.033	0.6	0.8	15
Lyonia lucida	0.13	0.4	.067	1.3	1.7	13
Lyonia ferruginea	0.33	1.0	.033	0.6	1.6	14
Liatris tenuifolia	0.20	0.6	.100	1.9	2.5	11
Quercus chapmanii	2.20	6.5	.367	7.0	13.5	6
Befaria racemosa	0.27	0.8	.067	1.3	2.1	12
Licania michauxii	1.20	3.5	.067	1.3	4.8	9
Serenoa repens	0.07	0.2	.033	0.6	0.8	15
Vaccinium stamineum var. caesium	0.07	0.2	.033	0.6	0.8	15
Smilax auriculata	0.07	0.2	.033	0.6	0.8	15

Table 69.. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Route 3 Scrub, November, 1977.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus myrtifolia	198.34	.733	29.7	42.5	72.2	1
Quercus virginiana var. *maritima*	50.74	.300	12.2	10.8	23.0	4
Quercus chapmanii	46.12	.367	14.9	10.0	24.9	3
Serenoa repens	87.64	.533	21.6	19.2	40.8	2
Myrica cerifera var. *pumila*	18.45	.167	6.8	4.2	11.0	5
Lyonia ferruginea	18.45	.100	4.1	4.2	8.3	7
Vaccinium stamineum var. *caesium*	3.69	.033	1.3	0.8	2.1	9
Befaria racemosa	13.84	.100	4.1	3.3	7.4	8
Lyonia lucida	23.06	.133	5.4	5.0	10.4	6

Table 70. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Wind Tower Scrub, July, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Gaylussacia dumosa	29.87	47.7	.800	16.2	63.9	1
Quercus myrtifolia	14.00	22.4	.633	12.8	35.2	2
Quercus v. var. maritima	1.73	2.8	.433	8.8	11.6	6
Vaccinium myrsinites	2.40	3.8	.500	10.1	13.9	4
Rhynchospora megalocarpa	0.20	0.3	.100	2.0	2.3	13
Smilax auriculata	0.07	0.1	.033	0.7	0.8	18
Aristida stricta	0.87	1.4	.300	6.1	7.5	8
Lyonia lucida	3.20	5.1	.500	10.1	15.2	3
Pteridium aquilinum	0.07	0.1	.033	0.7	0.8	18
Quercus chapmanii	3.93	6.3	.367	7.4	13.7	5
Andropogon virginicus	0.13	0.2	.067	1.4	1.6	15
Satureja rigida	0.07	0.1	.033	0.7	0.8	18
Bulbostylis ciliatifolia	0.33	0.5	.100	2.0	2.5	12
Ximenia americana	0.07	0.1	.033	0.7	0.8	18
Vaccinium stamineum	0.33	0.5	.033	0.7	1.2	16
Befaria racemosa	0.33	0.5	.133	2.7	3.2	10
Lyonia fruticosa	3.00	4.8	.300	6.1	10.9	7
Panicum patentifolium	0.33	0.5	.133	2.7	3.2	10
Liatris tenuifolia var. laevigata	0.40	0.6	.100	2.0	2.6	11
Myrica cerifera	0.53	0.8	.167	3.4	4.2	9
Hypericum reductum	0.13	0.2	.033	0.7	0.9	17
Paronychia americana	0.07	0.1	.033	0.7	0.8	18
Lachnocaulon minus	0.53	0.8	.067	1.4	2.2	14

Table 71. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Wind Tower Scrub, July, 1977.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus myrtifolia	185.97	.600	24.0	34.2	58.2	1
Quercus v. var. maritima	72.32	.367	14.7	13.3	28.0	3
Lyonia lucida	63.62	.300	12.0	11.7	23.7	4
Quercus chapmanii	36.43	.233	9.3	6.7	16.0	6
Gaylussacia dumosa	9.24	.067	2.7	1.7	4.4	8
Lyonia ferruginea	22.84	.100	4.0	4.2	8.2	7
Befaria racemosa	45.13	.333	13.3	8.3	21.6	5
Serenoa repens	95.16	.400	16.0	17.5	33.5	2
Hypericum reductum	4.35	.033	1.3	0.8	2.1	9
Myrica cerifera	4.35	.033	1.3	0.8	2.1	9
Ximenia americana	4.35	.033	1.3	0.8	2.1	9

Table 72. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Rosemary Scrub, November, 1978. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Vaccinium myrsinites	5.07	42.9	.533	29.6	72.5	1
Quercus v. var. maritima	1.33	11.3	.333	18.5	29.8	3
Quercus myrtifolia	0.67	5.7	.167	9.3	15.0	4
Licania michauxii	0.07	0.6	.033	1.8	2.4	10
Quercus chapmanii	0.47	4.0	.133	7.4	11.4	6
Ximenia americana	0.40	3.4	.100	5.6	9.0	8
Galactia elliottii	0.13	1.1	.067	3.7	4.8	9
Serenoa repens	0.40	3.4	.133	7.4	10.8	7
Lyonia ferruginea	2.67	22.6	.133	7.4	30.0	2
Ceratiola ericoides	0.60	5.1	.167	9.3	14.4	5

Table 73. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Rosemary Scrub, November, 1978.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Quercus myrtifolia	15.12	.633	28.4	20.0	48.4	2
Ceratiola ericoides	44.76	.933	41.8	59.2	101.0	1
Serenoa repens	3.18	.133	6.0	4.2	10.2	4
Quercus v var. maritima	7.56	.333	14.9	10.0	24.9	3
Quercus chapmanii	1.89	.067	3.0	2.5	5.5	5
Ximenia americana	3.18	.133	6.0	4.2	10.2	4

Table 74. Density, relative density, frequency, relative frequency, and importance values (I.V. = relative density + relative frequency) of plants less than 50 cm in height on Complex 34 Coastal Scrub, December, 1977. Data are from 30 plots 0.5 m^2 in area.

Species	No. Per m^2	Relative Density	Frequency	Relative Frequency	I.V.	I.V. Rank
Quercus v. var. maritima	2.27	32.8	.467	36.9	69.7	1
Quercus virginiana var. virginiana	2.13	30.7	.100	7.9	38.6	2
Quercus myrtifolia	1.00	14.4	.200	15.8	30.2	3
Smilax auriculata	0.53	7.6	.267	21.0	28.6	5
Lyonia ferruginea	0.93	13.4	.200	15.8	29.2	4
Vitis rotundifolia	0.07	1.0	.033	2.6	3.6	6

Table 75. Density, frequency, relative frequency, relative density, and importance value (I.V. = relative frequency + relative density) for shrub species 50 cm or greater in height on Complex 34 Coastal Scrub, December, 1977.

Species	No. Per 100 m^2	Frequency	Relative Frequency	Relative Density	I.V.	I.V. Rank
Serenoa repens	70.56	1.000	57.7	80.0	137.7	1
Quercus virginiana var. virginiana	2.91	.133	7.7	3.3	11.0	4
Quercus myrtifolia	1.50	.067	3.8	1.7	5.5	5
Myrica cerifera	5.12	.167	9.6	5.8	15.4	3
Lyonia ferruginea	6.61	.300	17.3	7.5	24.8	2
Quercus v. var. maritima	1.50	.067	3.8	1.7	5.5	5

Table 76. Density, frequency, basal area, and importance values (I.V. = relative density + relative frequency + relative dominance) of tree species (>2.54cm dbh) on Complex 34 Coastal Scrub, (December, 1977).

Species	No. per $100m^2$	Frequency	Basal Area(cm^2) per $100m^2$	Relative Density	Relative Frequency	Relative Dominance	I.V.	I.V. Rank
Quercus virginiana var. virginiana	5.02	.267	306.0	16.7	14.8	22.7	54.2	3
Quercus v. var. maritima	9.53	.600	525.1	31.7	33.3	39.0	104.0	2
Quercus myrtifolia	13.52	.733	491.9	45.0	40.7	36.5	122.2	1
Lyonia ferruginea	2.01	.200	24.3	6.7	11.1	1.8	19.6	4

Table 77. Coverage, relative coverage, frequency, relative frequency and importance value of plants on the beach grid (Zone 1), summer, 1976. Values are based on 9 line transects each of which were 15 m in length.

Species	Absolute Frequency	Relative Frequency	Absolute Cover (cm)	Relative Cover	Importance Value
Heterotheca subaxillaris	88.8	10.5	1249.5	23.9	34.4
Uniola paniculata	100.0	11.8	667.0	12.7	23.8
Panicum amarulum	55.5	6.5	545.0	10.4	16.9
Atriplex arenaria	44.4	5.3	572.0	10.9	16.2
Andropogon virginicus	66.6	7.9	413.5	7.9	15.8
Canavalia rosea	22.2	2.6	254.5	4.9	7.5
Paspalum vaginatum	44.4	5.3	244.5	4.7	10.0
Ipomoea stolonifer	100.0	11.8	391.0	7.5	19.3
Ipomoea pes-caprae	44.4	5.3	200.5	3.8	9.1
Sesuvium maritima	33.3	3.9	243.5	4.7	8.6
Croton punctatus	44.4	5.3	213.0	4.1	9.4
Chloris petraea	33.3	3.9	83.0	1.6	5.5
Opuntia compressa	22.2	2.6	30.5	0.6	3.2
Spartina patens	11.1	1.3	40.5	0.8	2.1
Licania michauxii	11.1	1.3	20.0	0.4	1.7
Phyllanthus abnormis	22.2	2.6	14.0	0.3	2.9
Polygala grandiflora	22.2	2.6	9.0	0.2	2.8
Cnidoscolus stimulosus	11.1	1.3	9.0	0.2	1.5
Yucca aloifolia	11.1	1.3	6.0	0.1	1.4
Physalis viscosa ssp. maritima	11.1	1.3	6.0	0.1	1.4
Hydrocotyle bonariensis	11.1	1.3	5.0	0.1	1.4
Commelina diffusa	11.1	1.3	5.0	0.1	1.4
Bumelia tenax	11.1	1.3	4.0	0.1	1.4
Cakile fusiformis	11.1	1.3	4.0	0.1	1.4

Table 78. Coverage, relative coverage, frequency, relative frequency and importance value of plants on the beach grid (Zone 2), summer, 1976. Values are based on 6 line transects each of which were 15 m in length.

Species	Absolute Frequency	Relative Frequency	Absolute Cover (cm)	Relative Cover	Importance Value
Serenoa repens	83.3	14.7	1809.0	58.0	72.7
Coccoloba uvifera	83.3	14.7	540.0	17.0	31.7
Smilax auriculata	66.6	11.7	95.0	3.0	14.7
Heterotheca subaxillaris	50.0	8.8	99.5	3.0	11.8
Uniola paniculata	50.0	8.8	92.0	2.0	10.8
Opuntia compressa	50.0	8.8	80.0	2.0	10.8
Andropogon virginicus	33.3	5.9	32.0	1.0	6.9
Croton punctatus	16.6	3.0	122.0	7.0	10.0
Licania michauxii	16.6	3.0	139.0	4.0	7.0
Strophostyles helvola	16.6	3.0	51.0	1.0	4.0
Chiococca alba	16.6	3.0	15.0	0.9	3.9
Commelina diffusa	16.6	3.0	11.0	0.7	3.7
Polygala grandiflora	16.6	3.0	11.0	0.3	3.3
Cnidoscolus stimulosus	16.6	3.0	11.0	0.3	3.3
Chloris petraea	16.6	3.0	5.0	0.3	3.3
Chamaesyce maculata	16.6	3.0	4.0	0.2	3.2

Table 79. Coverage, relative coverage, frequency, relative frequency and Importance value of plants on the LC 39-B beach site (analogous to beach grid zone 1), summer, 1978. Values are based on 5 line transects each of which were 15 m in length.

Species	Absolute Frequency	Relative Frequency	Absolute Coverage (cm)	Relative Coverage	Importance Value
Uniola paniculata	100.0	13.8	2838	44.7	58.5
Heterotheca subaxillaris	20.0	2.7	59	0.9	3.6
Ipomoea stolonifer	60.0	8.3	119	1.8	10.1
Atriplex arenaria	80.0	11.1	1587	25.0	36.1
Spartina patens	80.0	11.1	200	3.1	14.2
Hydrocotyle bonariensis	40.0	5.5	95	1.5	7.0
Coccoloba uvifera	40.0	5.5	153	2.4	7.9
Croton punctatus	60.0	8.3	92	1.4	9.7
Panicum amarulum	20.0	2.7	8	0.1	2.8
Opuntia compressa	20.0	2.7	51	0.8	3.5
Lantana camara	20.0	2.7	180	2.8	5.5
Scaevola plumieri	20.0	2.7	35	0.5	3.2
Cenchrus incertus	20.0	2.7	50	0.8	3.5
Composite, unk.	100.0	13.8	847	13.3	27.1
Unk. I	20.0	2.7	10	0.1	2.8
Unk. II	20.0	2.7	16	0.2	2.9

Table 80. Coverage, relative coverage, frequency, relative frequency and importance value of plants on the beach grid (Zone 3), summer, 1976. Values are based on 6 line transects each of which were 15 m in length.

Species	Absolute Frequency	Relative Frequency	Absolute Cover (cm)	Relative Cover	Importance Value
Serenoa repens	100.0	20.0	6063.0	65.3	85.3
Myrica cerifera	100.0	20.0	754.0	8.1	28.1
Bumelia tenax	83.3	16.6	925.0	9.9	26.5
Myrcianthes fragrans	16.6	3.3	329.0	3.5	6.8
Chiococca alba	100.0	20.0	369.0	3.9	23.9
Cnidoscolus stimulosus	16.6	3.3	5.0	0.1	3.4
Coccoloba uvifera	50.0	10.0	753.0	8.1	18.1
Smilax auriculata	16.6	3.3	60.0	0.6	3.9
Licania michauxii	16.6	3.3	17.0	0.2	3.5

Table 81. Coverage, relative coverage, frequency, relative frequency and importance value of plants from coastal strand (analogous to Zone 3) on Cape Canaveral, 1977. Values are based on 5 line transects each of which were 15 m in length.

Species	Absolute Frequency	Relative Frequency	Absolute Coverage (cm)	Relative Coverage	Importance Value
Serenoa repens	100.0	23.8	6044.0	64.5	88.3
Myrcianthes fragrans	100.0	23.8	2343.0	25.0	48.8
Bumelia tenax	80.0	19.0	523.0	5.5	24.5
Myrica cerifera	60.0	14.3	217.0	2.3	16.6
Chiococca alba	60.0	14.3	77.0	0.8	15.1
Forestiera segregata	20.0	4.7	156.0	1.6	6.3

Table 82. Canopy coverage of woody plant species on permanent line transects in Happy Hammock, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Acer rubrum var. tridens	37	0	0	0	0	37	0.25
Psychotria nervosa	95	80	216	48	102	541	3.68
Psychotria sulzneri	0	0	0	6	0	6	0.00
Toxicodendron radicans	21	7	44	746	9	827	5.62
Myrcianthes fragrans	290	219	200	0	74	783	5.32
Myrsine guianensis	52	61	0	78	87	278	1.89
Morus rubra	396	729	709	313	935	3082	20.97
Sabal palmetto	1434	1298	633	1500	600	5465	37.19
Nectandra coriacea	0	205	333	82	193	813	5.53
Quercus virginiana	0	14	1647	10	0	1671	11.37
Ulmus americana var. floridanus	0	4	0	0	414	418	2.84
Ilex vomitoria	0	288	0	0	0	288	1.95
Celtis laevigata	0	0	0	0	288	288	1.95
Unk. Legume	0	0	0	0	192	192	1.30
Vitis sp.	0	0	5	0	0	5	0.00

Table 33. Canopy coverage of woody plant species on permanent line transects in Route 3 Hammock, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Sabal palmetto	1374	2100	1696	401	955	6526	40.22
Toxicodendron radicans	459	0	170	0	0	629	3.87
Ulmus americana var. *floridana*	821	192	299	62	0	1374	8.46
Psychotria nervosa	0	0	0	106	18	124	0.76
Celtis laevigata	284	317	0	0	0	601	3.70
Vitis sp.	90	0	0	200	478	768	4.73
Quercus virginiana	0	380	0	1442	1262	3084	19.00
Smilax bona-nox	0	88	0	6	0	94	0.57
Psychotria sulzneria	0	15	18	128	30	191	1.17
Unknown Woody Vine	0	63	0	0	0	63	0.38
Persea palustris	0	200	512	0	0	712	4.38
Myrcianthes fragrans	0	0	57	68	26	151	0.93

Table 33. Canopy coverage of woody plant species on permanent line transects in Route 3 Hammock, 1978. Each transect is 15 m in length. (Continued.)

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Myrica cerifera	0	0	67	0	0	67	0.41
Rubus trivialis	0	235	0	6	0	241	1.48
Prunus caroliniana	0	0	0	392	680	1072	6.60
Morus rubra	0	0	0	90	325	415	2.55
Parthenocissus quinquefolia	0	0	0	0	113	113	0.69

Table 84. Canopy coverage of woody plant species on permanent line transects in Juniper Hammock, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect 1	2	3	4	5	Total	Percent Composition
Toxicodendron radicans	0	23	16	0	0	39	0.24
Sabal palmetto	629	701	753	777	160	3020	18.70
Ilex vomitoria	65	726	854	572	673	2890	17.89
Serenoa repens	0	43	157	381	767	1348	8.34
Quercus virginiana	0	1368	0	0	1289	2657	16.45
Juniperus silicicola	820	283	200	679	0	1982	12.27
Persea palustris	13	0	0	0	0	13	0.08
Carya glabra	690	0	1110	0	0	1800	11.14
Parthenocissus quinquefolia	70	0	0	0	0	70	0.43
Carya aquatica	510	0	0	828	0	1338	8.28
Ulmus americana var. floridanus	576	0	0	0	0	576	3.56
Vitis rotundifolia	0	0	100	20	194	314	1.94
Smilax bona-nox	0	0	0	4	0	4	0.02
Callicarpa americana	0	0	0	0	69	69	0.42
Erythrina herbacea	0	0	0	0	28	28	0.17

Table 85. Canopy coverage of woody plant species on permanent line transects in Volusia Pine Flatwoods, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Pinus elliottii var. densa	90	950	210	550	0	1800	21.67
Quercus chapmani	243	103	0	0	0	346	4.16
Quercus myrtifolia	234	925	534	495	0	2188	26.34
Quercus geminata	0	0	407	0	15	422	5.08
Serenoa repens	770	171	375	482	580	2378	28.63
Lyonia lucida	72	80	16	92	404	664	7.99
Lyonia fruticosa	0	0	27	0	16	43	0.51
Smilax auriculata	25	0	0	178	4	207	2.49
Licania michauxii	0	33	0	0	0	33	0.39
Asiminia reticulata	0	0	7	0	0	7	0.08
Befaria racemosa	0	0	0	217	0	217	2.61

Table 86. Canopy coverage of woody plant species on permanent line transects in Headquarters Pineland, 1977. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Serenoa repens	488	501	1085	–[a]	–	2074	39.58
Lyonia lucida	183	471	0	–	–	654	12.48
Lyonia fruticosa	112	0	52	–	–	164	3.12
Quercus virginiana var. *maritima*	728	446	159	–	–	1333	25.43
Quercus myrtifolia	124	66	0	–	–	190	3.62
Quercus chapmanii	40	10	20	–	–	70	1.33
Befaria racemosa	43	135	41	–	–	219	4.17
Asimina reticulata	33	0	0	–	–	33	0.62
Myrica cerifera var. *pumila*	105	45	146	–	–	296	5.64
Vaccinium myrsinites	0	14	16	–	–	30	0.57
Smilax auriculata	0	92	0	–	–	92	1.75
Ximenia americana	0	9	0	–	–	9	0.17
Vitis rotundifolia	0	0	6	–	–	6	0.11
Satureja rigida	0	0	16	–	–	16	0.30
Pinus elliottii var. *densa*	0[b]	0	54	–	–	54	1.03

[a]Lines 4 and 5 were not added until 1978.

[b]Only canopy coverage of seedlings was measured in 1977.

Table 87. Canopy coverage of woody plant species on permanent line transects in Headquarters Pineland, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Serenoa repens	762	481	918	428	443	3032	27.03
Lyonia lucida	260	611	79	396	789	2135	19.03
Lyonia fruticosa	83	36	71	158	53	401	3.57
Quercus virginiana var. *maritima*	945	486	98	823	179	2531	22.56
Quercus myrtifolia	93	13	0	0	0	106	0.94
Quercus chapmanii	74	34	20	0	0	128	1.14
Befaria racemosa	114	165	0	28	191	498	4.44
Asimina reticulata	0	0	20	10	0	30	0.26
Myrica cerifera var. *pumila*	60	38	89	44	81	312	2.78
Vaccinium myrsinites	5	17	16	59	43	140	1.24
Smilax auriculata	0	56	128	66	0	250	2.22
Vitis rotundifolia	0	13	0	58	312	383	3.41
Pinus elliottii var. *densa*[a]	360	700	0	0	200	1260	11.23
Gaylussacia dumosa	0	0	0	10	0	10	0.00
Ximenia americana[b]	0	0	0	0	0	0	-
Satureja rigida[b]	0	0	0	0	0	0	-

[a] Canopy coverage not measured in 1977.

[b] Found on transects in 1977.

Table 88. Canopy coverage of woody plant species on permanent line transects at Wisconsin Village Grid, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Serenoa repens	783	451	225	706	194	2359	31.26
Lyonia lucida	684	707	699	493	752	3335	44.19
Lyonia fruticosa	0	0	16	11	51	78	1.03
Quercus minima	71	27	230	19	108	455	6.02
Vaccinium myrsinites	28	19	58	16	7	128	1.69
Ilex glabra	126	0	190	0	0	316	4.18
Hypericum reductum	7	30	0	18	23	78	1.03
Gaylussacia dumosa	0	25	32	22	32	111	1.47
Befaria racemosa	0	64	8	0	0	72	0.95
Myrica cerifera var. pumila	0	0	228	57	270	555	7.35
Asiminia reticulata	0	0	0	8	12	20	0.26
Quercus myrtifolia	0	0	0	0	39	39	0.51

Table 89. Canopy coverage of woody plant species on permanent line transects on the Dune Scrub, 1977. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect 1	2	3	4	5	Total	Percent Composition
Lyonia ferruginea	462	778	127	–[a]	–	1367	21.92
Serenoa repens	404	271	283	–	–	958	15.36
Ceratiola ericoides	267	5	759	–	–	1031	16.53
Quercus virginiana var. maritima	546	53	135	–	–	734	11.77
Quercus myrtifolia	477	919	102	–	–	1498	24.02
Quercus chapmanii	8	91	0	–	–	99	1.58
Vaccinium myrsinites	79	0	0	–	–	79	1.26
Myrica cerifera	10	0	0	–	–	10	0.16
Ximenia americana	59	96	300	–	–	455	7.29
Smilax auriculata	0	5	0	–	–	5	0.08

[a]Lines 4 and 5 were not added until 1978.

Table 90. Canopy coverage of woody plant species on permanent line transects on the Dune Scrub, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Lyonia ferruginea	481	915	107	135	0	1638	15.62
Serenoa repens	375	140	372	172	75	1134	10.81
Ceratiola ericoides	357	45	881	638	842	2763	26.36
Quercus virginiana var. maritima	647	167	120	553	100	1587	15.14
Quercus myrtifolia	391	1144	99	151	874	2659	25.36
Quercus chapmanii	0	0	0	0	98	98	0.93
Vaccinium myrsinites	66	10	0	9	0	85	0.81
Myrica cerifera	0	0	0	0	0	0	0.00
Ximenia americana	18	65	221	143	64	511	4.87
Smilax auriculata	0	6	0	0	0	6	0.05

Table 91. Canopy coverage of woody plant species on permanent line transects on the Happy Creek Scrub, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Lyonia ferruginea	214	0	0	0	0	214	2.18
Lyonia fruticosa	0	0	64	184	0	248	2.53
Quercus myrtifolia	643	994	1099	1673	1180	5589	57.05
Quercus chapmanii	46	127	42	164	166	545	5.56
Quercus virginiana var. *maritima*	10	201	367	71	62	711	7.25
Quercus minima	0	0	0	0	30	30	0.31
Myrica pusilla	32	163	5	0	26	226	2.30
Serenoa repens	614	390	322	222	434	1982	20.23
Ximenia americana	34	0	0	0	0	34	0.34
Licania michauxii	5	10	26	74	0	115	1.17
Gaylussacia dumosa	0	10	0	0	0	10	0.10
Smilax auriculata	0	5	0	0	0	5	0.05
Vaccinium myrsinites	0	0	30	22	0	52	0.53
Vaccinium stamineum var. *caesium*	0	0	0	34	0	34	0.34

Table 92. Canopy coverage of woody plant species on permanent line transects on the 39B Scrub, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Quercus myrtifolia	815	706	727	553	1073	3874	37.32
Quercus virginiana var. *maritima*	173	92	217	96	23	601	5.79
Quercus chapmanii	140	133	74	226	88	661	6.36
Quercus minima	0	0	12	0	0	12	0.11
Serenoa repens	448	796	674	758	303	2979	28.70
Befaria racemosa	39	85	145	161	23	453	4.36
Lyonia lucida	426	62	380	98	104	1070	10.31
Lyonia fruticosa	12	40	0	47	0	99	0.95
Lyonia Ferruginea	0	0	0	0	196	196	1.88
Gaylussacia dumosa	30	140	7	26	25	228	2.19
Myrica cerifera	56	0	39	14	5	114	1.09
Vaccinium mysinites	20	8	0	9	30	67	0.64
Smilax auriculata	0	0	2	0	0	2	0.01
Ilex glabra	0	0	10	0	0	10	0.09
Hypericum reductum	0	0	0	0	13	13	0.12

Table 93. Canopy coverage of plants on permanent line transects on the Beach Grid, 1977. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Heterotheca subaxillaris	159	72	0	-[a]	-	231	8.98
Sporobolus virginicus	2	0	0	-	-	2	0.07
Andropogon virginicus	173	0	0	-	-	173	6.72
Croton punctatus	13	0	0	-	-	13	0.50
Uniola paniculata	74	13	0	-	-	87	3.38
Canavalia rosea	62	0	0	-	-	62	2.41
Atriplex arenaria	81	0	0	-	-	81	3.15
Panicum amarulum	17	0	0	-	-	17	0.66
Chloris petraea	91	0	0	-	-	91	3.54
Ipomoea stolonifera	14	0	0	-	-	14	0.54
Ipomoea pes-caprae	0	0	0	-	-	0	0.00
Opuntia compressa	0	7	14	-	-	21	0.81
Serenoa repens	0	333	712	-	-	1045	40.64
Spartina patens	0	12	0	-	-	12	0.46
Myrica cerifera	0	0	365	-	-	365	14.19
Coccoloba uvifera	0	0	140	-	-	140	5.44
Licania michauxii	0	0	217	-	-	217	8.44

[a]Lines 4 and 5 were not added until 1978.

Table 94. Canopy coverage of plants on permanent line transects on the Beach Grid, 1978. Each transect is 15 m in length.

Species	Coverage (cm) Per Transect					Total	Percent Composition
	1	2	3	4	5		
Heterotheca subaxillaris	539	284	10	268	0	1101	17.87
Sporobolus virginicus	3	0	0	0	0	3	0.04
Andropogon virginicus	152	0	0	49	0	201	3.26
Croton punctatus	0	0	0	48	0	48	0.78
Uniola paniculata	119	10	0	658	0	787	12.78
Canavalia rosea	0	0	0	0	0	0	0.00
Atriplex arenaria	94	0	0	0	0	94	1.52
Panicum amarulum	30	0	0	15	0	45	0.73
Chloris petraea	74	0	0	0	0	74	1.20
Ipomoea stolonifera	31	0	0	40	0	71	1.15
Ipomoea pes-caprae	13	0	0	0	0	13	0.21
Opuntia compressa	0	0	0	0	0	0	0.00
Serenoa repens	0	727	633	0	883	2243	36.42
Spartina patens	0	0	0	0	0	0	0.00
Myrica cerifera	0	0	538	0	235	773	12.55
Coccoloba uvifera	0	0	108	151	134	393	6.38
Licania michauxii	0	0	290	0	0	290	4.71
Unknown Legume	0	2	0	0	0	2	0.03
Mikania cordifolia	0	0	8	0	0	8	0.12
Smilax auriculata	0	0	8	0	0	8	0.12
Hydrocotyle bonariensis	0	0	0	4	0	4	0.06

APPENDIX TABLES

SMALL MAMMAL POPULATIONS

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida.

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Arata, 1959	PP, PF, SH				X	
Baker, 1968	P.spp				X	
Barrington, 1949	ON, PG				X	X
Bigler and Jenkins, 1975	PG, SH			X		X
Bigler _et al_., 1977	SH					X
Birney _et al_., 1975	SH		X			
Bishopp and Trembley, 1945	All but ON			X		
Blair, 1935	PG			X	X	
Blair, 1942	P.spp	X				
Blair, 1946	PP					X
Blair, 1951	PP	X	X		X	X

*PP = _Peromyscus polionotus_, PG = _P. gossypinus_, PF = _P. floridanus_, ON = _Ochrotomys nuttalli_, SH = _Sigmodon hispidus_, RR = _Rattus rattus_, P.spp = various _Peromyscus_ species plus in many cases with _Ochrotomys_ information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Blair and Kilby, 1936	PF		X			
Blair <u>et</u> <u>al</u>., 1968	All	X				
Bowen, 1968	PP	X			X	
Bowen and Dawson, 1977	PP	X				
Briese and Smith, 1974	PP					X
Caldwell, 1964	PP				X	
Calhoun, 1945	SH		X			
Cameron, 1977	SH					X
Carmon <u>et</u> <u>al</u>., 1963	PP	X	X			
Carmon <u>et</u> <u>al</u>., 1967	PP		X			
Chipman, 1965	SH		X			

*PP = <u>Peromyscus polionotus</u>, PG = <u>P. gossypinus</u>, PF = <u>P. floridanus</u>, ON = <u>Ochrotomys nuttalli</u>, SH = <u>Sigmodon hispidus</u>, RR = <u>Rattus rattus</u>, P.spp = various <u>Peromyscus</u> species plus in many cases with <u>Ochrotomys</u> information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Chipman, 1966	SH		X			X
Davenport, 1964	PP		X			X
Dawson, 1973	SH		X			
Dewsbury, 1972	SH		X			
Dunaway and Kaye, 1961	SH		X			X
Ehrhart, 1976	All but PP	X				X
Eisenberg, 1963	P.spp		X			
Erickson, 1949	SH, PG					X
Falls, 1968			X			
Fertig and Layne, 1963	PF		X		X	
Fleharty and Olson, 1969	SH				X	

*PP = Peromyscus polionotus, PG = P. gossypinus, PF = P. floridanus, ON = Ochrotomys nuttalli, SH = Sigmodon hispidus, RR = Rattus rattus, P.spp = various Peromyscus species plus in many cases with Ochrotomys information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Fleharty and Mares, 1973	SH				X	X
French et al., 1975	All but PF					X
Garten, 1976	PP		X			
Garten and Smith, 1974	PP					X
Gentry, 1964	PP		X			
Gentry, 1966	PP				X	X
Gentry and Odum, 1957	PP		X			X
Gentry and Smith, 1968	PP	X			X	
Gentry et al., 1971	PG, ON					X
Gentry et al., 1975	PP, SH		X			
Goertz, 1964	SH				X	X

*PP = Peromyscus polionotus, PG = P. gossypinus, PF = P. floridanus, ON = Ochrotomys nuttalli, SH = Sigmodon hispidus, RR = Rattus rattus, P.spp = various Peromyscus species plus in many cases with Ochrotomys information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Goertz, 1965	SH		X			X
Golley, 1961	SH				X	
Golley *et al*., 1966	PP		X			
Golley *et al*., 1968	PP		X			
Haines, 1961	SH		X			X
Haines, 1963	SH					X
Haines, 1971	SH					X
Hall and Kelson, 1959	All	X				
Hamilton, 1941	SH, RR	X				
Harkema and Kartman, 1948	SH			X		
Hayne, 1936	PP		X			

*PP = *Peromyscus polionotus*, PG = *P. gossypinus*, PF = *P. floridanus*, ON = *Ochrotomys nuttalli*, SH = *Sigmodon hispidus*, RR = *Rattus rattus*, P.spp = various *Peromyscus* species plus in many cases with *Ochrotomys* information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Hooper, 1968	P.spp	X				
Hooper and Musser, 1964	P.spp	X				
Howell, 1954	ON, SH, RR				X	X
Ivey, 1949	PP, PG, ON		X		X	
Jackson, 1963	P.spp		X			
Kaufman, 1974	PP	X				
Kaufman and Kaufman, 1973	PP		X			
Kilgore, 1970	SH		X			
King, 1968	P.spp		X			
Kirkpatrick, 1965	SH		X			
Layne, 1963				X		

*PP = Peromyscus polionotus, PG = P. gossypinus, PF = P. floridanus, ON = Ochrotomys nuttalli, SH = Sigmodon hispidus, RR = Rattus rattus, P.spp = various Peromyscus species plus in many cases with Ochrotomys information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Layne, 1966	PF		X			
Layne, 1967	PF, PG, SH			X		
Layne, 1968	P.spp		X			
Layne, 1969	PF, PG		X			
Layne, 1970	PF, PG		X		X	
Layne, 1971	All			X		
Layne, 1974	SH, PG	X	X			X
Layne and Ehrhart, 1970	PF, PG, PP		X		X	
Layne and Griffo, 1961	PF			X		
Lee, 1968	PP, PF	X				
Linzey and Packard, 1977	ON	X	X	X	X	X

*PP = Peromyscus polionotus, PG = P. gossypinus, PF = P. floridanus, ON = Ochrotomys nuttalli, SH = Sigmodon hispidus, RR = Rattus rattus, P.spp = various Peromyscus species plus in many cases with Ochrotomys information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
McCarley, 1954	PG					X
McCarley, 1959a	PG, ON				X	X
McCarley, 1959b	PG, ON		X			X
McCarley, 1963	PG	X			X	
McClenaghan and Gaines, 1976	SH					X
Moore, 1965	PP	X	X			
Neill, 1957	PG, PF	X			X	
Odum, 1955	SH				X	X
Odum *et al*., 1962	PP		X			
O'Farrell and Kaufman, 1975	PP		X			
O'Farrell *et al*., 1977	PP, SH					X

*PP = *Peromyscus polionotus*, PG = *P. gossypinus*, PF = *P. floridanus*, ON = *Ochrotomys nuttalli*, SH = *Sigmodon hispidus*, RR = *Rattus rattus*, P.spp = various *Peromyscus* species plus in many cases with *Ochrotomys* information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Pearson, 1953	PG, ON			X	X	X
Pearson, 1954	PH, ON, SH				X	X
Peterson, 1973	SH				X	X
Pournelle, 1950	PH, ON, SH	X				
Pournelle, 1952	PG		X	X		X
Pournelle and Barrington, 1953	All but ON				X	
Pucek and Lowe, 1975	PP, SH		X			
Ramsey and Briese, 1971	SH				X	X
Rand and Host, 1942	All but ON		X		X	X
Raun and Wilks, 1964	SH				X	X
Roberts and Wolfe, 1974	SH		X	X		

*PP = *Peromyscus polionotus*, PG = *P. gossypinus*, PF = *P. floridanus*, ON = *Ochrotomys nuttalli*, SH = *Sigmodon hispidus*, RR = *Rattus rattus*, P.spp = various *Peromyscus* species plus in many cases with *Ochrotomys* information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Schnell, 1968	SH			X		
Schwartz, 1954	PP	X				
Sealander and Walker, 1955	SH		X	X	X	X
Sherman, 1936	P.spp	X			X	
Smith, 1964	PP, PG		X			
Smith, 1967a	PP	X				
Smith, 1967b	PP		X			
Smith, 1968a	PP					X
Smith, 1968b	PP					X
Smith and Blessing, 1969	PP				X	X
Smith and Criss, 1967	PP		X			

*PP = Peromyscus polionotus, PG = P. gossypinus, PF = P. floridanus, ON = Ochrotomys nuttalli

SH = Sigmodon hispidus, RR = Rattus rattus, P.spp = various Peromyscus species plus in many cases with Ochr)mys information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Smith *et al.*, 1972	PP	X				
Smith *et al.*, 1975	PP, SH					X
Starner, 1956	PG, PF, ON, SH	X			X	
Stickel, 1968	P.spp					X
Stickel and Stickel, 1949	SH				X	X
Summerlin and Wolfe, 1971	SH		X			
Sumner and Karol, 1929	PP		X			
Svihla, 1929	SH	X				
Terman, 1968	P.spp					X
Terman, 1974	SH				X	
Whitaker, 1968	P.spp			X		

*PP = *Peromyscus polionotus*, PG = *P. gossypinus*, PF = *P. floridanus*, ON = *Ochrotomys nuttalli*, SH = *Sigmodon hispidus*, RR = *Rattus rattus*, P.spp = various *Peromyscus* species plus in many cases with *Ochrotomys* information.

Table 95. Selected references concerning the major small mammals trapped in the study areas in East Central Florida. (Continued).

References	Species*	Life History Classifi. Distribution Gen. Info.	Ontogeny Behavior Physiol.	Parasites Predators	Food Pref. Habitat Pref. Competition	Pop. Cycles Demography Movements
Wiegert, 1972	SH			X		
Wiegert and Mayenschein, 1966	SH		X			X
Wolfe, 1970	P.spp		X			
Wolfe and Linzey, 1977	PG	X	X	X	X	X
Wolfe and Rogers, 1969	PG, PP, SH				X	
Worth, 1950	PG, SH, RR			X		
Wright and Pagels, 1977	SH		X			

*PP = Peromyscus polionotus, PG = P. gossypinus, PF = P. floridanus, ON = Ochrotomys nuttalli, SH = Sigmodon hispidus, RR = Rattus rattus, P.spp = various Peromyscus species plus in many cases with Ochrotomys information.

Table 96. Definitions of codes used in small mammal format statement.

Heading	Code	Definition
Data Type	01	Small Mammal Populations
Site	01	Wisconsin Village Grid
	02	Happy Hammock Grid
	03	Beach Grid
	04	Dune Scrub Grid
Investigator	Initials	Identifies person(s) who recorded data
Day	01-31	
Month	01-12	
Year	76	
Plot Size	01	1.44 Hectares
	02	1.12 Hectares
	01	1.44 Hectares
	01	1.44 Hectares
Column	A	
Row	1	
Genus	P	Peromyscus
Species	P	polionotus
Tag No.	0001-0999	
Status	1	Untagged
	2	Recaptured
Male	1	Abdominal testes
	2	Descended testes
	3	Intermediate
Female	1	Imperforate
	2	Perforate
Vulva	1	Inactive
	2	Turgid
	3	Cornified or Membraneous
	4	Copulatory plug
	5	Bloody
Mammary	1	Small
	2	Large
	3	Hairless or pigmented
SP (Symphysis pubis)	1	Closed
	2	Notched
	3	Open
Pads (Plantar pads)	4-6	
Foot Length		millimeter
Body Weight		grams
Pelage	1	gray (Juvenile)
	2	Subadult
	3	Adult

Table 96. Definitions of codes used in small mammal format statement. (Continued)

Heading	Code	Definition
Ticks	00-99	No. on animal
Fleas	0	none
	1	1-5
	2	6 or more
Mites	0	none
	1	Present
Chiggers	0	none
	1	1-50
	2	More than 50
Bot Flies	0-9	No. on animal
Condition	1	Good
	2	Poor
	3	Died in Trap
	4	Died after processing

Table 97. Reproductive status of male *Sigmodon hispidus* (cotton rats) on the Wisconsin Village Grid, 1976-79. Individuals reported are 60 g or greater in body weight.

	Position of Testes (%)					
Month	Abdominal		Descended		Intermediate	
1976						
June	0.0	(0)[a]	0.0	(0)	100.0	(3)
July	14.3	(1)	85.7	(6)	0.0	(0)
August	0.0	(0)	100.0	(5)	0.0	(0)
September	18.2	(2)	81.8	(9)	0.0	(0)
October	61.9	(13)	38.1	(8)	0.0	(0)
November	100.0	(21)	0.0	(0)	0.0	(0)
December	100.0	(23)	0.0	(0)	0.0	(0)
1977						
January	100.0	(7)	0.0	(0)	0.0	(0)
February	100.0	(5)	0.0	(0)	0.0	(0)
March	100.0	(6)	0.0	(0)	0.0	(0)
April	87.5	(7)	12.5	(1)	0.0	(0)
May	70.0	(7)	10.0	(1)	20.0	(2)
June	0.0	(0)	80.0	(8)	20.0	(2)
July	0.0	(0)	66.7	(4)	33.3	(2)
August	0.0	(0)	87.5	(7)	12.5	(1)
September	0.0	(0)	90.9	(10)	9.1	(1)
October	100.0	(1)	0.0	(0)	0.0	(0)
November	100.0	(2)	0.0	(0)	0.0	(0)
December	100.0	(2)	0.0	(0)	0.0	(0)
1978						
January	100.0	(2)	0.0	(0)	0.0	(0)
February	100.0	(1)	0.0	(0)	0.0	(0)
March	0.0	(0)	0.0	(0)	0.0	(0)
April	0.0	(0)	0.0	(0)	0.0	(0)
May	0.0	(0)	0.0	(0)	0.0	(0)

[a]Sample Size

Table 97. Reproductive status of male Sigmodon hispidus (cotton rats) on the Wisconsin Village Grid, 1976-79. Individuals reported are 60 g or greater in body weight. (Continued).

Month		Position of Testes (%)					
		Abdominal		Descended		Intermediate	
1978							
June		0.0	(0)[a]	0.0	(0)	0.0	(0)
July		0.0	(0)	50.0	(1)	50.0	(1)
August		0.0	(0)	100.0	(1)	0.0	(0)
September	(6th)	0.0	(0)	50.0	(1)	50.0	(1)
	(22nd)	0.0	(0)	0.0	(0)	0.0	(0)
October		0.0	(0)	0.0	(0)	0.0	(0)
November	(8th)	100.0	(3)	0.0	(0)	0.0	(0)
	(29th)	100.0	(2)	0.0	(0)	0.0	(0)
December		0.0	(0)	0.0	(0)	0.0	(0)
1979							
January		100.0	(2)	0.0	(0)	0.0	(0)
February		100.0	(1)	0.0	(0)	0.0	(0)
March		66.7	(2)	33.3	(1)	0.0	(0)

[a]Sample Size

Table 98. Reproductive status of male *Peromyscus gossypinus* (cotton mice) on the Wisconsin Village Grid, 1976-79. Individuals reported are 15 g or greater in body weight.

	Position of Testes (%)		
Month	Abdominal	Descended	Intermediate
1976			
June	66.7 (2)[a]	0.0 (0)	33.3 (1)
July	100.0 (2)	0.0 (0)	0.0 (0)
August	0.0 (0)	80.0 (4)	20.0 (1)
September	0.0 (0)	100.0 (3)	0.0 (0)
October	0.0 (0)	0.0 (0)	0.0 (0)
November	50.0 (1)	50.0 (1)	0.0 (0)
December	50.0 (1)	50.0 (1)	0.0 (0)
1977			
January	100.0 (4)	0.0 (0)	0.0 (0)
February	100.0 (2)	0.0 (0)	0.0 (0)
March	25.0 (1)	75.0 (3)	0.0 (0)
April	50.0 (2)	50.0 (2)	0.0 (0)
May	100.0 (6)	0.0 (0)	0.0 (0)
June	75.0 (3)	0.0 (0)	25.0 (1)
July	0.0 (0)	33.3 (1)	66.7 (2)
August	0.0 (0)	100.0 (4)	0.0 (0)
September	0.0 (0)	100.0 (2)	0.0 (0)
October	0.0 (0)	100.0 (2)	0.0 (0)
November	100.0 (1)	0.0 (0)	0.0 (0)
December	0.0 (0)	100.0 (3)	0.0 (0)
1978			
January	25.0 (1)	75.0 (3)	0.0 (0)
February	100.0 (1)	0.0 (0)	0.0 (0)
March	60.0 (3)	40.0 (2)	0.0 (0)
April	50.0 (2)	25.0 (1)	25.0 (1)
May	75.0 (3)	0.0 (0)	25.0 (1)

[a]Sample Size

Table 98. Reproductive status of male *Peromyscus gossypinus* (cotton mice) on the Wisconsin Village Grid, 1976-79. Individuals reported are 15 g or greater in body weight. (Continued).

Month		Position of Testes (%)					
		Abdominal		Descended		Intermediate	
1978							
June		100.0	(4) [a]	0.0	(0)	0.0	(0)
July		100.0	(2)	0.0	(0)	0.0	(0)
August		0.0	(0)	0.0	(0)	0.0	(0)
September	(6th)	0.0	(0)	100.0	(2)	0.0	(0)
	(22nd)	0.0	(0)	100.0	(1)	0.0	(0)
October		0.0	(0)	0.0	(0)	0.0	(0)
November	(8th)	33.3	(2)	16.6	(1)	50.0	(3)
	(29th)	0.0	(0)	0.0	(0)	0.0	(0)
December		100.0	(2)	0.0	(0)	0.0	(0)
1979							
January		100.0	(2)	0.0	(0)	0.0	(0)
February		0.0	(0)	100.0	(1)	0.0	(0)
March		66.7	(2)	0.0	(0)	33.3	(1)

[a] Sample Size

Table 99. Reproductive status of male Peromyscus floridanus (Florida mice) on the Wisconsin Village Grid, 1976-79. Individuals reported are 15 g or greater in body weight.

	Position of Testes (%)					
Month	Abdominal		Descended		Intermediate	
1976						
June	0.0	(0)[a]	0.0	(0)	100.0	(1)
July	0.0	(0)	0.0	(0)	0.0	(0)
August	0.0	(0)	0.0	(0)	0.0	(0)
September	0.0	(0)	0.0	(0)	0.0	(0)
October	0.0	(0)	0.0	(0)	0.0	(0)
November	0.0	(0)	0.0	(0)	100.0	(1)
December	50.0	(1)	50.0	(1)	0.0	(0)
1977						
January	100.0	(4)	0.0	(0)	0.0	(0)
February	100.0	(1)	0.0	(0)	0.0	(0)
March	66.7	(2)	33.3	(1)	0.0	(0)
April	66.7	(2)	33.3	(1)	0.0	(0)
May	66.7	(2)	33.3	(1)	0.0	(0)
June	50.0	(1)	50.0	(1)	0.0	(0)
July	0.0	(0)	0.0	(0)	0.0	(0)
August	0.0	(0)	100.0	(1)	0.0	(0)
September	0.0	(0)	0.0	(0)	0.0	(0)
October	0.0	(0)	0.0	(0)	0.0	(0)
November	0.0	(0)	0.0	(0)	0.0	(0)
December	0.0	(0)	0.0	(0)	0.0	(0)
1978						
January	0.0	(0)	0.0	(0)	0.0	(0)
February	0.0	(0)	0.0	(0)	0.0	(0)
March	0.0	(0)	0.0	(0)	0.0	(0)
April	0.0	(0)	0.0	(0)	0.0	(0)
May	0.0	(0)	0.0	(0)	0.0	(0)

[a]Sample Size

Table 99. Reproductive status of male *Peromyscus floridanus* (Florida mice) on the Wisconsin Village Grid, 1976-79. Individuals reported are 15 g or greater in body weight. (Continued).

Month		Position of Testes (%)					
		Abdominal		Descended		Intermediate	
1978							
June		0.0	(0) [a]	0.0	(0)	0.0	(0)
July		0.0	(0)	0.0	(0)	0.0	(0)
August		0.0	(0)	0.0	(0)	0.0	(0)
September	(6th)	0.0	(0)	0.0	(0)	0.0	(0)
	(22nd)	0.0	(0)	0.0	(0)	0.0	(0)
October		0.0	(0)	0.0	(0)	0.0	(0)
November	(8th)	0.0	(0)	0.0	(0)	0.0	(0)
	(29th)	0.0	(0)	0.0	(0)	0.0	(0)
December		0.0	(0)	0.0	(0)	0.0	(0)
1979							
January		0.0	(0)	0.0	(0)	0.0	(0)
February		0.0	(0)	0.0	(0)	0.0	(0)
March		0.0	(0)	0.0	(0)	0.0	(0)

[a] Sample Size

Table 100. Sex ratio of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Wisconsin Village Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at p <.05.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
<u>1976</u>					
June	14	5	9	0.55	0.64
July	19	7	12	0.58	0.84
August	25	9	16	0.56	1.44
September	34	15	19	0.78	0.47
October	77	39	38	1.02	0.01
November	85	46	39	1.17	0.58
December	75	43	32	1.34	1.61
<u>1977</u>					
January	29	14	15	0.93	0.0
February	19	9	10	0.90	0.0
March	15	7	8	0.87	0.0
April	16	9	7	1.28	0.06
May	17	10	7	1.42	0.24
June	17	10	7	1.40	0.24
July	14	6	8	0.75	0.07
August	19	9	10	0.90	0.00
September	27	13	14	0.92	0.0
October	28	14	14	1.00	0.04
November	7	3	4	0.75	0.00
December	7	2	5	0.40	0.57
<u>1978</u>					
January	5	2	3	0.67	0.00
February	4	1	3	0.33	0.25
March	2	0	2	0.00	0.50
April	1	0	1	0.00	0.00
May	3	1	2	0.50	0.00

Table 100. Sex ratio of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Wisconsin Village Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$. (Continued).

Month		No. Caught	Male	Female	Ratio	Chi-square Value
<u>1978</u>						
June		0	-	-	-	0.00
July		3	2	1	2.00	0.00
August		1	1	0	0.00	0.00
September	(6th)	9	4	5	0.80	0.00
	(22nd)	3	1	2	0.50	0.00
October		0	-	-	-	0.00
November	(8th)	3	3	0	0.00	1.33
	(29th)	4	2	2	1.00	0.25
December		3	0	3	0.00	1.33
<u>1979</u>						
January		4	2	2	1.00	0.25
February		3	1	2	0.50	0.00
March		5	3	2	1.50	0.00

Table 101. Sex ratio of <u>Peromyscus gossypinus</u> (cotton mice) live trapped on the Wisconsin Village Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
<u>1976</u>					
June	5	3	2	1.50	0.0
July	5	2	3	0.66	0.0
August	8	5	3	1.66	0.13
September	5	3	2	1.50	0.0
October	0	-	-	-	0.0
November	5	2	3	0.66	0.0
December	4	2	2	1.00	0.25
<u>1977</u>					
January	7	4	3	1.33	0.0
February	2	2	0	-	0.5
March	7	4	3	1.33	0.0
April	8	4	4	1.00	0.13
May	10	6	4	1.50	0.10
June	9	4	5	0.80	0.00
July	4	3	1	3.00	0.25
August	6	4	2	2.00	0.17
September	5	2	3	0.66	0.0
October	6	3	3	1.00	0.17
November	1	1	0	0.00	0.0
December	4	3	1	3.00	0.25
<u>1978</u>					
January	8	4	4	1.00	0.13
February	3	1	2	0.50	0.00
March	10	5	5	1.00	0.10
April	10	5	5	1.00	0.10
May	9	4	5	0.80	0.00

Table 101. Sex ratio of Peromyscus gossypinus (cotton mice) live trapped on the Wisconsin Village Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$. (Continued).

Month		No. Caught	Male	Female	Ratio	Chi-square Value
1978						
June		5	4	1	4.00	0.80
July		3	2	1	2.00	0.00
August		1	0	1	0.00	0.00
September	(6th)	4	2	2	1.00	0.25
	(22nd)	3	1	2	0.50	0.00
October		1	0	1	0.00	0.00
November	(8th)	8	6	2	3.00	1.13
	(29th)	0	-	-	-	0.00
December		7	2	5	0.40	0.57
1979						
January		5	2	3	0.67	0.00
February		4	1	3	0.33	0.25
March		4	3	1	3.00	0.25

Table 102. Sex ratio of <u>Peromyscus</u> <u>floridanus</u> (Florida mice) live trapped on the Wisconsin Village Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at p <.05.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
<u>1976</u>					
June	1	1	0	0.0	0.0
July	1	0	1	0.0	0.0
August	1	0	1	0.0	0.0
September	1	0	1	0.0	0.0
October	0	-	-	-	0.0
November	2	1	1	1.0	0.0
December	4	2	2	1.0	0.0
<u>1977</u>					
January	6	4	2	2.0	0.17
February	4	1	3	0.33	0.25
March	6	3	3	1.0	0.17
April	6	3	3	1.0	0.17
May	6	3	3	1.0	0.17
June	4	2	2	1.0	0.25
July	0	-	-	-	0.0
August	1	1	0	0.0	0.0
September	0	-	-	-	0.0
October	0	-	-	-	0.0
November	0	-	-	-	0.0
December	0	-	-	-	0.0
<u>1978</u>					
January	0	-	-	-	0.0
February	0	-	-	-	0.0
March	0	-	-	-	0.0
April	0	-	-	-	0.0
May	0	-	-	-	0.0

Table 102. Sex ratio of <u>Peromyscus</u> <u>floridanus</u> (Florida mice) live trapped on the Wisconsin Village Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at p <.05. (Continued).

Month		No. Caught	Male	Female	Ratio	Chi-square Value
1978						
June		0	-	-	-	0.0
July		0	-	-	-	0.0
August		0	-	-	-	0.0
September	(6th)	0	-	-	-	0.0
	(22nd)	0	-	-	-	0.0
October		0	-	-	-	0.0
November	(8th)	0	-	-	-	0.0
	(29th)	0	-	-	-	0.0
December		0	-	-	-	0.0
1979						
January		0	-	-	-	0.0
February		0	-	-	-	0.0
March		0	-	-	-	0.0

Table 103. Age structure of cotton rats based on weight classes: 0-60 g juvenile; 61-100 g, subadult; greater than 100 g, adult. Data are from Wisconsin Village Grid, June 1976 to March 1979. Sample size in parentheses.

Month	% Weight Class					
	0 - 60		61 - 100		> 100	
1976						
June	16	(2)	0	(0)	83	(10)
July	0	(0)	21	(4)	78	(15)
August	30	(6)	5	(1)	65	(13)
September	32	(11)	8	(3)	58	(20)
October	50	(38)	26	(20)	23	(18)
November	57	(48)	21	(18)	21	(18)
December	44	(33)	33	(25)	21	(16)
1977						
January	48	(12)	44	(11)	8	(2)
February	47	(9)	47	(9)	5	(1)
March	14	(2)	71	(10)	14	(2)
April	0	(0)	73	(11)	26	(4)
May	0	(0)	58	(10)	41	(7)
June	0	(0)	47	(8)	52	(9)
July	7	(1)	50	(7)	42	(6)
August	5	(1)	15	(3)	78	(15)
September	7	(2)	3	(1)	88	(24)
October	64	(18)	0	(0)	35	(10)
November	14	(1)	57	(4)	28	(2)
December	0	(0)	57	(4)	42	(3)
1978						
January	0	(0)	40	(2)	60	(3)
February	0	(0)	100	(4)	0	(0)
March	0	(0)	50	(1)	50	(1)
April	0	(0)	100	(1)	0	(0)

Table 103. Age structure of cotton rats based on weight classes: 0-60 g juvenile; 61-100 g, subadult; greater than 100 g, adult. Data are from Wisconsin Village Grid, June 1976 to March 1979. Sample size in parentheses. (Continued).

Month		% Weight Class					
		0 - 60		61 - 100		> 100	
1978							
May		100	(1)	0	(0)	0	(0)
June		0	(0)	0	(0)	0	(0)
July		0	(0)	33	(1)	66	(2)
August		0	(0)	0	(0)	100	(1)
September	(6th)	62	(5)	37	(3)	0	(0)
	(22nd)	50	(1)	0	(0)	50	(1)
October		0	(0)	0	(0)	0	(0)
November	(8th)	0	(0)	66	(2)	33	(1)
	(29th)	0	(0)	33	(1)	66	(2)
December		33	(1)	33	(1)	33	(1)
1979							
January		0	(0)	25	(1)	75	(3)
February		0	(0)	66	(2)	33	(1)
March		0	(0)	40	(2)	60	(3)

Table 104. Age structure of cotton mice based on pelage. Data are from Wisconsin Village Grid, June 1976 to March 1979. Sample size in parentheses.

Month	% Pelage Class					
	Juvenile		Subadult		Adult	
1976						
June	0	(0)	20	(1)	80	(4)
July	0	(0)	20	(1)	80	(4)
August	0	(0)	0	(0)	100	(8)
September	0	(0)	0	(0)	100	(5)
October	0	(0)	0	(0)	0	(0)
November	25	(1)	25	(1)	50	(2)
December	0	(0)	25	(1)	75	(3)
1977						
January	14	(1)	14	(1)	71	(5)
February	0	(0)	0	(0)	100	(2)
March	0	(0)	14	(1)	85	(6)
April	0	(0)	0	(0)	100	(8)
May	0	(0)	0	(0)	100	(9)
June	0	(0)	0	(0)	100	(9)
July	0	(0)	0	(0)	100	(4)
August	0	(0)	0	(0)	100	(5)
September	0	(0)	0	(0)	100	(5)
October	16	(1)	0	(0)	83	(5)
November	0	(0)	100	(1)	0	(0)
December	0	(0)	25	(1)	75	(3)
1978						
January	12	(1)	12	(1)	75	(6)
February	0	(0)	33	(1)	66	(2)
March	0	(0)	0	(0)	100	(10)
April	0	(0)	50	(5)	50	(5)

Table 104. Age structure of cotton mice based on pelage. Data are from Wisconsin Village Grid, June 1976 to March 1979. Sample size in parentheses. (Continued).

Month		% Pelage Class					
		Juvenile		Subadult		Adult	
1978							
May		0	(0)	44	(4)	55	(5)
June		0	(0)	40	(2)	60	(3)
July		0	(0)	0	(0)	100	(3)
August		0	(0)	0	(0)	100	(1)
September	(6th)	0	(0)	0	(0)	100	(4)
	(22nd)	0	(0)	0	(0)	100	(3)
October		0	(0)	0	(0)	100	(1)
November	(8th)	0	(0)	0	(0)	100	(8)
	(29th)	0	(0)	0	(0)	0	(0)
December		28	(2)	28	(2)	42	(3)
1979							
January		0	(0)	0	(0)	100	(5)
February		0	(0)	25	(1)	75	(3)
March		0	(0)	25	(1)	75	(3)

Table 105. Age structure of Florida mice based on pelage. Data from Wisconsin Village Grid, June 1976 to March 1979. Sample size in parentheses.

Month	% Pelage Class		
	Juvenile	Subadult	Adult
1976			
June	0 (0)	0 (0)	100 (1)
July	0 (0)	0 (0)	100 (1)
August	0 (0)	0 (0)	100 (1)
September	0 (0)	0 (0)	100 (1)
October	0 (0)	0 (0)	0 (0)
November	0 (0)	0 (0)	100 (1)
December	0 (0)	25 (1)	75 (3)
1977			
January	0 (0)	66 (2)	33 (1)
February	0 (0)	25 (1)	75 (3)
March	0 (0)	33 (2)	66 (4)
April	0 (0)	16 (1)	83 (5)
May	0 (0)	0 (0)	100 (6)
June	0 (0)	0 (0)	100 (3)
July	0 (0)	0 (0)	0 (0)
August	0 (0)	0 (0)	100 (1)
September	0 (0)	0 (0)	0 (0)
October	0 (0)	0 (0)	0 (0)
November	0 (0)	0 (0)	0 (0)
December	0 (0)	0 (0)	0 (0)
1978			
January	0 (0)	0 (0)	0 (0)
February	0 (0)	0 (0)	0 (0)
March	0 (0)	0 (0)	0 (0)
April	0 (0)	0 (0)	0 (0)

Table 105. Age structure of Florida mice based on pelage. Data from Wisconsin Village Grid, June 1976 to March 1979. Sample size in parentheses. (Continued).

Month		% Pelage Class				
		Juvenile		Subadult		Adult	
1978							
May		0	(0)	0	(0)	0	(0)
June		0	(0)	0	(0)	0	(0)
July		0	(0)	0	(0)	0	(0)
August		0	(0)	0	(0)	0	(0)
September	(6th)	0	(0)	0	(0)	0	(0)
	(22nd)	0	(0)	0	(0)	0	(0)
October		0	(0)	0	(0)	0	(0)
November	(8th)	0	(0)	0	(0)	0	(0)
	(29th)	0	(0)	0	(0)	0	(0)
December		0	(0)	0	(0)	0	(0)
1979							
January		0	(0)	0	(0)	0	(0)
February		0	(0)	0	(0)	0	(0)
March		0	(0)	0	(0)	0	(0)

Table 106. Ectoparasite burden of cotton rats live trapped on the Wisconsin Village Grid, 1976-79.

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
1976											
June	14	0.14	4	9	1	14	0	13	1	0	0.0
July	19	0.16	17	2	0	19	0	12	7	0	0.0
August	25	0.12	19	5	1	25	0	21	4	0	0.0
September	36	0.17	34	2	0	24	12	14	19	3	0.0
October	77	1.15	64	13	0	38	39	21	53	3	0.03
November	85	0.11	59	26	0	67	18	78	7	0	0.0
December	77	0.13	58	18	1	46	31	76	1	0	0.0
1977											
January	30	0.07	22	8	0	29	1	29	1	0	0.0
February	19	0.21	5	3	11	14	5	19	0	0	0.0
March	15	0.33	5	5	5	13	2	15	0	0	0.0
April	16	0.06	11	4	1	13	3	15	1	0	0.0
May	18	0.05	7	11	0	15	3	17	1	0	0.0
June	39	0.02	24	14	1	23	16	32	6	0	0.0
July	14	0.14	8	5	1	11	3	9	5	0	0.0
August	20	0.70	10	9	1	20	0	7	8	5	0.0
September	27	0.25	22	5	0	26	1	8	9	10	0.0
October	28	0.61	20	7	1	26	2	9	18	1	0.0
November	7	0.29	4	0	3	7	0	5	2	0	0.0
December	7	0.14	2	4	1	7	0	7	0	0	0.0

Table 106. Ectoparasite burden of cotton rats live trapped on the Wisconsin Village Grid, 1976-79. (Continued).

Month		No. Examined	Ticks Per Host	Frequency No. of Fleas 0	1-5	>5	Mites No	Yes	Frequency No. of Chiggers 0	1-50	>50	Botflies Per Host
1978												
January		5	1.60	3	2	0	4	1	5	0	0	0.0
February		4	7.75	0	3	1	3	1	4	0	0	0.0
March		2	6.50	2	0	0	2	0	2	0	0	0.0
April		1	6.0	1	0	0	1	0	0	1	0	0.0
May		3	0.67	1	2	0	3	0	2	1	0	0.0
June		0	-	-	-	-	-	-	-	-	-	-
July		3	0.0	2	1	0	3	0	0	3	0	0.0
August		1	0.0	1	0	0	1	0	0	1	0	0.0
September	(6th)	9	0.44	9	0	0	7	2	0	8	1	0.0
	(22nd)	3	0.0	3	0	0	3	0	0	3	0	0.0
October		0	-	-	-	-	-	-	-	-	-	-
November	(8th)	3	1.00	3	0	0	3	0	0	3	0	0.0
	(29th)	4	5.75	4	0	0	4	0	4	0	0	0.0
December		3	5.00	3	0	0	3	0	3	0	0	0.0
1979												
January		5	13.20	3	1	0	4	0	4	0	0	0.0
February		3	2.33	0	2	1	3	0	3	0	0	0.0
March		5	14.40	5	0	0	3	2	5	0	0	0.0

Table 107. Ectoparasite burden of cotton mice live trapped on the Wisconsin Village Grid, 1976-79.

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas 0	1-5	>5	Mites No	Yes	Frequency No. of Chiggers 0	1-50	>50	Botflies Per Host
1976											
June	5	0.0	5	0	0	5	0	5	0	0	0.0
July	5	0.0	5	0	0	5	0	5	0	0	0.0
August	8	0.0	8	0	0	8	0	8	0	0	0.0
September	5	0.2	5	0	0	4	1	5	0	0	0.0
October	0	-	-	-	-	-	-	-	-	-	-
November	5	0.8	5	0	0	5	0	5	0	0	0.0
December	4	0.5	4	0	0	3	1	4	0	0	0.0
1977											
January	7	0.0	7	0	0	7	0	7	0	0	0.0
February	2	1.50	2	0	0	2	0	2	0	0	0.0
March	7	0.14	7	0	0	7	0	7	0	0	0.0
April	8	0.12	8	0	0	8	0	8	0	0	0.12
May	10	0.00	8	2	0	10	0	9	1	0	0.10
June	19	0.00	18	0	0	18	0	18	0	0	0.0
July	4	0.50	4	0	0	4	0	4	0	0	0.0
August	7	0.28	6	0	0	6	0	5	0	1	0.14
September	5	0.00	5	0	0	5	0	5	0	0	0.00
October	6	3.00	6	0	0	6	0	5	1	0	0.00
November	1	0.00	1	0	0	1	0	1	0	0	0.00
December	4	3.75	4	0	0	4	0	4	0	0	0.25

Table 107. Ectoparasite burden of cotton mice live trapped on the Wisconsin Village Grid, 1976-79. (Continued).

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas 0	1-5	>5	Mites No	Yes	Frequency No. of Chiggers 0	1-50	>50	Botflies Per Host
1978											
January	8	6.50	8	0	0	8	0	8	0	0	0.0
February	3	2.00	3	0	0	3	0	3	0	0	0.0
March	10	1.60	9	1	0	10	0	10	0	0	0.0
April	10	0.80	10	0	0	10	0	10	0	0	0.0
May	9	0.0	9	0	0	9	0	9	0	0	0.0
June	5	0.0	5	0	0	5	0	5	0	0	0.20
July	3	0.0	3	0	0	3	0	3	0	0	0.0
August	1	0.0	1	0	0	1	0	1	0	0	0.0
September (6th)	4	0.0	4	0	0	4	0	4	0	0	0.0
(22nd)	3	0.33	3	0	0	3	0	3	0	0	0.0
October	1	4.00	1	0	0	1	0	1	0	0	0.0
November (8th)	8	5.13	8	0	0	8	0	8	0	0	0.13
(29th)	0	-	-	-	-	-	-	-	-	-	-
December	7	15.70	7	0	0	7	0	7	0	0	0.14
1979											
January	6	5.00	5	0	0	5	0	5	0	0	0.17
February	4	17.00	4	0	0	3	1	4	0	0	0.00
March	4	14.00	4	0	0	4	0	4	0	0	0.00

Table 108. Mean distance (meters) between sucessive recaptures of small mammals from the Wisconsin Village Grid. Animals included in the calculations had been captured four or more times. Sample size in parentheses.

Species	Sex	
	Male	Female
Sigmodon hispidus	34.4 (15)*	28.1 (23)
Peromyscus gossypinus	48.7 (10)**	32.4 (8)
Peromyscus floridanus	49.8 (3) ***	39.1 (4)

*t = 1.69, df = 37, $p < .1$

**t = 2.14, df = 16, $p < .05$

***t = 0.61, df = 5, Not Significant

Table 109. Reproductive status of male Peromyscus gossypinus (cotton mice) on the Happy Hammock Grid, 1976-79. Individuals reported are 15 g or greater in body weight.

Month	Position of Testes (%)					
	Abdominal		Descended		Intermediate	
1976						
June	100.0	(7)[a]	0.0	(0)	0.0	(0)
July	90.0	(9)	10.0	(1)	0.0	(0)
August	16.7	(2)	75.0	(9)	8.3	(1)
September	0.0	(0)	100.0	(11)	0.0	(0)
October	5.6	(1)	5.6	(1)	88.9	(16)
November	20.0	(1)	80.0	(4)	0.0	(0)
December	12.5	(2)	68.8	(11)	18.8	(3)
1977						
January	100.0	(6)	0.0	(0)	0.0	(0)
February	88.2	(15)	11.8	(2)	0.0	(0)
March	88.2	(15)	0.0	(0)	11.8	(2)
April	100.0	(11)	0.0	(0)	0.0	(0)
May	100.0	(13)	0.0	(0)	0.0	(0)
June	100.0	(7)	0.0	(0)	0.0	(0)
July	88.9	(8)	0.0	(0)	11.1	(1)
August	25.0	(1)	75.0	(3)	0.0	(0)
September	0.0	(0)	90.0	(9)	10.0	(1)
October	0.0	(0)	0.0	(0)	100.0	(1)
November	100.0	(1)	0.0	(0)	0.0	(0)
December	60.0	(3)	40.0	(2)	0.0	(0)
1978						
January	80.0	(4)	0.0	(0)	20.0	(1)
February	0.0	(0)	0.0	(0)	0.0	(0)
March	20.0	(1)	80.0	(4)	0.0	(0)
April	100.0	(3)	0.0	(0)	0.0	(0)
May	100.0	(7)	0.0	(0)	0.0	(0)

[a]Sample Size

Table 109. Reproductive status of male <u>Peromyscus gossypinus</u> (cotton mice) on the Happy Hammock Grid, 1976-79. Individuals reported are 15 g or greater in body weight. (Continued).

	Position of Testes (%)					
Month	Abdominal		Descended		Intermediate	
1978						
June	100.0	(7)[a]	0.0	(0)	0.0	(0)
July	100.0	(6)	0.0	(0)	0.0	(0)
August	80.0	(4)	20.0	(1)	0.0	(0)
September	0.0	(0)	0.0	(0)	100.0	(3)
October	50.0	(1)	0.0	(0)	50.0	(1)
November	0.0	(1)	25.0	(1)	75.0	(3)
December	66.7	(2)	33.3	(1)	0.0	(0)
1979						
January	0.0	(0)	0.0	(0)	0.0	(0)
February	0.0	(0)	66.7	(2)	33.3	(1)
March	100.0	(2)	0.0	(0)	0.0	(0)

[a]Sample Size

Table 110. Sex ratio of Peromyscus gossypinus (cotton mice) live trapped on the Happy Hammock Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1976					
June	13	7	6	1.16	0.00
July	17	10	7	1.42	0.24
August	18	12	6	2.00	1.39
September	19	11	8	1.37	0.21
October	31	18	13	1.38	0.81
November	13	5	8	0.62	0.31
December	29	16	13	1.23	0.14
1977					
January	16	6	10	0.60	0.56
February	30	17	13	1.30	0.53
March	33	17	16	1.06	0.03
April	25	11	14	0.78	0.16
May	26	13	13	1.00	0.04
June	16	7	9	0.78	0.06
July	17	9	8	1.12	0.00
August	8	4	4	1.00	0.13
September	15	10	5	2.00	1.07
October	4	1	3	0.33	0.25
November	1	1	0	0.00	0.00
December	10	5	5	1.00	0.10
1978					
January	8	6	2	3.00	1.13
February	0	-	-	-	0.00
March	8	5	3	1.70	0.13
April	5	3	2	1.50	0.00
May	10	8	2	4.00	2.50

Table 110. Sex ratio of Peromyscus gossypinus (cotton mice) live trapped on the Happy Hammock Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at p <.05. (Continued).

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1978					
June	12	7	5	1.40	0.08
July	12	7	5	1.40	0.08
August	10	5	5	1.00	0.10
September	4	3	1	3.00	0.25
October	4	2	2	1.00	0.25
November	5	4	1	4.00	0.80
December	5	3	2	1.50	0.00
1979					
January	2	0	2	0.00	0.50
February	8	4	4	1.00	0.13
March	0	-	-	-	0.00

Table 111. Sex ratio of Sigmodon hispidus (cotton rats) live trapped on the Happy Hammock Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at p <.05.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1976					
June	3	1	2	0.50	0.00
July	0	-	-	-	-
August	0	-	-	-	-
September	0	-	-	-	-
October	2	0	2	0.00	0.50
November	0	-	-	-	-
December	1	0	1	0.00	0.00
1977					
January	0	-	-	-	-
February	0	-	-	-	-
March	0	-	-	-	-
April	0	-	-	-	-
May	0	-	-	-	-
June	0	-	-	-	-
July	0	-	-	-	-
August	0	-	-	-	-
September	0	-	-	-	-
October	0	-	-	-	-
November	0	-	-	-	-
December	0	-	-	-	-
1978					
January	0	-	-	-	-
February	0	-	-	-	-
March	0	-	-	-	-
April	0	-	-	-	-
May	0	-	-	-	-

Table 111. Sex ratio of Sigmodon hispidus (cotton rats) live trapped on the Happy Hammock Grid, 1976-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$. (Continued).

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1978					
June	0	-	-	-	-
July	0	-	-	-	-
August	0	-	-	-	-
September	0	-	-	-	-
October	0	-	-	-	-
November	0	-	-	-	-
December	0	-	-	-	-
1979					
January	0	-	-	-	-
February	0	-	-	-	-
March	0	-	-	-	-

Table 112. Age structure of cotton mice based on pelage. Data are from Happy Hammock Grid, June 1976 to March 1979. Sample size in parentheses.

Month	% Pelage Class					
	Juvenile		Subadult		Adult	
1976						
June	0	(0)	0	(0)	100	(13)
July	0	(0)	25	(4)	75	(12)
August	0	(0)	0	(0)	100	(18)
September	0	(0)	0	(0)	100	(19)
October	13	(4)	3	(1)	83	(25)
November	7	(1)	30	(4)	61	(8)
December	0	(0)	31	(9)	68	(20)
1977						
January	6	(1)	25	(4)	68	(11)
February	0	(0)	30	(9)	70	(21)
March	0	(0)	33	(11)	66	(22)
April	0	(0)	4	(1)	96	(24)
May	0	(0)	3	(1)	96	(25)
June	0	(0)	6	(1)	93	(15)
July	0	(0)	5	(1)	94	(16)
August	0	(0)	0	(0)	100	(8)
September	0	(0)	0	(0)	100	(15)
October	0	(0)	0	(0)	100	(4)
November	0	(0)	100	(1)	0	(0)
December	0	(0)	40	(4)	60	(6)
1978						
January	12	(1)	12	(1)	75	(6)
February	0	(0)	0	(0)	0	(0)
March	0	(0)	0	(0)	100	(8)
April	0	(0)	0	(0)	100	(5)
May	0	(0)	30	(3)	70	(7)

Table 112. Age structure of cotton mice based on pelage. Data are from Happy Hammock Grid, June 1976 to March 1979. Sample size in parentheses. (Continued).

Month	% Pelage Class		
	Juvenile	Subadult	Adult
<u>1978</u>			
June	0 (0)	16 (2)	83 (10)
July	0 (0)	27 (3)	72 (8)
August	0 (0)	10 (1)	90 (9)
September	0 (0)	0 (0)	100 (4)
October	0 (0)	0 (0)	100 (4)
November	0 (0)	0 (0)	100 (5)
December	20 (1)	20 (1)	60 (3)
<u>1979</u>			
January	0 (0)	50 (1)	50 (1)
February	12 (1)	0 (0)	87 (7)
March	0 (0)	0 (0)	100 (3)

Table 113. Ectoparasite burden of <u>Peromyscus gossypinus</u> (cotton mice) live trapped on the Happy Hammock Grid, 1976-79.

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
1976											
June	13	0.07	13	0	0	13	0	13	0	0	0.15
July	17	0.00	17	0	0	17	0	17	0	0	0.58
August	18	0.55	18	0	0	18	0	18	0	0	0.38
September	19	0.05	19	0	0	19	0	19	0	0	0.05
October	31	8.32	31	0	0	31	0	31	0	0	0.06
November	13	9.61	13	0	0	13	0	13	0	0	0.15
December	29	3.31	29	0	0	29	0	29	0	0	0.27
1977											
January	16	1.18	16	0	0	16	0	16	0	0	0.06
February	30	0.53	30	0	0	30	0	30	0	0	0.00
March	33	0.27	33	0	0	33	0	33	0	0	0.00
April	26	0.19	26	0	0	26	0	26	0	0	0.26
May	26	0.11	26	3	0	26	0	26	0	0	0.46
June	18	0.11	18	0	0	18	0	18	0	0	0.50
July	17	0.00	17	0	0	17	0	17	0	0	0.58
August	8	0.25	8	0	0	8	0	8	0	0	0.25
September	15	1.00	15	0	0	15	0	15	0	0	0.00
October	4	0.75	4	0	0	4	0	4	0	0	0.00
November	1	7.00	1	0	0	1	0	1	0	0	0.00
December	10	9.30	10	[illegible]	0	10	0	10	0	0	0.30

Table 113. Ectoparasite burden of <u>Peromyscus gossypinus</u> (cotton mice) live trapped on the Happy Hammock Grid, 1976-79. (Continued).

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
<u>1978</u>											
January	8	5.88	8	0	0	8	0	0	0	0	0.38
February	0	-	-	-	-	-	-	-	-	-	-
March	8	1.75	8	0	0	8	0	8	0	0	0.00
April	5	0.00	5	0	0	5	0	4	1	0	0.20
May	10	2.50	10	0	0	10	0	10	0	0	0.50
June	12	0.33	12	0	0	12	0	12	0	0	0.83
July	12	0.58	12	0	0	12	0	12	0	0	0.33
August	10	0.80	10	0	0	10	0	9	1	0	0.70
September	4	1.25	4	0	0	4	0	4	0	0	0.00
October	4	9.75	4	0	0	4	0	4	0	0	0.50
November	5	14.80	5	0	0	5	0	5	0	0	0.20
December	5	14.60	5	0	0	5	0	5	0	0	0.20
<u>1979</u>											
January	2	9.00	2	0	0	2	0	2	0	0	0.00
February	8	5.75	8	0	0	7	1	8	0	0	0.00
March	3	0.00	3	0	0	3	0	3	0	0	0.00

Table 114. Mean distance (meters) between successive recaptures of cotton mice from the Happy Hammock Grid. Animals included in the calculations had been captured four or more times. Sample size in parentheses.

Species	Sex	
	Male	Female
Peromyscus gossypinus	32.3 (20)*	24.9 (20)

*t = 0.71, df = 38, Not significant

Table 115. Reproductive status of male <u>Sigmodon hispidus</u> (cotton rats) on the Beach Grid, 1975-79. Individuals reported are 60 g or greater in body weight.

	Position of Testes (%)					
Month	Abdominal		Descended		Intermediate	
<u>1975</u>						
July	33.3	(1)[a]	66.7	(2)	0.0	(0)
August	0.0	(0)	100.0	(9)	0.0	(0)
September	25.0	(1)	75.0	(3)	0.0	(0)
<u>1976</u>						
July	0.0	(0)	100.0	(2)	0.0	(0)
August	0.0	(0)	100.0	(2)	0.0	(0)
September	0.0	(0)	100.0	(4)	0.0	(0)
October	0.0	(0)	100.0	(4)	0.0	(0)
November	50.0	(1)	0.0	(0)	50.0	(1)
December	100.0	(3)	0.0	(0)	0.0	(0)
<u>1977</u>						
January	100.0	(2)	0.0	(0)	0.0	(0)
February	100.0	(4)	0.0	(0)	0.0	(0)
March	100.0	(1)	0.0	(0)	0.0	(0)
April	0.0	(0)	0.0	(0)	0.0	(0)
May	0.0	(0)	100.0	(4)	0.0	(0)
June	0.0	(0)	100.0	(2)	0.0	(0)
July	0.0	(0)	100.0	(3)	0.0	(0)
August	0.0	(0)	100.0	(2)	0.0	(0)
September	0.0	(0)	0.0	(0)	0.0	(0)
October	0.0	(0)	0.0	(0)	0.0	(0)
November	100.0	(1)	0.0	(0)	0.0	(0)
December	0.0	(0)	100.0	(1)	0.0	(0)

[a]Sample Size

Table 115. Reproductive status of male <u>Sigmodon hispidus</u> (cotton rats) on the Beach Grid, 1975-79. Individuals reported are 60 g or greater in body weight. (Continued).

Month		Position of Testes (%)					
		Abdominal		Descended		Intermediate	
1978							
January		0.0	(0) [a]	0.0	(0)	0.0	(0)
February		100.0	(1)	0.0	(0)	0.0	(0)
March		100.0	(1)	0.0	(0)	0.0	(0)
April		0.0	(0)	0.0	(0)	0.0	(0)
May		0.0	(0)	0.0	(0)	0.0	(0)
June		0.0	(0)	0.0	(0)	0.0	(0)
July		0.0	(0)	0.0	(0)	0.0	(0)
August		0.0	(0)	0.0	(0)	0.0	(0)
September		0.0	(0)	100.0	(1)	0.0	(0)
October	(6th)	0.0	(0)	0.0	(0)	0.0	(0)
	(18th)	0.0	(0)	0.0	(0)	0.0	(0)
November	(1st)	0.0	(0)	0.0	(0)	0.0	(0)
	(15th)	0.0	(0)	100.0	(1)	0.0	(0)
December	(2nd)	0.0	(0)	0.0	(0)	0.0	(0)
	(15th)	0.0	(0)	0.0	(0)	0.0	(0)
1979							
January	(13th)	0.0	(0)	0.0	(0)	0.0	(0)
	(27th)	0.0	(0)	0.0	(0)	0.0	(0)
February	(15th)	0.0	(0)	100.0	(1)	0.0	(0)
March	(3rd)	0.0	(0)	0.0	(0)	100.0	(1)
	(20th)	0.0	(0)	0.0	(0)	0.0	(0)

[a] Sample Size

Table 116. Reproductive status of male *Peromyscus polionotus* (beach mice) on the Beach Grid, 1975-79. Individuals reported are 10 g or greater in body weight.

Month	Position of Testes (%)					
	Abdominal		Descended		Intermediate	
1975						
July	25.0	(1)[a]	50.0	(2)	25.0	(1)
August	0.0	(0)	100.0	(4)	0.0	(0)
September	22.2	(2)	77.8	(7)	0.0	(0)
1976						
July	50.0	(4)	37.5	(3)	12.5	(1)
August	22.2	(2)	77.8	(7)	0.0	(0)
September	0.0	(0)	100.0	(14)	0.0	(0)
October	7.69	(1)	84.62	(11)	7.69	(1)
November	100.0	(14)	0.0	(0)	0.0	(0)
December	100.0	(15)	0.0	(0)	0.0	(0)
1977						
January	100.0	(13)	0.0	(0)	0.0	(0)
February	100.0	(8)	0.0	(0)	0.0	(0)
March	75.0	(3)	0.0	(0)	25.0	(1)
April	66.7	(4)	16.6	(1)	16.6	(1)
May	28.6	(2)	57.1	(4)	14.3	(1)
June	33.3	(2)	66.7	(4)	0.0	(0)
July	0.0	(0)	88.9	(8)	11.1	(1)
August	0.0	(0)	100.0	(7)	0.0	(0)
September	0.0	(0)	100.0	(1)	0.0	(0)
October	0.0	(0)	83.3	(5)	16.7	(1)
November	0.0	(0)	55.5	(5)	44.4	(4)
December	0.0	(0)	40.0	(2)	60.0	(3)

[a]Sample Size

Table 116. Reproductive status of male *Peromyscus polionotus* (beach mice) on the Beach Grid, 1975-79. Individuals reported are 10 g or greater in body weight. (Continued).

Month		Position of Testes (%)					
		Abdominal		Descended		Intermediate	
1978							
January		75.0	(3)[a]	25.0	(1)	0.0	(0)
February		0.0	(0)	100.0	(1)	0.0	(0)
March		75.0	(3)	25.0	(1)	0.0	(0)
April		100.0	(10)	0.0	(0)	0.0	(0)
May		100.0	(1)	0.0	(0)	0.0	(0)
June		40.0	(2)	60.0	(3)	0.0	(0)
July		54.5	(6)	18.2	(2)	27.3	(3)
August		0.0	(0)	77.8	(7)	22.2	(2)
September		0.0	(0)	100.0	(7)	0.0	(0)
October	(6th)	25.0	(1)	25.0	(1)	50.0	(2)
	(18th)	12.5	(1)	25.0	(2)	62.5	(5)
November	(1st)	28.6	(2)	14.3	(1)	57.1	(4)
	(15th)	66.7	(4)	16.7	(1)	16.7	(1)
December	(2nd)	57.1	(4)	14.3	(1)	28.6	(2)
	(15th)	71.4	(5)	0.0	(0)	28.6	(2)
1979							
January	(13th)	64.3	(9)	7.1	(1)	28.6	(4)
	(27th)	80.0	(20)	12.0	(3)	8.0	(2)
February	(15th)	46.7	(14)	16.7	(5)	36.7	(11)
March	(3rd)	75.0	(24)	6.3	(2)	18.7	(6)
	(20th)	76.9	(20)	11.5	(3)	11.5	(3)

[a]Sample Size

Table 117. Sex ratio of Peromyscus polionotus (beach mice) live trapped on the Beach Grid, 1975-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1975					
July	8	4	4	1.00	0.13
August	6	4	2	2.00	0.17
September	12	10	2	5.00	4.08*
1976					
July	14	8	6	1.33	0.07
August	16	9	7	1.28	0.06
September	20	15	5	3.00	4.05*
October	22	15	7	2.14	2.23
November	26	14	12	1.16	0.04
December	29	16	13	1.23	0.14
1977					
January	27	13	14	0.92	0.00
February	26	8	18	0.44	3.12
March	15	4	11	0.36	2.40
April	13	6	7	0.85	0.00
May	13	7	6	1.16	0.00
June	11	6	5	1.20	0.00
July	12	9	3	3.00	2.08
August	8	7	1	7.00	3.13
September	5	1	4	0.25	0.80
October	7	6	1	6.00	2.29
November	16	9	7	1.30	0.06
December	11	5	6	0.83	0.00

Table 117. Sex ratio of Peromyscus polionotus (beach mice) live trapped on the Beach Grid, 1975-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$. (Continued).

Month		No. Caught	Male	Female	Ratio	Chi-square Value
1978						
January		10	4	6	0.67	0.10
February		3	1	2	0.50	0.00
March		10	4	6	0.67	0.10
April		20	10	10	1.00	0.05
May		7	1	6	0.17	2.29
June		10	5	5	1.00	0.10
July		16	11	5	2.20	1.56
August		15	9	6	1.50	0.27
September		12	7	5	1.40	0.08
October	(6th)	9	5	4	1.30	0.00
	(18th)	14	8	6	1.30	0.07
November	(1st)	14	8	6	1.30	0.07
	(15th)	16	6	10	0.60	0.56
December	(2nd)	20	8	12	0.67	0.45
	(15th)	21	9	12	0.75	0.19
1979						
January	(13th)	35	14	21	0.67	1.40
	(27th)	58	25	33	0.76	1.10
February	(15th)	66	31	35	0.89	0.24
March	(3rd)	65	33	32	1.00	0.02
	(20th)	59	26	33	0.79	0.83

Table 118. Sex ratio of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Beach Grid, 1975-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at p <.05.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1975					
July	10	6	4	1.50	0.10
August	11	9	2	4.50	3.27
September	5	4	0	0.00	2.25
1976					
July	3	2	1	2.00	0.00
August	6	2	4	0.50	0.17
September	6	4	2	2.00	0.17
October	8	4	4	1.00	0.13
November	11	4	7	0.57	0.36
December	10	5	5	1.00	0.10
1977					
January	6	3	3	1.00	0.17
February	7	4	3	1.33	0.00
March	3	1	2	0.50	0.00
April	4	1	3	0.33	0.25
May	5	4	1	4.00	0.80
June	6	3	3	1.00	0.17
July	7	3	4	0.75	0.00
August	5	2	3	0.66	0.00
September	5	1	4	0.25	0.80
October	3	1	2	0.50	0.00
November	2	1	1	1.00	0.50
December	2	1	1	1.00	0.50

Table 118. Sex ratio of Sigmodon hispidus (cotton rats) live trapped on the Beach Grid, 1975-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$. (Continued).

Month		No. Caught	Male	Female	Ratio	Chi-square Value
1978						
January		2	1	1	1.00	0.50
February		2	1	1	1.00	0.50
March		1	1	0	0.00	0.00
April		0	-	-	-	-
May		0	-	-	-	-
June		0	-	-	-	-
July		0	-	-	-	-
August		0	-	-	-	-
September		1	1	0	0.00	0.00
October	(6th)	0	-	-	-	-
	(18th)	0	-	-	-	-
November	(1st)	0	-	-	-	-
	(15th)	1	1	0	0.00	0.00
December	(2nd)	2	1	1	1.00	0.50
	(15th)	0	-	-	-	-
1979						
January	(13th)	1	0	1	0.00	0.00
	(27th)	0	-	-	-	-
February	(15th)	1	1	0	0.00	0.00
March	(3rd)	2	1	1	1.00	0.50
	(20th)	1	1	0	0.00	0.00

Table 119. Age structure of beach mice based on pelage classes. Data are from Beach Grid, July 1976 to March 1979. Sample size in parentheses.

Month	% Pelage Class					
	Juvenile		Subadult		Adult	
1976						
July	0	(0)	57	(8)	42	(6)
August	0	(0)	62	(10)	37	(6)
September	0	(0)	47	(9)	52	(10)
October	13	(3)	50	(11)	36	(8)
November	0	(0)	73	(19)	26	(7)
December	0	(0)	53	(15)	46	(13)
1977						
January	0	(0)	48	(13)	51	(14)
February	0	(0)	23	(6)	76	(20)
March	0	(0)	13	(2)	86	(13)
April	0	(0)	0	(0)	100	(13)
May	0	(0)	15	(2)	84	(11)
June	0	(0)	9	(1)	90	(10)
July	8	(1)	25	(3)	66	(8)
August	0	(0)	25	(2)	75	(6)
September	0	(0)	16	(1)	83	(5)
October	0	(0)	28	(2)	71	(5)
November	0	(0)	12	(2)	87	(14)
December	0	(0)	0	(0)	100	(11)
1978						
January	0	(0)	30	(3)	70	(7)
February	0	(0)	0	(0)	100	(3)
March	0	(0)	18	(2)	81	(9)
April	0	(0)	10	(2)	90	(18)
May	0	(0)	14	(1)	85	(6)
June	0	(0)	0	(0)	100	(10)
July	0	(0)	0	(0)	100	(15)
August	0	(0)	6	(1)	93	(14)
September	0	(0)	0	(0)	100	(12)

Table 117. Age structure of beach mice based on pelage classes. Data are from Beach Grid, July 1976 to March 1979. Sample size in parentheses. (Continued).

Month		% Pelage Class					
		Juvenile		Subadult		Adult	
October	(6th)	0	(0)	12	(1)	87	(7)
	(18th)	0	(0)	21	(3)	78	(11)
November	(1st)	7	(1)	7	(1)	85	(12)
	(15th)	0	(0)	41	(7)	58	(10)
December	(2nd)	5	(1)	25	(5)	70	(14)
	(15th)	14	(3)	23	(5)	61	(13)
<u>1979</u>							
January	(13th)	8	(3)	13	(5)	77	(28)
	(27th)	1	(1)	18	(11)	80	(48)
February	(15th)	4	(3)	8	(6)	86	(58)
March	(3rd)	3	(2)	9	(6)	87	(57)
	(20th)	3	(2)	1	(1)	94	(56)

Table 120. Age structure of cotton rats based on weight classes: 0-60 g, juvenile; 61-100 g, subadult; greater than 100 g, adult. Data are from Beach Grid July to September 1975 and July 1976 to March 1979. Sample size in parentheses.

Month	% Weight Class		
	0 - 60	61 - 100	> 100
1975			
July	22 (2)	11 (1)	66 (6)
August	0 (0)	18 (2)	81 (9)
September	0 (0)	0 (0)	100 (4)
1976			
July	0 (0)	0 (0)	100 (3)
August	0 (0)	0 (0)	100 (5)
September	0 (0)	16 (1)	83 (5)
October	12 (1)	12 (1)	75 (6)
November	30 (3)	50 (5)	20 (2)
December	40 (4)	30 (3)	30 (3)
1977			
January	16 (1)	50 (3)	33 (2)
February	0 (0)	71 (5)	28 (2)
March	0 (0)	66 (2)	33 (1)
April	0 (0)	100 (3)	0 (0)
May	0 (0)	40 (2)	60 (3)
June	0 (0)	25 (1)	75 (3)
July	14 (1)	14 (1)	71 (5)
August	0 (0)	0 (0)	100 (5)
September	50 (2)	0 (0)	50 (2)
October	33 (1)	33 (1)	33 (1)
November	0 (0)	50 (1)	50 (1)
December	0 (0)	0 (0)	100 (2)

Table 120. Age structure of cotton rats based on weight classes: 0-60 g, juvenile; 61-100 g, subadult; greater than 100 g, adult. Data are from Beach Grid July to September 1975 and July 1976 to March 1979. Sample size in parentheses. (Continued).

Month		% Weight Class		
		0 - 60	61 - 100	> 100
1978				
January		0 (0)	0 (0)	100 (1)
February		0 (0)	0 (0)	100 (2)
March		0 (0)	0 (0)	100 (1)
April		0 (0)	0 (0)	0 (0)
May		0 (0)	0 (0)	0 (0)
June		0 (0)	0 (0)	0 (0)
July		0 (0)	0 (0)	0 (0)
August		0 (0)	0 (0)	0 (0)
September		0 (0)	0 (0)	100 (1)
October	(6th)	0 (0)	0 (0)	0 (0)
	(18th)	0 (0)	0 (0)	0 (0)
November	(1st)	0 (0)	0 (0)	0 (0)
	(15th)	0 (0)	100 (1)	0 (0)
December	(2nd)	100 (1)	0 (0)	0 (0)
	(15th)	0 (0)	0 (0)	0 (0)
1979				
January	(13th)	0 (0)	100 (1)	0 (0)
	(27th)	0 (0)	0 (0)	0 (0)
February	(15th)	0 (0)	100 (1)	0 (0)
March	(3rd)	0 (0)	100 (1)	0 (0)
	(20th)	0 (0)	0 (0)	0 (0)

Table 121. Ectoparasite burden of <u>Peromyscus polionotus</u> (beach mice) live trapped on the Beach Grid, 1975-79.

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
1975											
July	8	0.0	-	-	-	-	-	8	-	-	0.0
August	6	0.0	-	-	-	-	-	6	-	-	0.0
September	12	0.0	-	-	-	-	-	12	-	-	0.0
1976											
July	14	0.0	14	0	0	14	0	14	0	0	0.0
August	16	0.0	16	0	0	16	0	16	0	0	0.0
September	20	0.0	20	0	0	20	0	20	0	0	0.0
October	22	0.0	22	0	0	22	0	22	0	0	0.0
November	26	0.34	26	0	0	26	0	26	0	0	0.0
December	29	0.17	29	0	0	29	0	29	0	0	0.0
1977											
January	28	0.07	28	0	0	28	0	28	0	0	0.0
February	26	0.0	26	0	0	26	0	26	0	0	0.0
March	15	0.0	15	0	0	15	0	15	0	0	0.0
April	14	0.0	13	0	0	13	0	13	0	0	0.0
May	13	0.0	13	0	0	13	0	13	0	0	0.0
June	11	0.0	11	0	0	11	0	11	0	0	0.0
July	12	0.0	12	0	0	12	0	12	0	0	0.0
August	8	0.0	8	0	0	8	0	8	0	0	0.0

Table 121. Ectoparasite burden of <u>Peromyscus polionotus</u> (beach mice) live trapped on the Beach Grid, 1975-79. (Continued).

Month		No. Examined	Ticks Per Host	Frequency No. of Fleas 0	1-5	>5	Mites No	Yes	Frequency No. of Chiggers 0	1-50	>50	Botflies Per Host
1977												
September		6	0.0	5	0	0	5	0	5	0	0	0.0
October		7	0.0	7	0	0	7	0	7	0	0	0.0
November		16	0.25	16	0	0	16	0	16	0	0	0.0
December		11	0.36	11	0	0	11	0	11	0	0	0.0
1978												
January		10	0.0	10	0	0	10	0	10	0	0	0.0
February		3	0.33	3	0	0	3	0	3	0	0	0.0
March		10	0.09	10	0	0	10	0	10	0	0	0.0
April		20	0.05	20	0	0	20	0	20	0	0	0.0
May		6	0.0	6	0	0	6	0	6	0	0	0.0
June		10	0.0	10	0	0	10	0	10	0	0	0.0
July		16	0.0	16	0	0	16	0	16	0	0	0.0
August		15	0.0	15	0	0	15	0	15	0	0	0.0
September		12	0.0	12	0	0	12	0	12	0	0	0.0
October	(6th)	10	0.0	8	0	0	8	0	8	0	0	0.0
	(18th)	14	0.0	14	0	0	14	0	14	0	0	0.0

Table 121. Ectoparasite burden of <u>Peromyscus polionotus</u> (beach mice) live trapped on the Beach Grid, 1975-79. (Continued).

Month		No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
				0	1-5	>5	No	Yes	0	1-50	>50	
November	(1st)	14	0.0	14	0	0	14	0	14	0	0	0.0
	(15th)	17	0.0	17	0	0	17	0	17	0	0	0.0
December	(2nd)	20	0.05	20	0	0	19	1	20	0	0	0.10
	(15th)	22	0.05	21	0	0	21	0	21	0	0	0.05
<u>1979</u>												
January	(13th)	36	0.03	35	0	0	35	0	35	0	0	0.08
	(27th)	62	0.02	59	0	0	58	1	59	0	0	0.03
February	(15th)	67	0.01	66	0	0	65	1	66	0	0	0.01
March	(3rd)	65	0.02	65	0	0	65	0	65	0	0	0.00
	(20th)	59	0.00	59	0	0	59	0	59	0	0	0.00

Table 122. Ectoparasite burden of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Beach Grid, 1975-79.

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
1975											
July	10	0.0	0	0	0	0	0	10	0	0	0.0
August	11	0.0	0	0	0	0	0	11	0	0	0.0
September	5	0.2	0	0	0	0	0	5	0	0	0.0
1976											
July	3	0.0	2	1	0	3	0	3	0	0	0.0
August	6	0.0	6	0	0	6	0	6	0	0	0.0
September	6	0.0	6	0	0	6	0	6	0	0	0.0
October	8	0.12	5	3	0	7	1	8	0	0	0.0
November	11	1.0	9	2	0	8	3	11	0	0	0.0
December	10	0.2	6	2	1	6	3	10	0	0	0.0
1977											
January	6	0.0	6	0	0	6	0	5	1	0	0.0
February	7	0.71	1	6	0	7	0	7	0	0	0.0
March	3	0.0	1	2	0	3	0	3	0	0	0.0
April	4	0.0	0	4	0	3	0	3	0	0	0.0
May	5	0.40	2	3	0	4	1	5	0	0	0.0
June	6	0.0	5	0	0	5	0	5	0	0	0.0
July	7	0.0	7	0	0	7	0	7	0	0	0.0
August	5	0.20	5	0	0	5	0	5	0	0	0.0

Table 122. Ectoparasite burden of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Beach Grid, 1975-79. (Continued).

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas 0	1-5	>5	Mites No	Yes	Frequency No. of Chiggers 0	1-50	>50	Botflies Per Host
1977											
September	5	0.0	4	1	0	5	0	5	0	0	0.0
October	3	0.0	3	0	0	3	0	3	0	0	0.0
November	3	0.67	2	1	0	3	0	3	0	0	0.0
December	2	0.50	2	0	0	2	0	2	0	0	0.0
1978											
January	2	0.0	2	0	0	2	0	2	0	0	0.0
February	2	0.0	1	1	0	2	0	2	0	0	0.0
March	1	0.0	1	0	0	1	0	1	0	0	0.0
April	0	0.0	0	0	0	0	0	0	0	0	0.0
May	0	0.0	0	0	0	0	0	0	0	0	0.0
June	0	0.0	0	0	0	0	0	0	0	0	0.0
July	0	0.0	0	0	0	0	0	0	0	0	0.0
August	0	0.0	0	0	0	0	0	0	0	0	0.0
September	1	0.0	1	0	0	1	0	1	0	0	0.0
October (6th)	0	0.0	0	0	0	0	0	0	0	0	0.0
(18th)	0	0.0	0	0	0	0	0	0	0	0	0.0

Table 122. Ectoparasite burden of <u>Sigmodon</u> <u>hispidus</u> (cotton rats) live trapped on the Beach Grid, 1975-1979. (Continued).

Month		No. Examined	Ticks Per Host	Frequency No. of Fleas 0	1-5	>5	Mites No	Yes	Frequency No. of Chiggers 0	1-50	>50	Botflies Per Host
November	(1st)	0	0.0	0	0	0	0	0	0	0	0	0.0
	(15th)	1	0.0	1	0	0	0	1	1	0	0	0.0
December	(2nd)	2	0.0	2	0	0	2	0	2	0	0	0.0
	(15th)	0	0.0	0	0	0	0	0	0	0	0	0.0
<u>1979</u>												
January	(13th)	1	0.0	1	0	0	1	0	1	0	0	0.0
	(27th)	0	0.0	0	0	0	0	0	0	0	0	0.0
February	(15th)	1	0.0	1	0	0	1	0	1	0	0	0.0
March	(3rd)	2	0.0	2	0	0	2	0	2	0	0	0.0
	(20th)	2	-	-	-	-	-	-	-	-	-	-

Table 123. Mean distance (meters) between successive recaptures of small mammals on the Beach Grid. Animals included in the calculations had been captured four or more times. Sample size in parentheses.

Species	Sex	
	Male	Female
Peromyscus polionotus		
July 1976-Sept. 1978*	21.3 (13)	26.4 (15)
Oct. 1978-Mar. 1979**	14.0 (17)	16.9 (20)
Peromyscus gossypinus	44.6 (2)	16.8 (10)
Sigmodon hispidus	- (0)	28.3 (5)

* Trapped once per month.

** Trapped twice per month.

Table 124. Reproductive status of male <u>Sigmodon hispidus</u> (cotton rats) on the Dune Scrub Grid, 1975-79. Individuals reported are 60 g or greater in body weight

Month	Position of Testes (%)		
	Abdominal	Descended	Intermediate
1975			
July	0.0 (0)[a]	100.0 (1)	0.0 (0)
August	0.0 (0)	66.7 (2)	33.3 (1)
September	0.0 (0)	0.0 (0)	0.0 (0)
1976			
July	30.0 (3)	70.0 (7)	0.0 (0)
August	0.0 (0)	100.0 (9)	0.0 (0)
September	22.2 (2)	77.7 (7)	0.0 (0)
October	0.0 (0)	100.0 (9)	0.0 (0)
November	20.0 (2)	60.0 (6)	20.0 (2)
December	100.0 (8)	0.0 (0)	0.0 (0)
1977			
January	100.0 (4)	0.0 (0)	0.0 (0)
February	100.0 (6)	0.0 (0)	0.0 (0)
March	100.0 (3)	0.0 (0)	0.0 (0)
April	50.0 (1)	50.0 (1)	0.0 (0)
May	50.0 (1)	50.0 (1)	0.0 (0)
June	0.0 (0)	0.0 (0)	0.0 (0)
July	0.0 (0)	100.0 (2)	0.0 (0)
August	0.0 (0)	100.0 (1)	0.0 (0)
September	0.0 (0)	100.0 (1)	0.0 (0)
October	0.0 (0)	100.0 (3)	0.0 (0)
November	0.0 (0)	100.0 (2)	0.0 (0)
December	62.5 (5)	37.5 (3)	0.0 (0)

[a]Sample Size

Table 124. Reproductive status of male *Sigmodon hispidus* (cotton rats) on the Dune Scrub Grid, 1975-79. Individuals reported are 60 g or greater in body weight. (Continued).

Month	Position of Testes (%)		
	Abdominal	Descended	Intermediate
1978			
January	100.0 (1)[a]	0.0 (0)	0.0 (0)
February	100.0 (1)	0.0 (0)	0.0 (0)
March	100.0 (1)	0.0 (0)	0.0 (0)
April	100.0 (1)	0.0 (0)	0.0 (0)
May	0.0 (0)	100.0 (1)	0.0 (0)
June	100.0 (1)	0.0 (0)	0.0 (0)
July	0.0 (0)	0.0 (0)	0.0 (0)
August	0.0 (0)	0.0 (0)	0.0 (0)
September	0.0 (0)	0.0 (0)	0.0 (0)
October	0.0 (0)	0.0 (0)	0.0 (0)
November	0.0 (0)	0.0 (0)	0.0 (0)
December	0.0 (0)	0.0 (0)	0.0 (0)
1979			
January	0.0 (0)	0.0 (0)	0.0 (0)
February	0.0 (0)	0.0 (0)	0.0 (0)
March	0.0 (0)	0.0 (0)	0.0 (0)

[a]Sample Size

Table 125. Reproductive status of male Peromyscus polionotus (beach mice) on the Dune Scrub Grid, 1975-79. Individuals reported are 10 g or greater in body weight.

Month	Position of Testes (%)					
	Abdominal		Descended		Intermediate	
1975						
July	50.0	(1)[a]	50.0	(1)	0.0	(0)
August	100.0	(1)	0.0	(0)	0.0	(0)
September	0.0	(0)	0.0	(0)	0.0	(0)
1976						
July	0.0	(0)	100.0	(2)	0.0	(0)
August	0.0	(0)	100.0	(3)	0.0	(0)
September	0.0	(0)	100.0	(2)	0.0	(0)
October	0.0	(0)	0.0	(0)	0.0	(0)
November	75.0	(3)	25.0	(1)	0.0	(0)
December	0.0	(0)	75.0	(3)	25.0	(1)
1977						
January	33.3	(1)	0.0	(0)	66.7	(2)
February	100.0	(2)	0.0	(0)	0.0	(0)
March	100.0	(5)	0.0	(0)	0.0	(0)
April	100.0	(7)	0.0	(0)	0.0	(0)
May	55.5	(10)	16.7	(3)	27.8	(5)
June	50.0	(3)	16.7	(1)	33.3	(2)
July	0.0	(0)	60.0	(3)	40.0	(2)
August	0.0	(0)	100.0	(4)	0.0	(0)
September	0.0	(0)	100.0	(2)	0.0	(0)
October	0.0	(0)	100.0	(3)	0.0	(0)
November	0.0	(0)	100.0	(7)	0.0	(0)
December	0.0	(0)	100.0	(5)	0.0	(0)

[a]Sample Size

Table 125. Reproductive status of male *Peromyscus polionotus* (beach mice) on the Dune Scrub Grid, 1975-79. Individuals reported are 10 g or greater in body weight. (Continued).

Month	Position of Testes (%)		
	Abdominal	Descended	Intermediate
1978			
January	33.3 (1)[a]	66.6 (2)	0.0 (0)
February	100.0 (1)	0.0 (0)	0.0 (0)
March	25.0 (1)	25.0 (1)	50.0 (2)
April	0.0 (0)	88.9 (8)	11.1 (1)
May	40.0 (2)	40.0 (2)	20.0 (1)
June	16.7 (1)	66.7 (4)	16.7 (1)
July	50.0 (1)	50.0 (1)	0.0 (1)
August	0.0 (0)	66.7 (2)	33.3 (1)
September	0.0 (0)	0.0 (0)	0.0 (0)
October	0.0 (0)	0.0 (0)	100.0 (1)
November	0.0 (0)	0.0 (0)	100.0 (3)
December	0.0 (0)	0.0 (0)	0.0 (0)
1979			
January	0.0 (0)	100.0 (1)	0.0 (0)
February	50.0 (2)	25.0 (1)	25.0 (1)
March	40.0 (2)	0.0 (0)	60.0 (3)

[a]Sample Size

Table 126. Sex ratio of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Dune Scrub Grid, 1975-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at p <.05.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1975					
July	3 (2 sexed)	1	1	1.00	0.50
August	4	3	1	3.00	0.25
September	0	-	-	-	-
1976					
July	16	10	6	1.66	0.56
August	12	9	3	3.00	2.08
September	16	9	7	1.30	0.06
October	15	10	5	2.00	1.07
November	16	12	4	3.00	3.06
December	18	10	8	1.30	0.06
1977					
January	14	7	7	1.00	0.07
February	15	6	9	0.66	0.27
March	11	4	7	0.57	0.36
April	5	2	3	0.66	0.00
May	7	2	5	0.40	0.57
June	2	2	0	0.00	0.50
July	3	3	0	0.00	1.33
August	2	1	1	1.00	0.50
September	1	1	0	0.00	0.00
October	4	3	1	3.00	0.25
November	9	6	3	2.00	0.44
December	14	9	5	1.80	0.64

Table 126. Sex ratio of _Sigmodon hispidus_ (cotton rats) live trapped on the Dune Scrub Grid, 1975-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at p <.05. (Continued).

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1978					
January	3	1	2	0.50	0.00
February	4	1	3	0.33	0.25
March	2	1	1	1.00	0.50
April	1	1	0	0.00	0.00
May	1	1	0	0.00	0.00
June	1	1	0	0.00	0.00
July	0	-	-	-	-
August	0	-	-	-	-
September	0	-	-	-	-
October	0	-	-	-	-
November	0	-	-	-	-
December	0	-	-	-	-
1979					
January	0	-	-	-	-
February	3	1	2	0.50	0.00
March	1	0	1	0.00	0.00

Table 127. Sex ratio of Peromyscus polionotus (beach mice) live trapped on the Dune Scrub Grid, 1975-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$.

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1975					
July	5	2	3	0.66	0.00
August	5	1	4	0.25	0.80
September	2	0	2	0.00	0.50
1976					
July	2	2	0	0.00	0.50
August	3	3	0	0.00	1.33
September	2	2	0	0.00	0.50
October	0	0	0	0.00	-
November	5	4	1	4.00	0.80
December	9	4	5	0.80	0.00
1977					
January	6	3	3	1.00	0.17
February	8	2	6	0.33	1.13
March	10	5	5	1.00	0.10
April	14	7	7	1.00	0.07
May	28	18	10	1.80	1.75
June	14	6	8	0.75	0.07
July	8	6	2	3.00	1.13
August	6	4	2	2.00	0.17
September	5	2	3	0.66	0.00
October	5	3	2	1.50	0.00
November	11	7	4	1.80	0.36
December	12	5	7	0.71	0.08

Table 127. Sex ratio of Peromyscus polionotus (beach mice) live trapped on the Dune Scrub Grid, 1975-79. The Yate's correction factor has been employed. * indicates a significant Chi-square at $p < .05$. (Continued).

Month	No. Caught	Male	Female	Ratio	Chi-square Value
1978					
January	6	3	3	1.00	0.17
February	6	1	5	0.20	1.50
March	6	5	1	5.00	1.50
April	15	9	6	1.50	0.27
May	8	5	3	1.70	0.13
June	12	7	5	1.40	0.08
July	5	2	3	0.67	0.00
August	5	3	2	1.50	0.00
September	1	0	1	0.00	0.00
October	1	1	0	0.00	0.00
November	6	3	3	1.00	0.17
December	3	0	3	0.00	1.33
1979					
January	2	1	1	1.00	0.50
February	11	4	7	0.57	0.36
March	7	5	2	2.50	0.57

Table 123. Age structure of cotton rats based on weight classes: 0-60 g, juvenile; 61-100 g, subadult; greater than 100 g, adult. Data are from Dune Scrub Grid July to September 1975 and July 1976 to March 1979. Sample size in parentheses.

Month	% Weight Class 0 - 60		61 - 100		> 100	
<u>1975</u>						
July	0	(0)	100	(2)	0	(0)
August	0	(0)	50	(2)	50	(2)
September	0	(0)	0	(0)	0	(0)
<u>1976</u>						
July	0	(0)	56	(9)	43	(7)
August	0	(0)	8	(1)	91	(11)
September	12	(2)	12	(2)	75	(12)
October	6	(1)	6	(1)	86	(13)
November	12	(2)	0	(0)	87	(14)
December	18	(3)	18	(3)	62	(10)
<u>1977</u>						
January	0	(0)	55	(5)	44	(4)
February	0	(0)	57	(8)	42	(6)
March	9	(1)	63	(7)	27	(3)
April	0	(0)	40	(2)	60	(3)
May	0	(0)	42	(3)	57	(4)
June	0	(0)	0	(0)	0	(0)
July	0	(0)	50	(1)	50	(1)
August	0	(0)	0	(0)	100	(1)
September	0	(0)	0	(0)	100	(1)
October	0	(0)	25	(1)	75	(3)
November	44	(4)	22	(2)	33	(3)
December	9	(1)	45	(5)	45	(5)

Table 128. Age structure of cotton rats based on weight classes: 0-60 g, juvenile; 61-100 g, subadult; greater than 100 g, adult. Data are from Dune Scrub Grid July to September 1975 and July 1976 to March 1979. Sample size in parentheses. (Continued).

	% Weight Class					
Month	0 - 60		61 - 100		> 100	
1978						
January	33	(1)	0	(0)	66	(2)
February	25	(1)	75	(3)	0	(0)
March	0	(0)	100	(2)	0	(0)
April	0	(0)	100	(1)	0	(0)
May	0	(0)	0	(0)	100	(1)
June	0	(0)	0	(0)	100	(1)
July	0	(0)	0	(0)	0	(0)
August	0	(0)	0	(0)	0	(0)
September	0	(0)	0	(0)	0	(0)
October	0	(0)	0	(0)	0	(0)
November	0	(0)	0	(0)	0	(0)
December	0	(0)	0	(0)	0	(0)
1979						
January	0	(0)	0	(0)	0	(0)
February	66	(2)	0	(0)	33	(1)
March	0	(0)	0	(0)	100	(1)

Table 129. Age structure of beach mice based on pelage classes. Data are from Dune Scrub Grid, July 1976 to March 1979. Sample size in parentheses.

Month	% Pelage Class					
	Juvenile		Subadult		Adult	
1976						
July	0	(0)	0	(0)	100	(2)
August	0	(0)	0	(0)	100	(3)
September	0	(0)	50	(1)	50	(1)
October	0	(0)	0	(0)	0	(0)
November	0	(0)	60	(3)	40	(2)
December	11	(1)	55	(5)	33	(3)
1977						
January	0	(0)	83	(5)	16	(1)
February	0	(0)	75	(6)	25	(2)
March	0	(0)	30	(3)	70	(7)
April	0	(0)	14	(2)	85	(12)
May	0	(0)	21	(6)	78	(22)
June	0	(0)	14	(2)	85	(12)
July	0	(0)	0	(0)	100	(8)
August	0	(0)	0	(0)	100	(6)
September	0	(0)	20	(1)	80	(4)
October	0	(0)	20	(1)	80	(4)
November	9	(1)	9	(1)	81	(9)
December	0	(0)	0	(0)	100	(12)
1978						
January	0	(0)	0	(0)	100	(6)
February	0	(0)	0	(0)	100	(6)
March	0	(0)	0	(0)	100	(5)
April	0	(0)	0	(0)	100	(15)
May	0	(0)	12	(1)	87	(7)

Table 129. Age structure of beach mice based on pelage classes. Data are from Dune Scrub Grid, July 1976 to March 1979. Sample size in parentheses. (Continued).

	% Pelage Class					
Month	Juvenile		Subadult		Adult	
1978						
June	0	(0)	0	(0)	100	(12)
July	0	(0)	0	(0)	100	(5)
August	0	(0)	0	(0)	100	(5)
September	0	(0)	0	(0)	100	(1)
October	0	(0)	100	(1)	0	(0)
November	0	(0)	16	(1)	83	(5)
December	0	(0)	33	(1)	66	(2)
1979						
January	0	(0)	0	(0)	100	(2)
February	0	(0)	0	(0)	100	(11)
March	14	(1)	0	(0)	85	(6)

Table 130. Ectoparasite burden of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Dune Scrub Grid, 1975-79.

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
1975											
July	3	0.0	-	-	-	-	-	1	2	0	0.0
August	4	0.0	-	-	-	-	-	4	0	0	0.0
September	0	0.0	-	-	-	-	-	-	-	-	0.0
1976											
July	16	0.06	9	7	0	16	0	13	3	0	0.0
August	12	0.00	10	2	0	12	0	1	10	1	0.0
September	16	0.38	14	2	0	16	0	10	6	0	0.0
October	15	0.66	12	3	0	15	0	7	7	1	0.0
November	16	0.18	11	5	0	12	4	11	5	0	0.0
December	21	0.28	12	8	0	20	0	20	0	0	0.0
1977											
January	14	0.14	8	6	0	14	0	14	0	0	0.0
February	15	0.20	9	6	0	15	0	15	0	0	0.0
March	11	0.0	9	2	0	11	0	11	0	0	0.0
April	5	0.0	1	4	0	4	1	5	0	0	0.0
May	7	0.0	2	5	0	5	2	4	3	0	0.0
June	2	0.0	1	0	0	1	0	1	0	0	0.0
July	3	0.0	2	0	0	1	1	1	0	1	0.0
August	2	0.0	1	0	0	1	0	0	1	0	0.0

Table 130. Ectoparasite burden of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Dune Scrub Grid, 1975-79. (Continued).

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
<u>1977</u>											
September	1	0.0	1	0	0	1	0	0	1	0	0.0
October	4	1.0	4	0	0	4	0	1	2	1	0.0
November	9	1.56	7	2	0	7	2	5	4	0	0.0
December	14	0.57	12	2	0	14	0	13	1	0	0.0
<u>1978</u>											
January	2	0.50	2	0	0	2	0	2	0	0	0.0
February	4	0.0	3	1	0	4	0	4	0	0	0.0
March	2	2.0	1	1	0	2	0	2	0	0	0.0
April	1	0.0	0	1	0	1	0	1	0	0	0.0
May	1	0.0	0	1	0	1	0	0	1	0	0.0
June	1	0.0	1	0	0	1	0	0	1	0	0.0
July	0	0.0	-	-	-	-	-	-	-	-	0.0
August	0	0.0	-	-	-	-	-	-	-	-	0.0
September	0	0.0	-	-	-	-	-	-	-	-	0.0
October	0	0.0	-	-	-	-	-	-	-	-	0.0
November	0	0.0	-	-	-	-	-	-	-	-	0.0
December	0	0.0	-	-	-	-	-	-	-	-	0.0

Table 130. Ectoparasite burden of <u>Sigmodon hispidus</u> (cotton rats) live trapped on the Dune Scrub Grid, 1975-79. (Continued).

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
<u>1979</u>											
January	0	0.0	-	-	-	-	-	-	-	-	0.0
February	3	0.33	3	0	0	3	0	3	0	0	0.0
March	1	0.0	1	0	0	1	0	1	0	0	0.0

9. Table 131. Ectoparasite burden of <u>Peromyscus polionotus</u> (beach mice) live trapped on the Dune Scrub Grid, 1975-79.

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas 0	1-5	>5	Mites No	Yes	Frequency No. of Chiggers 0	1-50	>50	Botflies Per Host
1975											
July	5	0.0	-	-	-	-	-	5	0	0	0.0
August	5	0.0	-	-	-	-	-	5	0	0	0.0
September	2	0.0	-	-	-	-	-	2	0	0	0.0
1976											
July	2	0.0	2	0	0	2	0	2	0	0	0.0
August	3	0.0	3	0	0	3	0	3	0	0	0.0
September	2	0.5	2	0	0	2	0	2	0	0	0.0
October	0	0.0	0	0	0	0	0	0	0	0	0.0
November	5	0.0	5	0	0	5	0	5	0	0	0.0
December	9	0.11	9	0	0	9	0	9	0	0	0.0
1977											
January	6	0.0	6	0	0	6	0	6	0	0	0.0
February	8	0.0	8	0	0	8	0	8	0	0	0.0
March	10	0.0	10	0	0	10	0	10	0	0	0.0
April	14	0.0	14	0	0	14	0	14	0	0	0.0
May	28	0.10	27	1	0	28	0	28	0	0	0.0
June	14	0.0	13	1	0	14	0	14	0	0	0.0
July	8	0.12	8	0	0	8	0	8	0	0	0.0
August	6	0.0	6	0	0	6	0	6	0	0	0.0

Table 131. Ectoparasite burden of <u>Peromyscus polionotus</u> (beach mice) live trapped on the Dune Scrub Grid, 1975-79. (Continued).

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas 0	1-5	>5	Mites No	Yes	Frequency No. of Chiggers 0	1-50	>50	Botflies Per Host
1977											
September	5	0.20	5	0	0	5	0	5	0	0	0.0
October	5	0.00	5	0	0	5	0	5	0	0	0.0
November	11	0.18	11	0	0	11	0	11	0	0	0.0
December	12	0.42	12	0	0	12	0	12	0	0	0.0
1978											
January	6	0.17	6	0	0	6	0	6	0	0	0.0
February	6	0.0	6	0	0	6	0	6	0	0	0.0
March	6	0.83	5	0	0	5	0	5	0	0	0.0
April	15	0.0	15	0	0	15	0	15	0	0	0.0
May	8	0.0	8	0	0	8	0	8	0	0	0.0
June	11	0.0	11	0	0	11	0	11	0	0	0.0
July	5	0.0	5	0	0	5	0	5	0	0	0.0
August	5	0.0	5	0	0	5	0	5	0	0	0.0
September	1	0.0	1	0	0	1	0	1	0	0	0.0
October	1	0.0	1	0	0	1	0	1	0	0	0.0
November	6	1.17	6	0	0	6	0	6	0	0	0.0
December	3	0.0	3	0	0	3	0	3	0	0	0.0

Table 131. Ectoparasite burden of Peromyscus polionotus (beach mice) live trapped on the Dune Scrub Grid, 1975-79. (Continued).

Month	No. Examined	Ticks Per Host	Frequency No. of Fleas			Mites		Frequency No. of Chiggers			Botflies Per Host
			0	1-5	>5	No	Yes	0	1-50	>50	
1979											
January	2	0.0	2	0	0	2	0	2	0	0	0.0
February	11	0.18	11	0	0	11	0	11	0	0	0.0
March	7	0.0	7	0	0	7	0	7	0	0	0.0

Table 132. Mean distance between recaptures of small mammals on the Dune Scrub Grid. Animals included in the calculations had been captured four or more times. Sample size in parentheses.

Species	Sex	
	Male	Female
Peromyscus polionotus	22.0 (12)*	34.2 (7)
Peromyscus gossypinus	36.7 (4)	29.9 (6)
Sigmodon hispidus	47.8 (12)**	24.0 (8)

* $t = -1.76$, $df = 17$, $p <.20$

** $t = 3.77$, $df = 18$, $p <.10$

APPENDIX FIGURES

PLANT COMMUNITY ANALYSIS

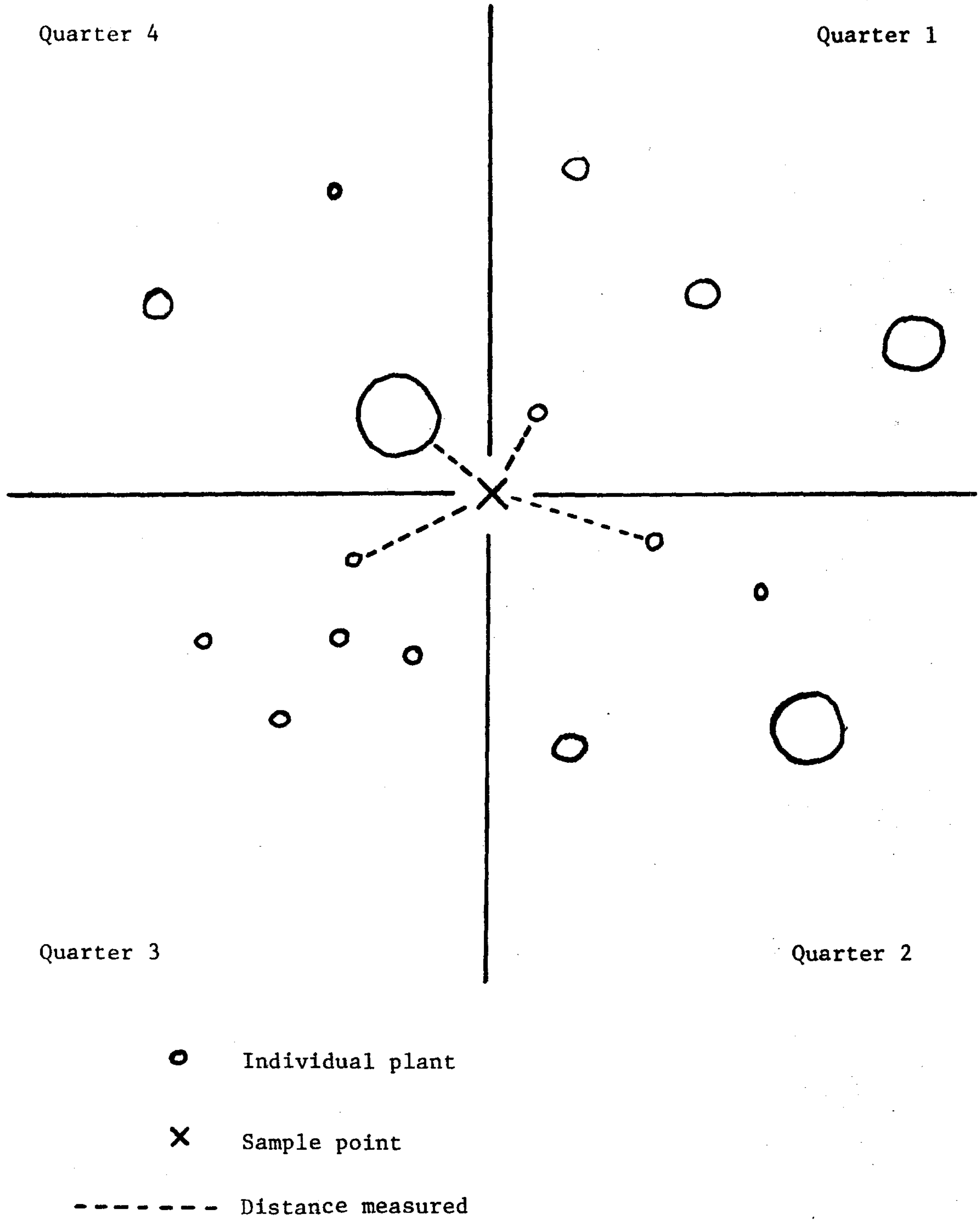


Figure 1.

Application of point-center quarter method to a hypothetical distribution of plants.

Figure 2.

Map of Vegetation of Merritt Island

To be inserted later

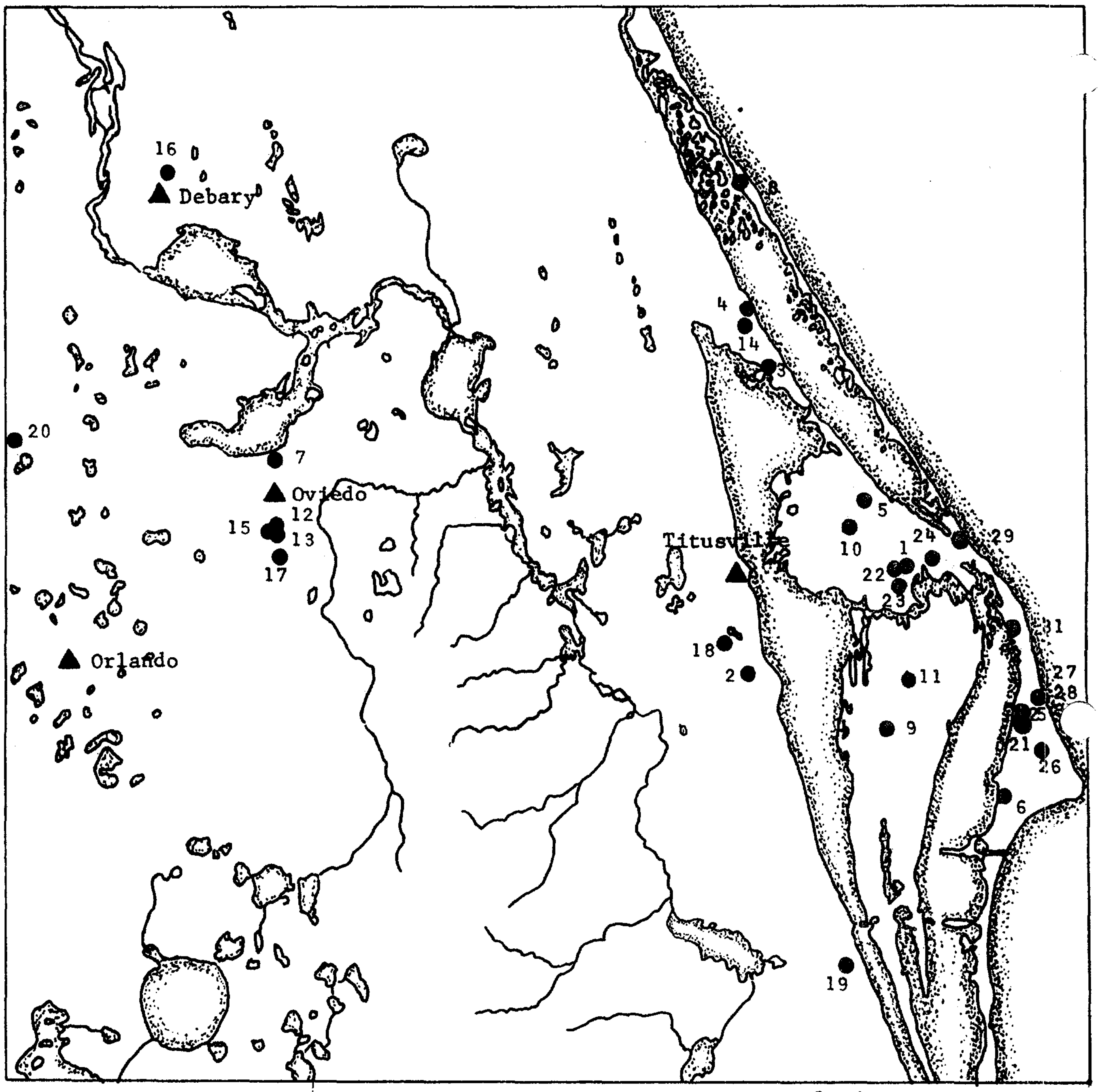


Figure 3. Location of stands sampled in the plant community analysis. 1 = Happy Hammock; 2 = Indian River Hammock; 3 = Juniper Hammock; 4 = Ross' Hammock; 5 = Route 3 Hammock; 6 = Indian Mound Hammock; 7 = Black Hammock; 8 = Castle Windy Hammock; 9 = Jerome Road Hammock; 10 = Wisconsin Village; 11 = Headquarters Pineland; 12 = UCF Pine Flatwoods; 13 = UCF Pond Pine Flatwoods; 14 = Volusia Pineland; 15 = UCF Sand Pine Scrub; 16 = Debary Sand Pine Scrub; 17 = Rt. 50 Sand Pine Scrub; 18 = Rt. 405 Sand Pine Scrub; 19 = Rockledge Scrub; 20 = Wekiva Sand Pine Scrub; 21 = Dune Scrub; 22 = Happy Creek Scrub; 23 = Rt. 3 Scrub; 24 = Ground Winds Tower Scrub; 25 = Cape Rosemary Scrub; 26 = Complex 34 Scrub; 27 = Beach Grid Zone 1; 28 = Beach Grid Zone 2; 29 = LC 39-B Beach; 30 = Beach Grid Zone 3; 31 = Canaveral Strand. (Adopted from USGS State of Florida Map, Scale 1:500,000. Edition 1967.) 1" = 8 miles.

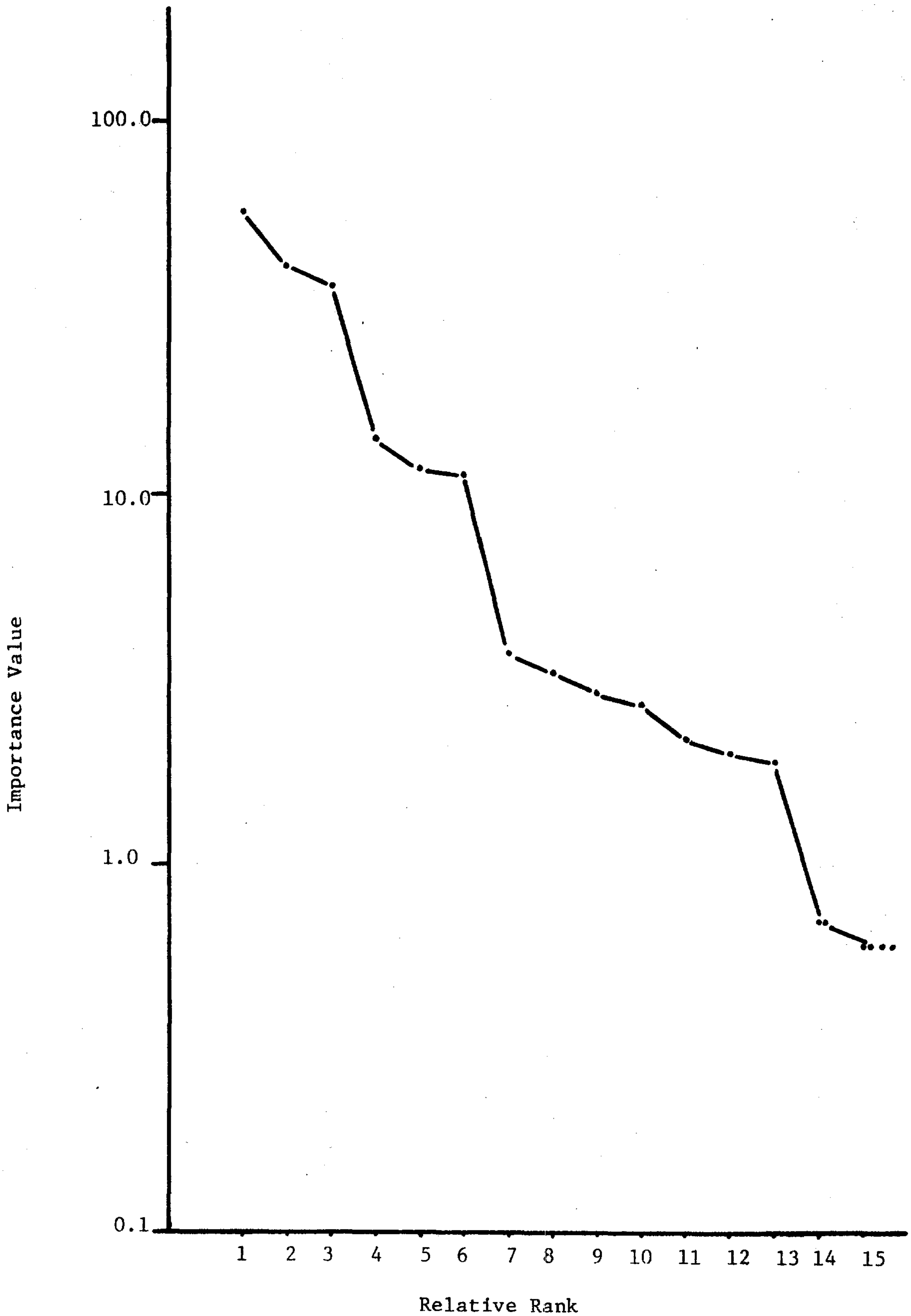


Figure 4. Dominance-diversity curve based on shrubs, vines and tree seedlings of Happy Hammock. Importance values are based on relative density and frequency, summer, 1976.

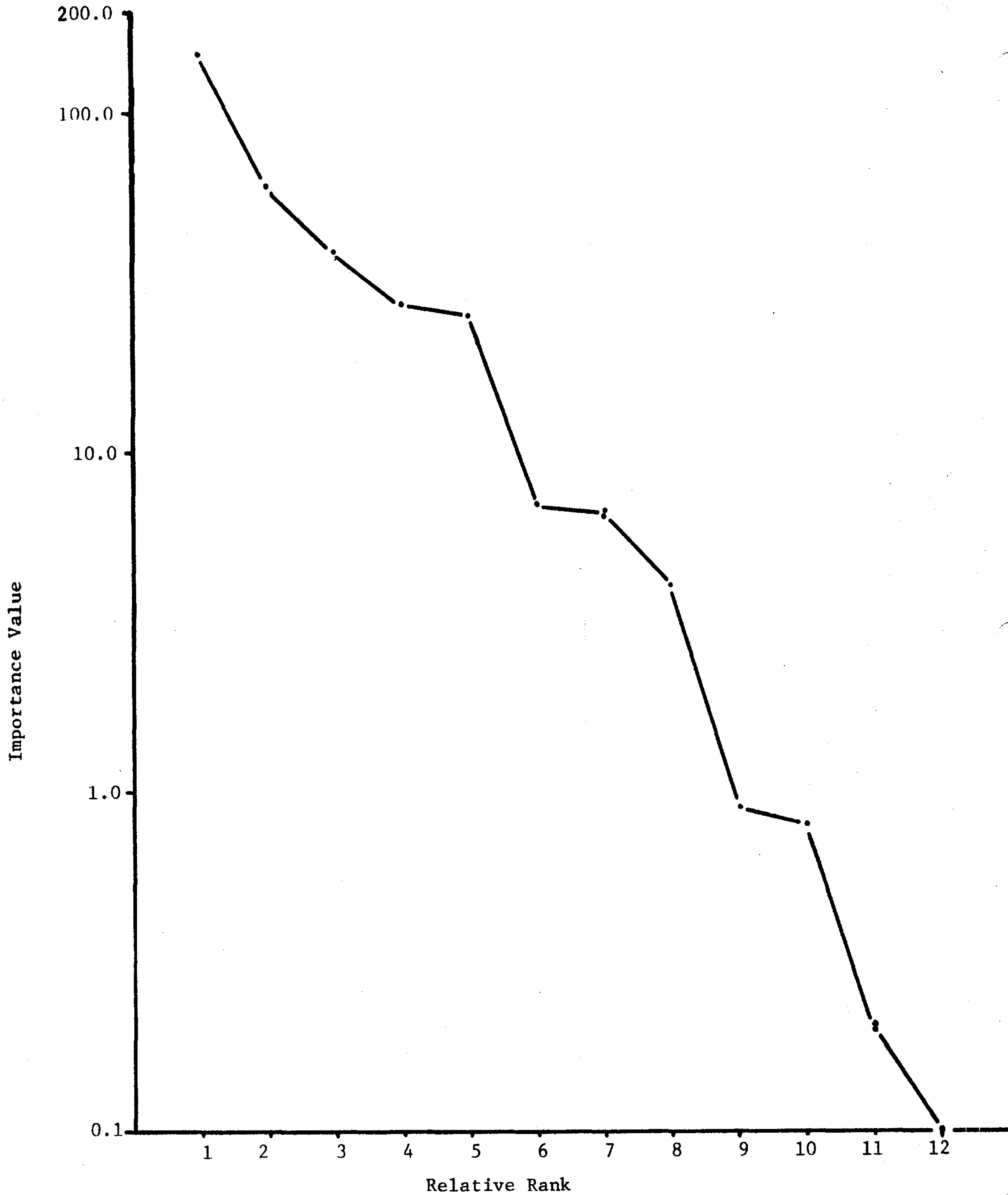


Figure 5. Dominance-diversity curve based on the tree species of Happy Hammock. Importance values are based on relative density, frequency and dominance (basal area), summer, 1976.

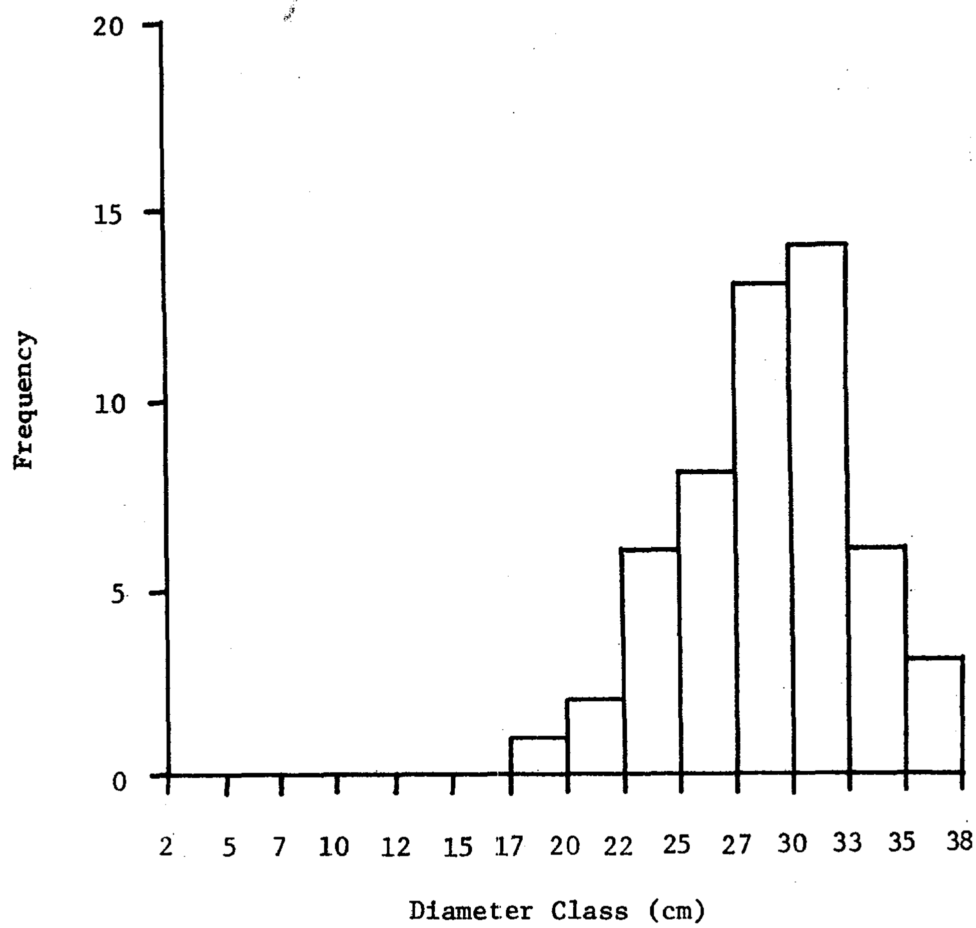


Figure 6. Size-frequency distribution of sabal palm on the Happy Hammock site.

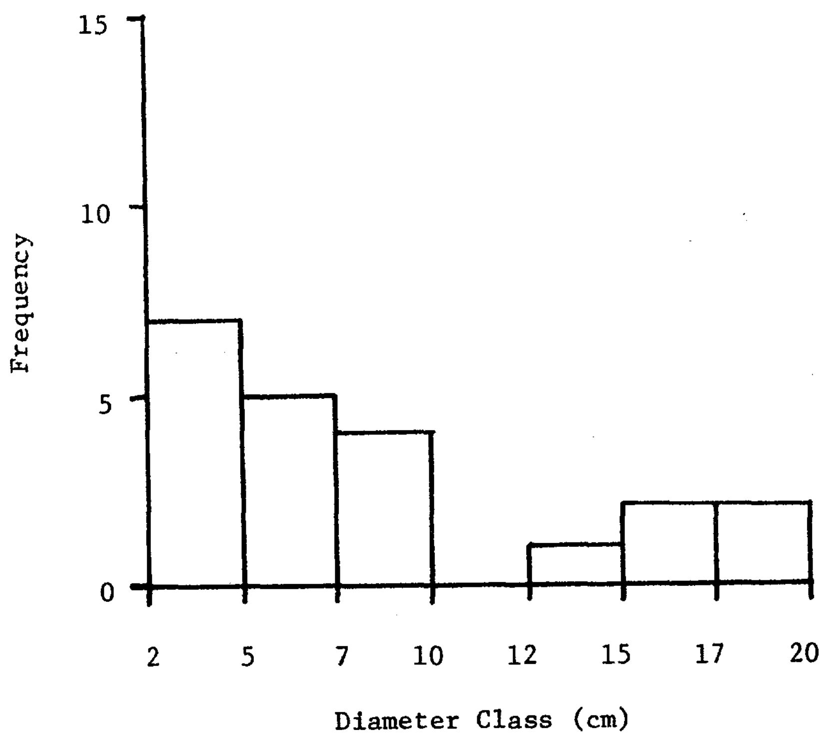


Figure 7. Size-frequency distribution of red mulberry on the Happy Hammock site.

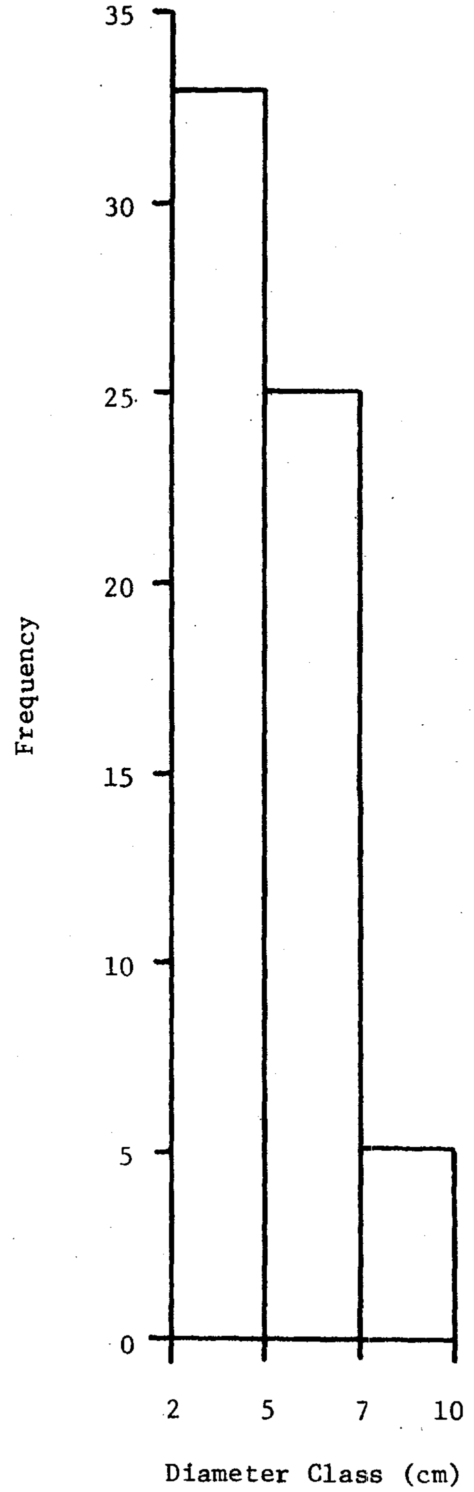


Figure 8. Size-frequency distribution of lancewood on the Happy Hammock site.

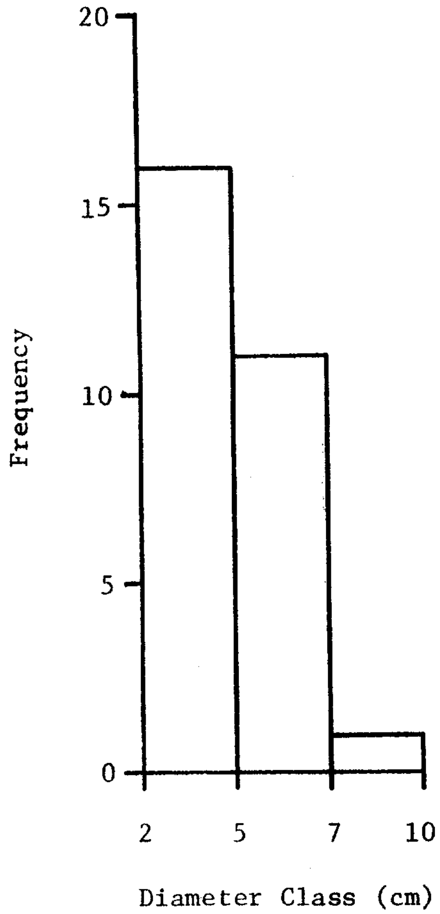


Figure 9. Size-frequency distribution of myrsine on the Happy Hammock site.

Figure 10. Dominance-diversity curve based on shrubs, vines and tree seedlings of Indian River Hammock. Importance values are based on relative density and frequency, summer, 1976.

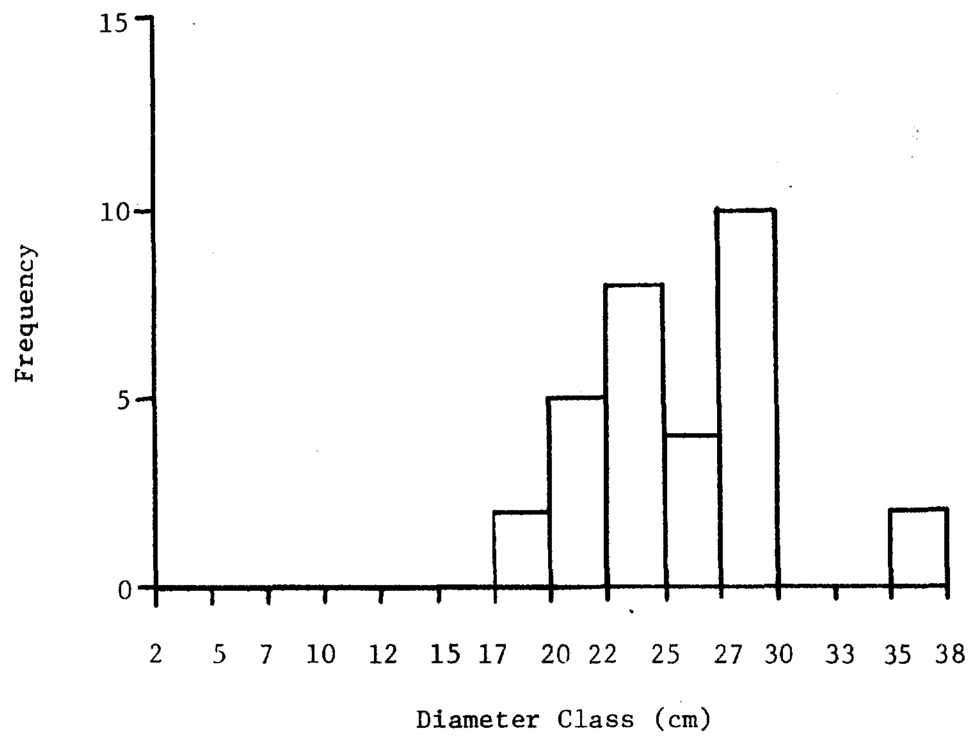


Figure 11. Size-frequency distribution of sabal palm on the Indian River Hammock site.

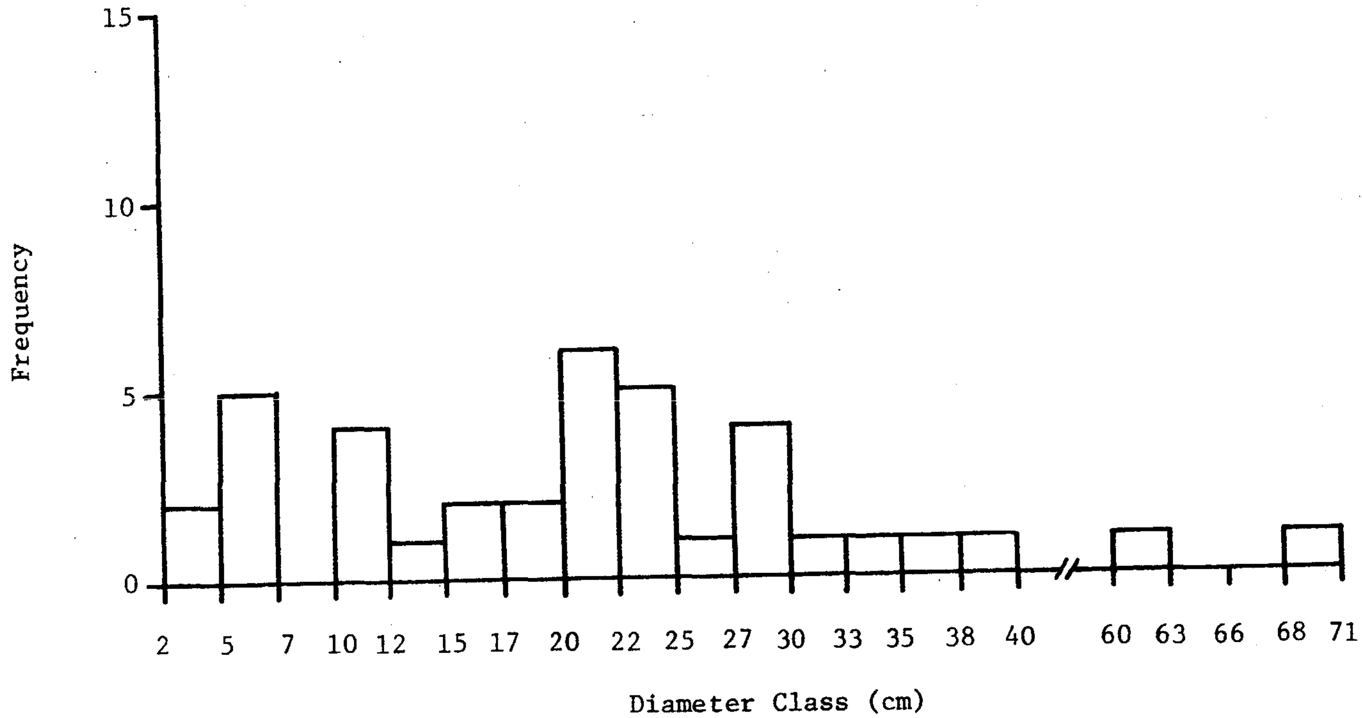


Figure 12. Size-frequency distribution of ash on the Indian River Hammock site.

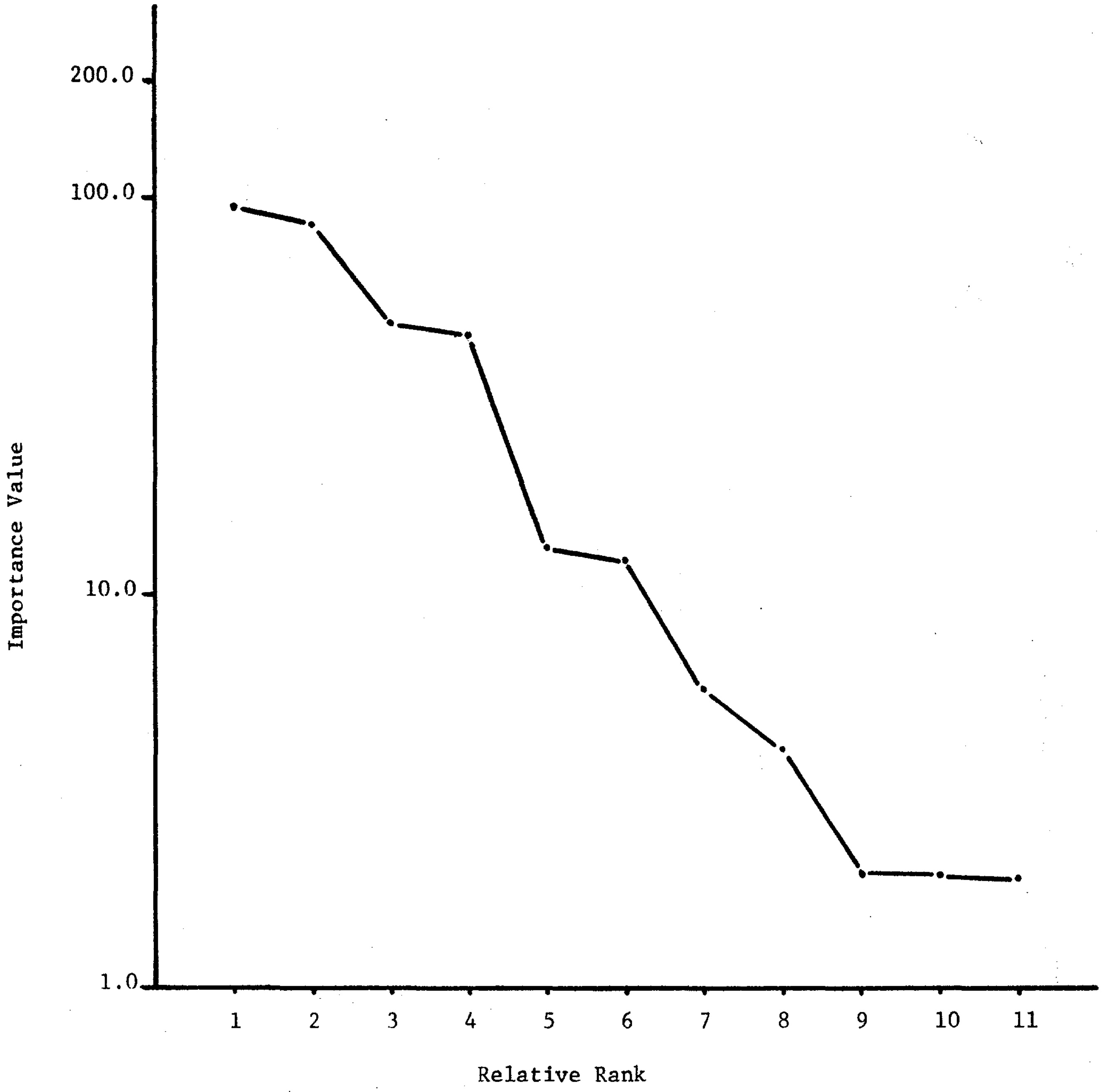


Figure 13. Dominance-diversity curve based on tree species of Indian River Hammock. Importance values are based on relative density, frequency and dominance (basal area), summer, 1976.

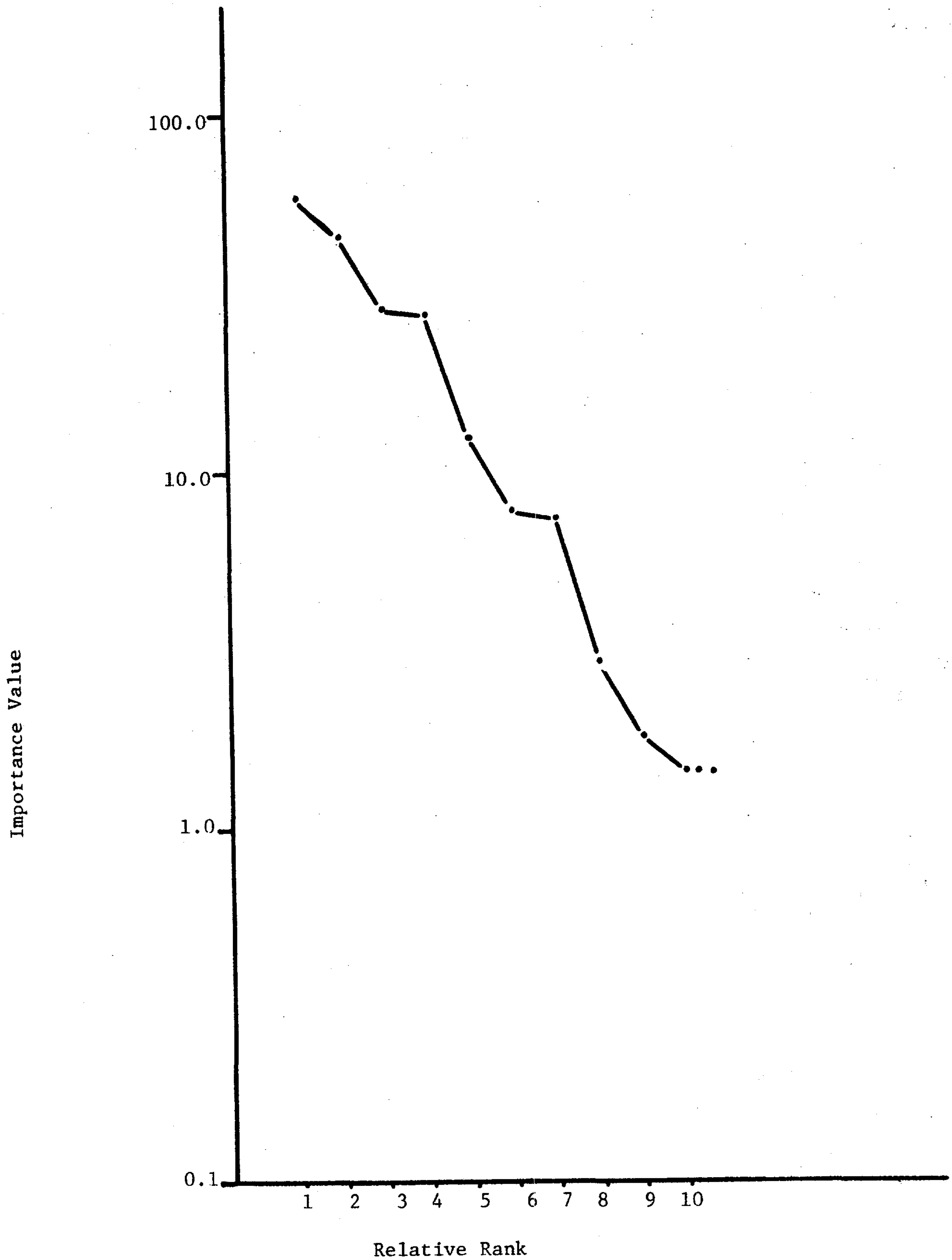


Figure 14. Dominance-diversity curve based on shrubs, vines and tree seedlings of Juniper Hammock. Importance values are based on relative density and frequency, summer, 1976.

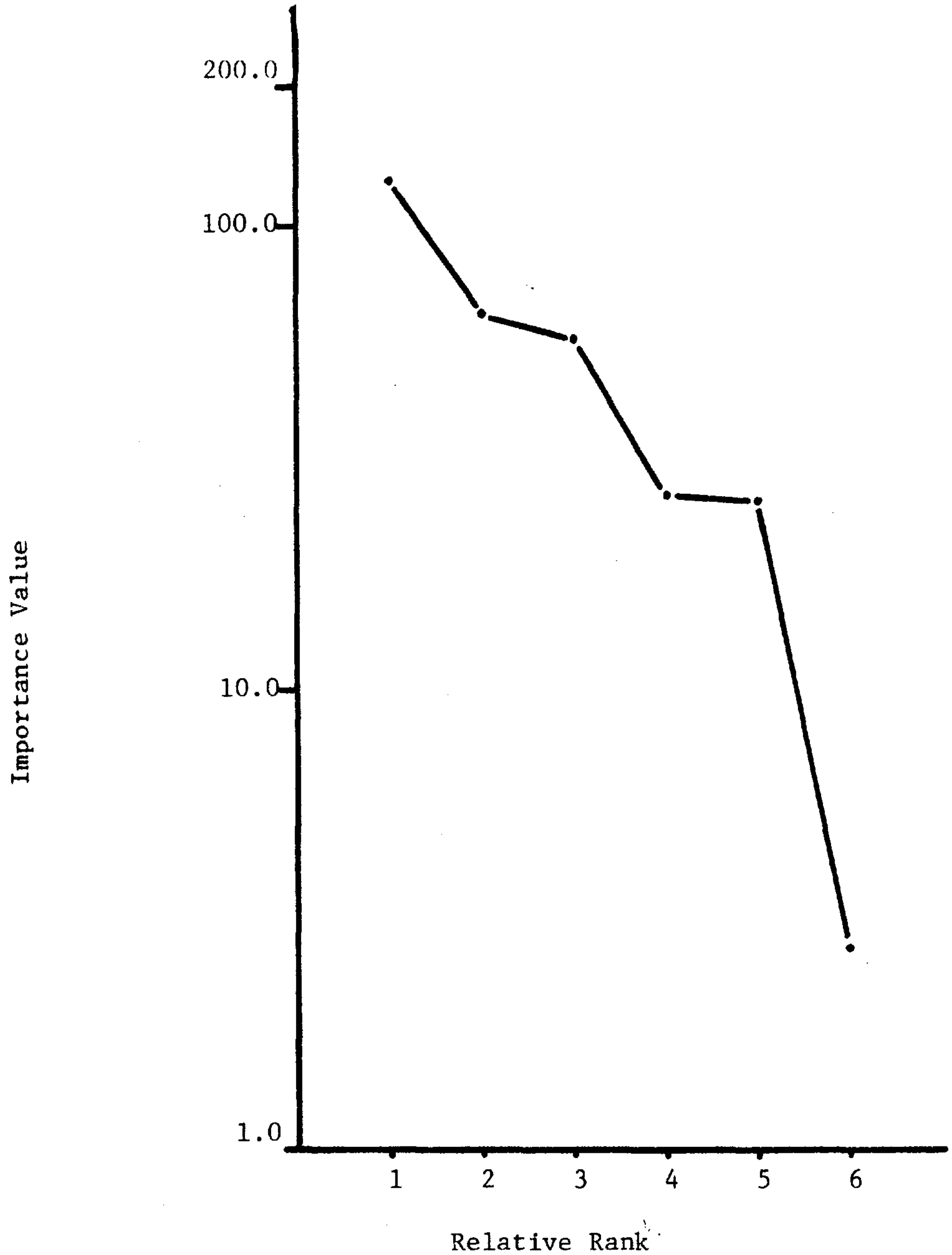


Figure 15. Dominance-diversity curve based on tree species of Juniper Hammock. Importance values are based on relative density, frequency and dominance (basal area), summer, 1976.

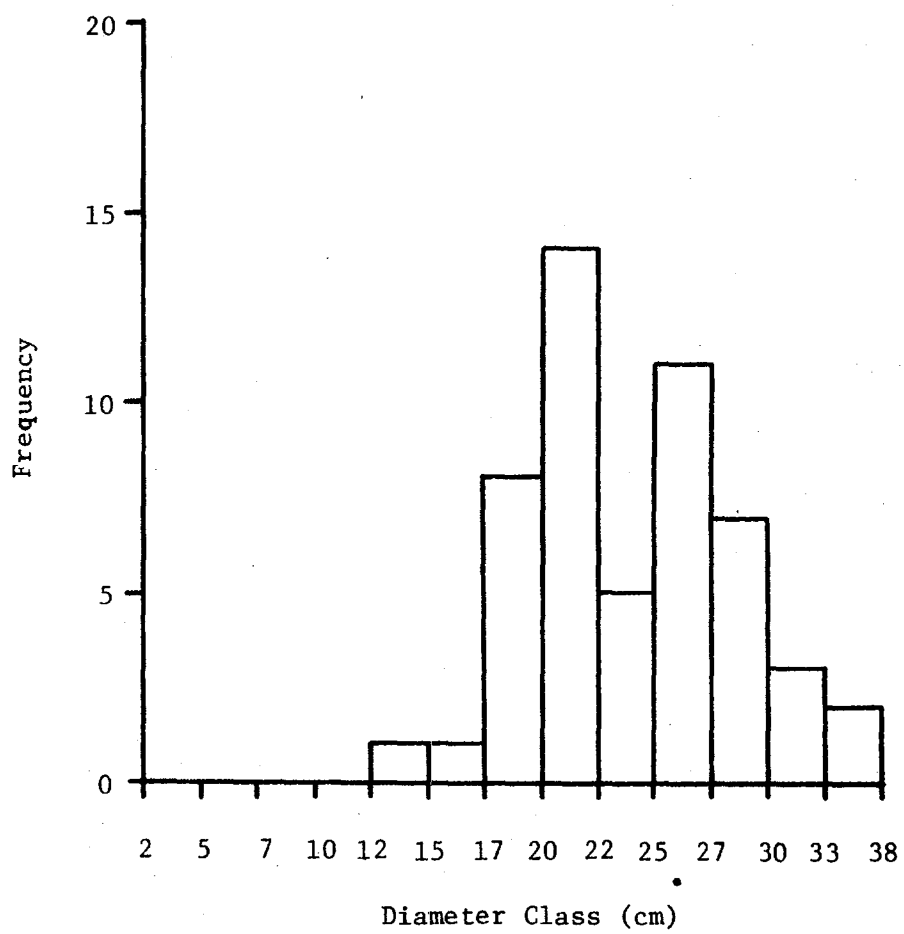


Figure 16. Size-frequency distribution of sabal palm on the Juniper Hammock site.

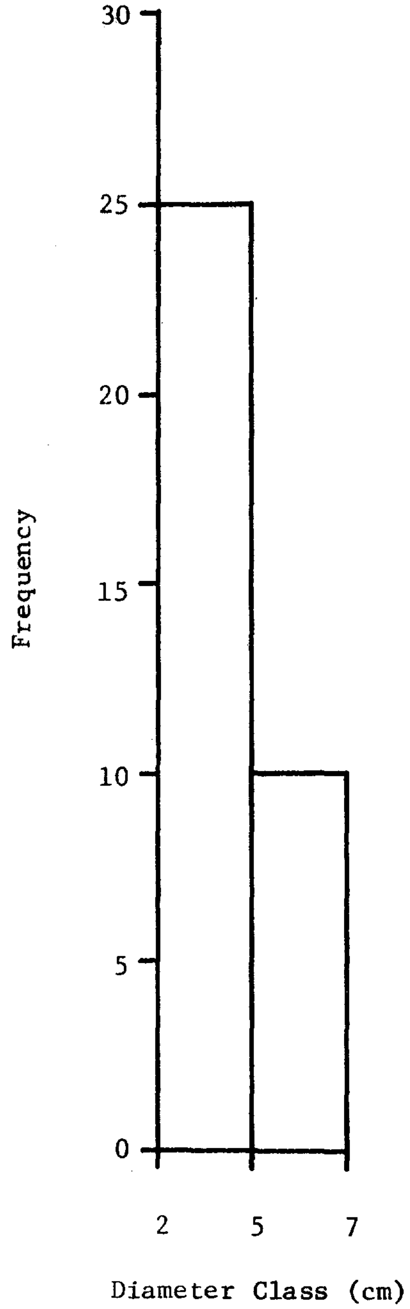


Figure 17. Size-frequency distribution of holly on the Juniper Hammock site.

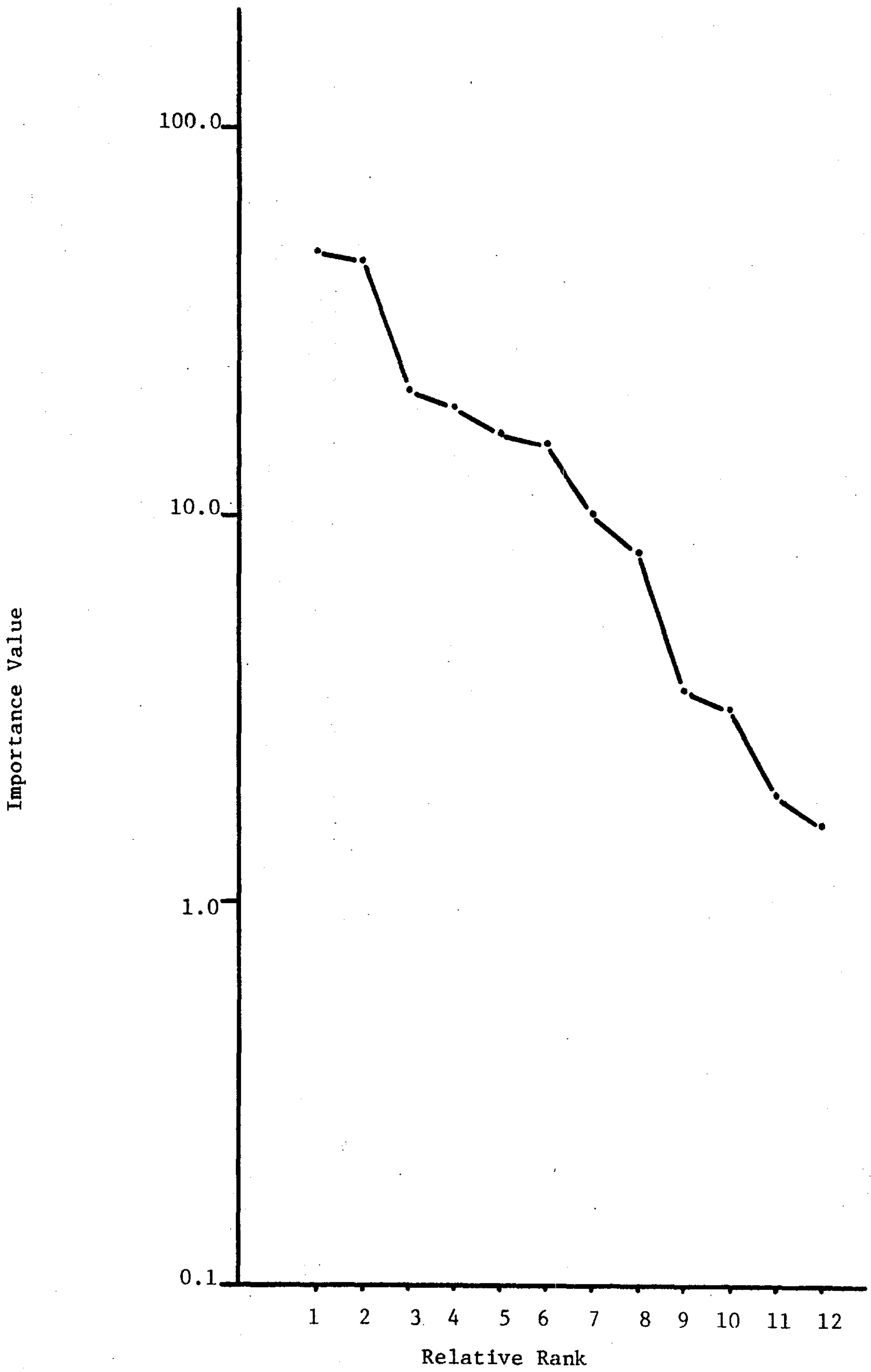


Figure 18. Dominance-diversity curve based on shrubs, vines and tree seedlings of Ross' Hammock. Importance values are based on relative density and frequency, summer, 1976.

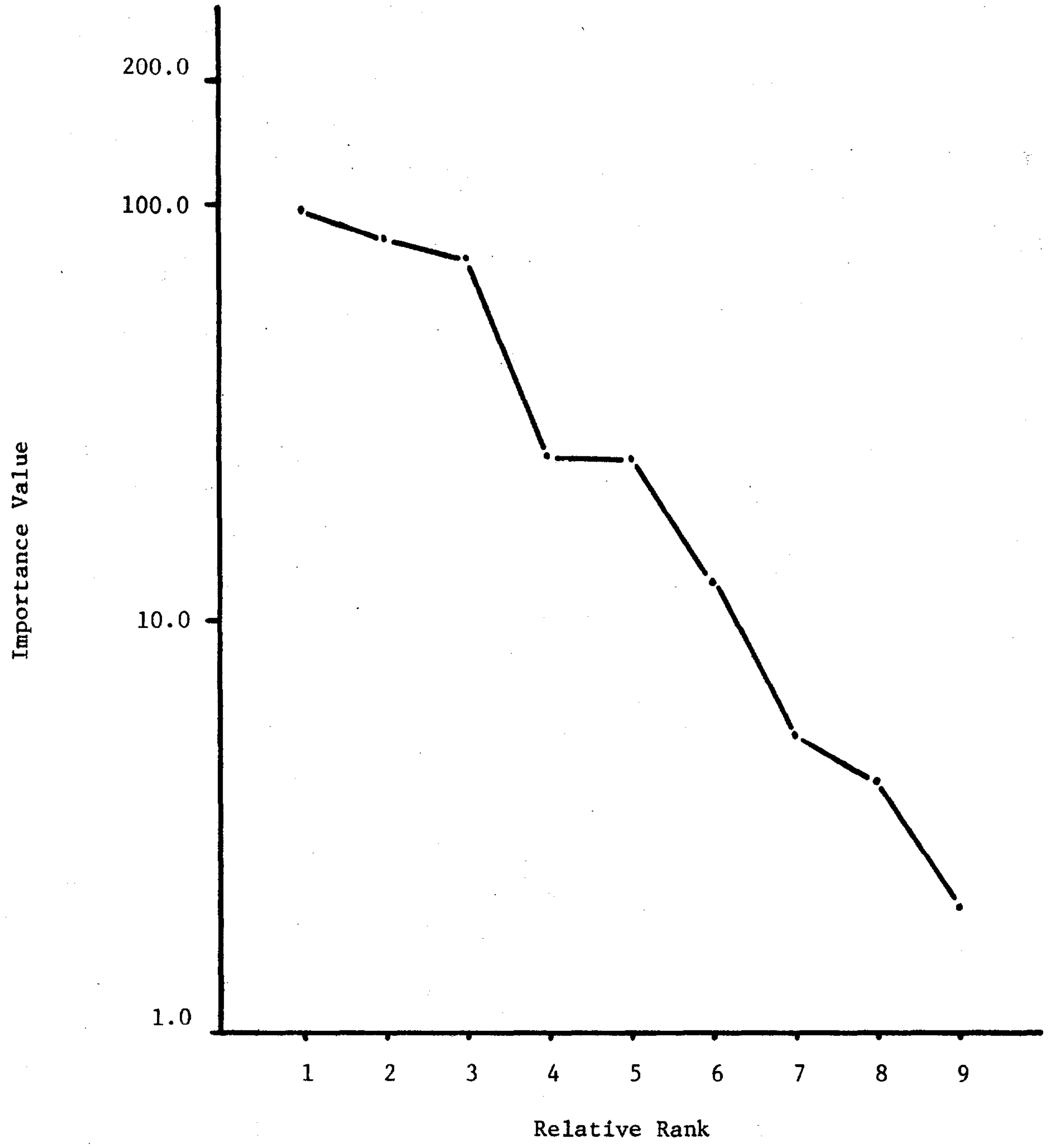


Figure 19. Dominance-diversity curve based on tree species of Ross' Hammock. Importance values are based on relative density, frequency and dominance (basal area), summer, 1976.

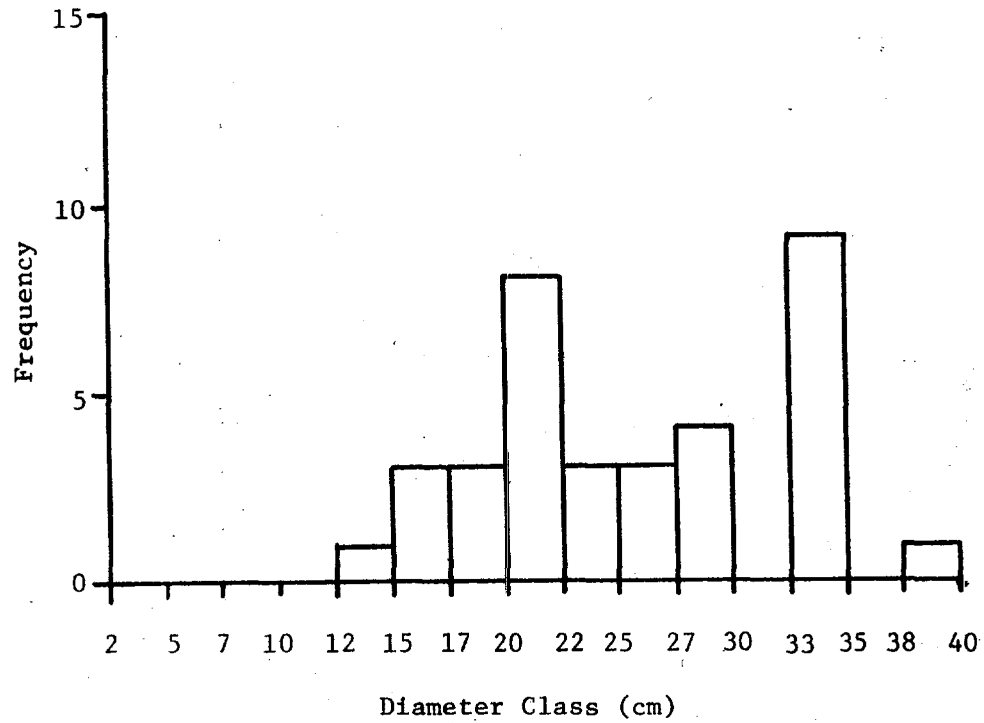


Figure 20. Size-frequency distribution of sabal palm on the Ross Hammock site.

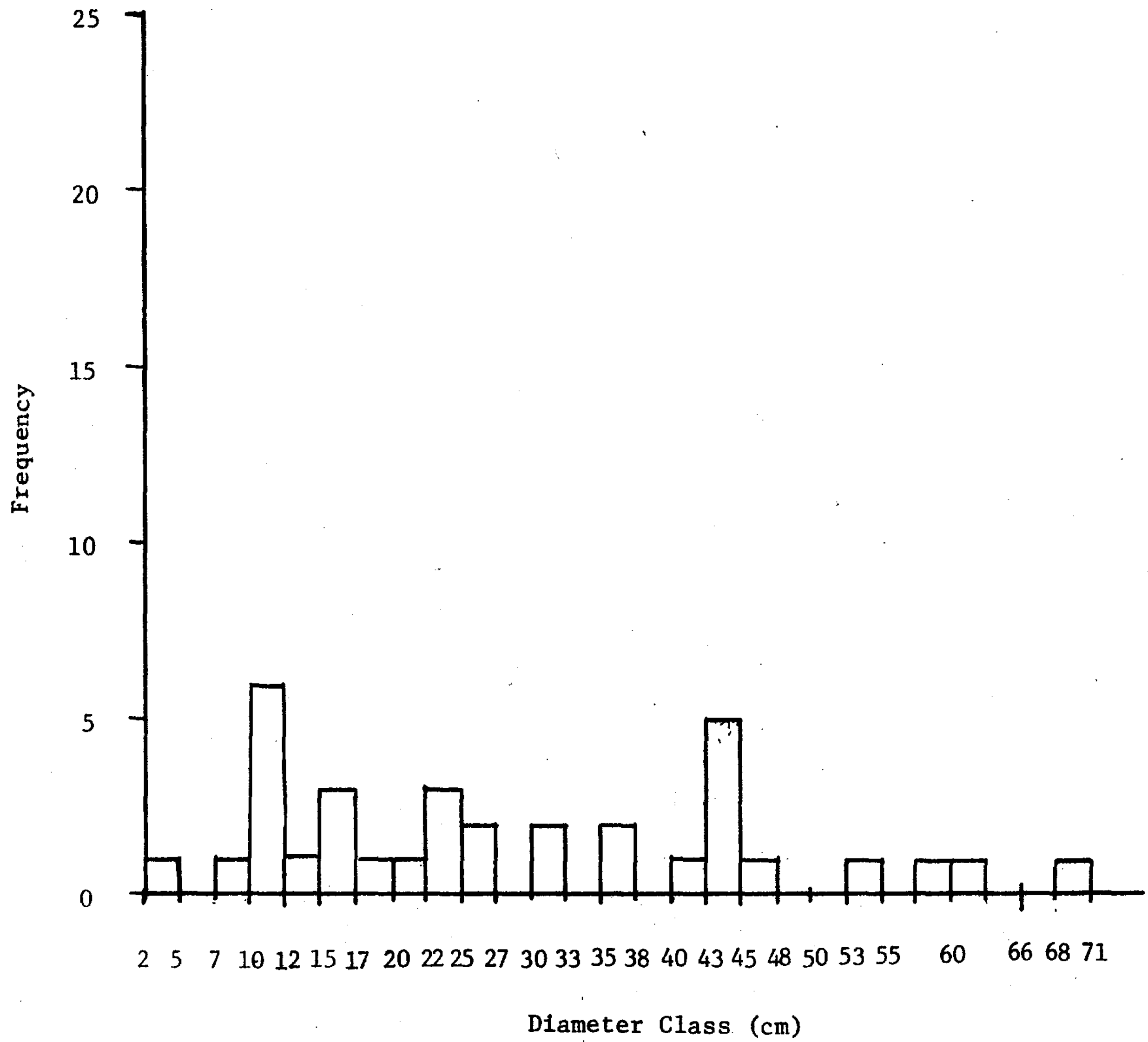


Figure 21. Size-frequency distribution of laurel oak on the Ross' Hammock site.

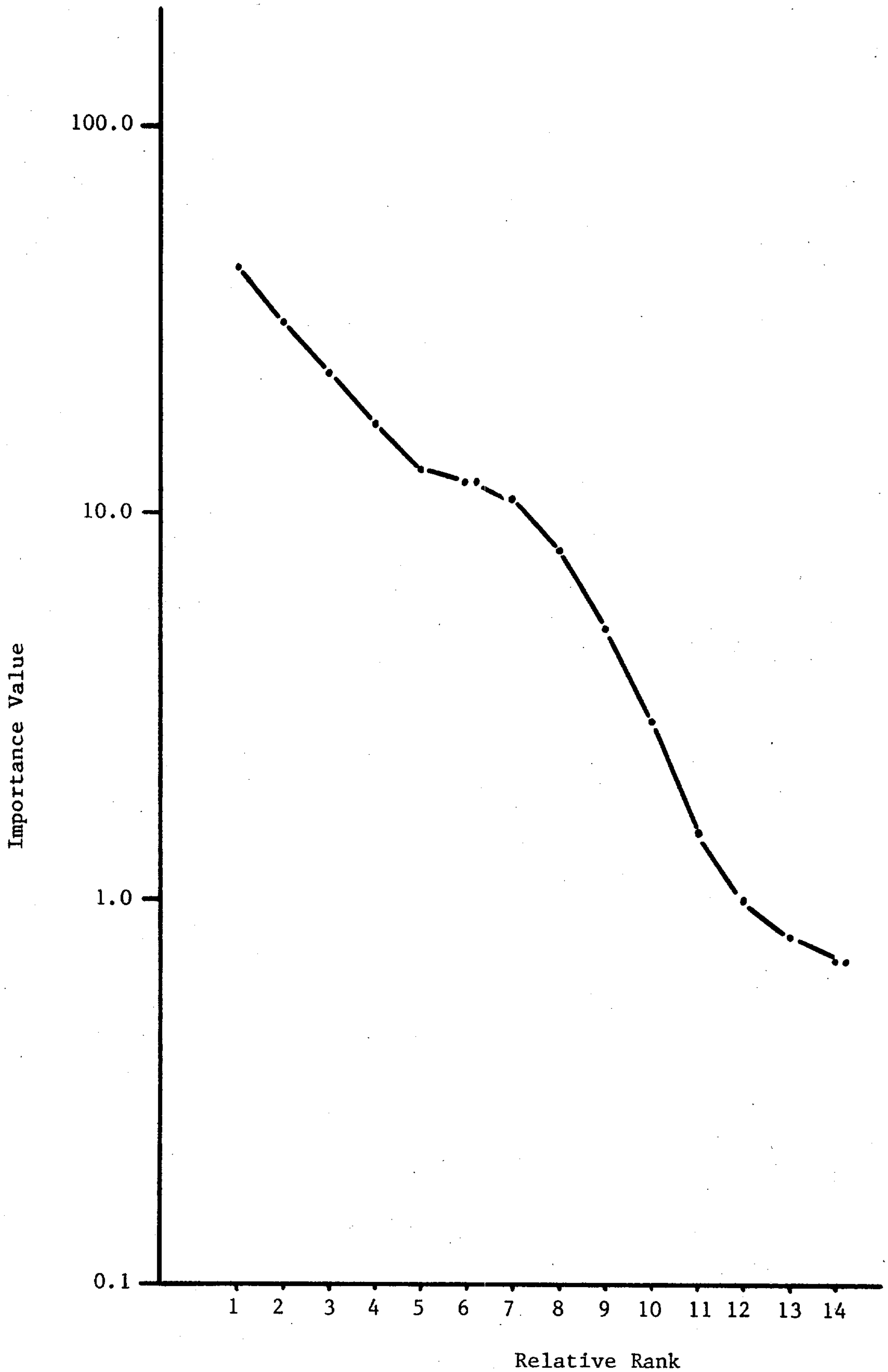


Figure 22. Dominance-diversity curve based on shrubs, vines and tree seedlings of of Route 3 Hammock. Importance values are based on relative density and frequency, summer, 1976.

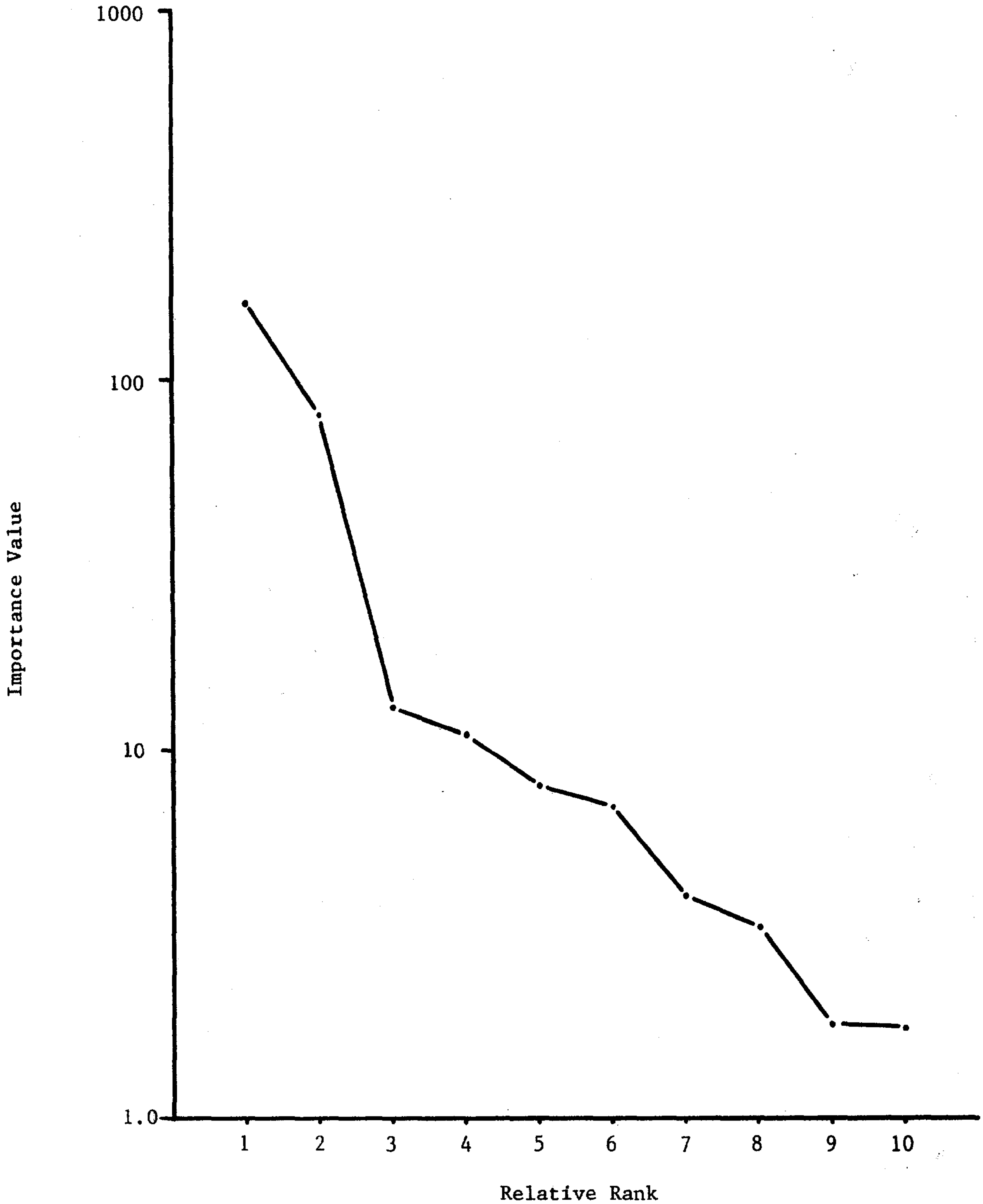


Figure 23. Dominance-diversity curve based on tree species of Route 3 Hammock. Importance values are based on relative density, frequency and dominance (basal area), summer, 1976.

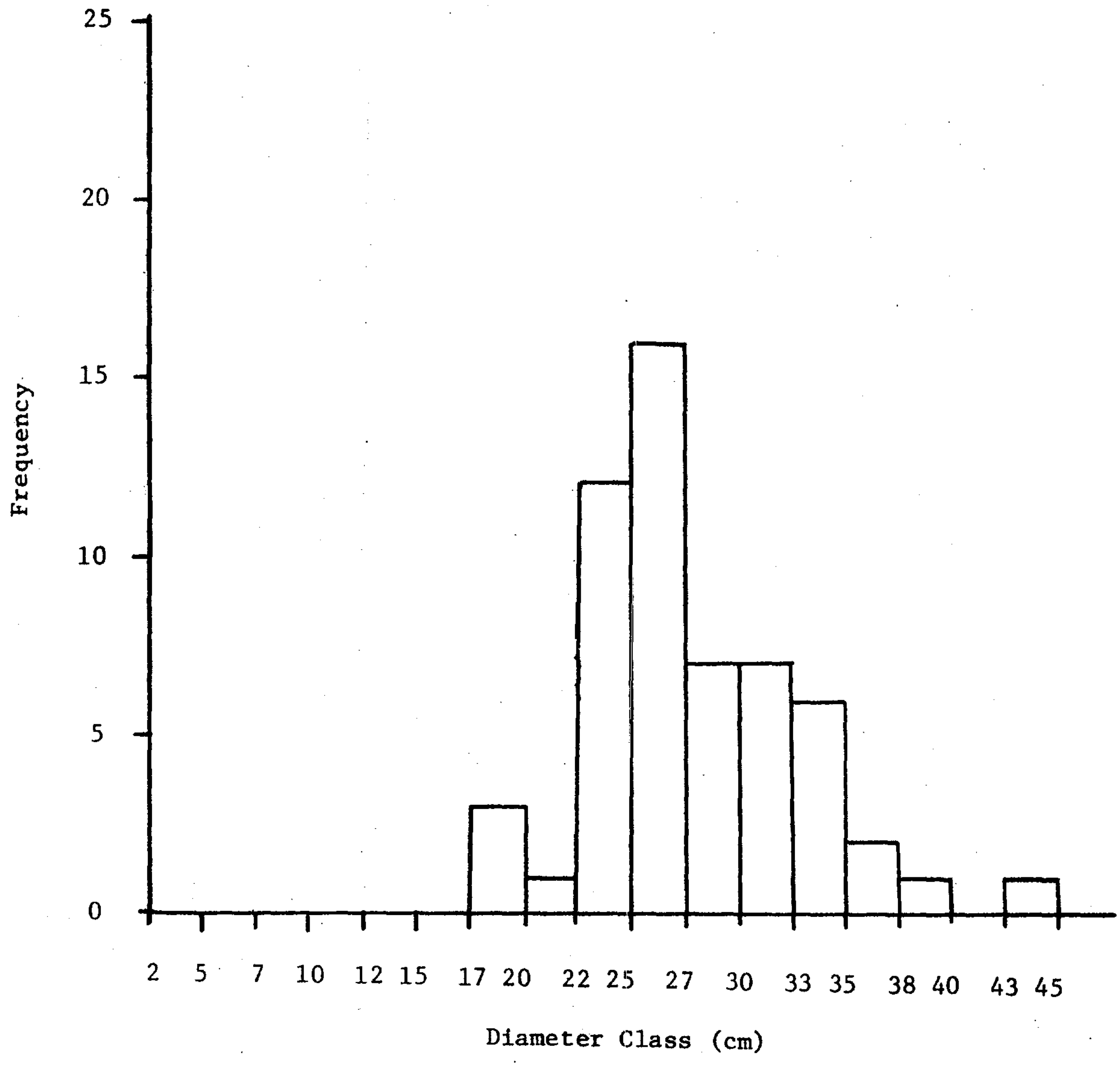


Figure 24. Size-frequency distribution of sabal palm on the Route 3 Hammock site.

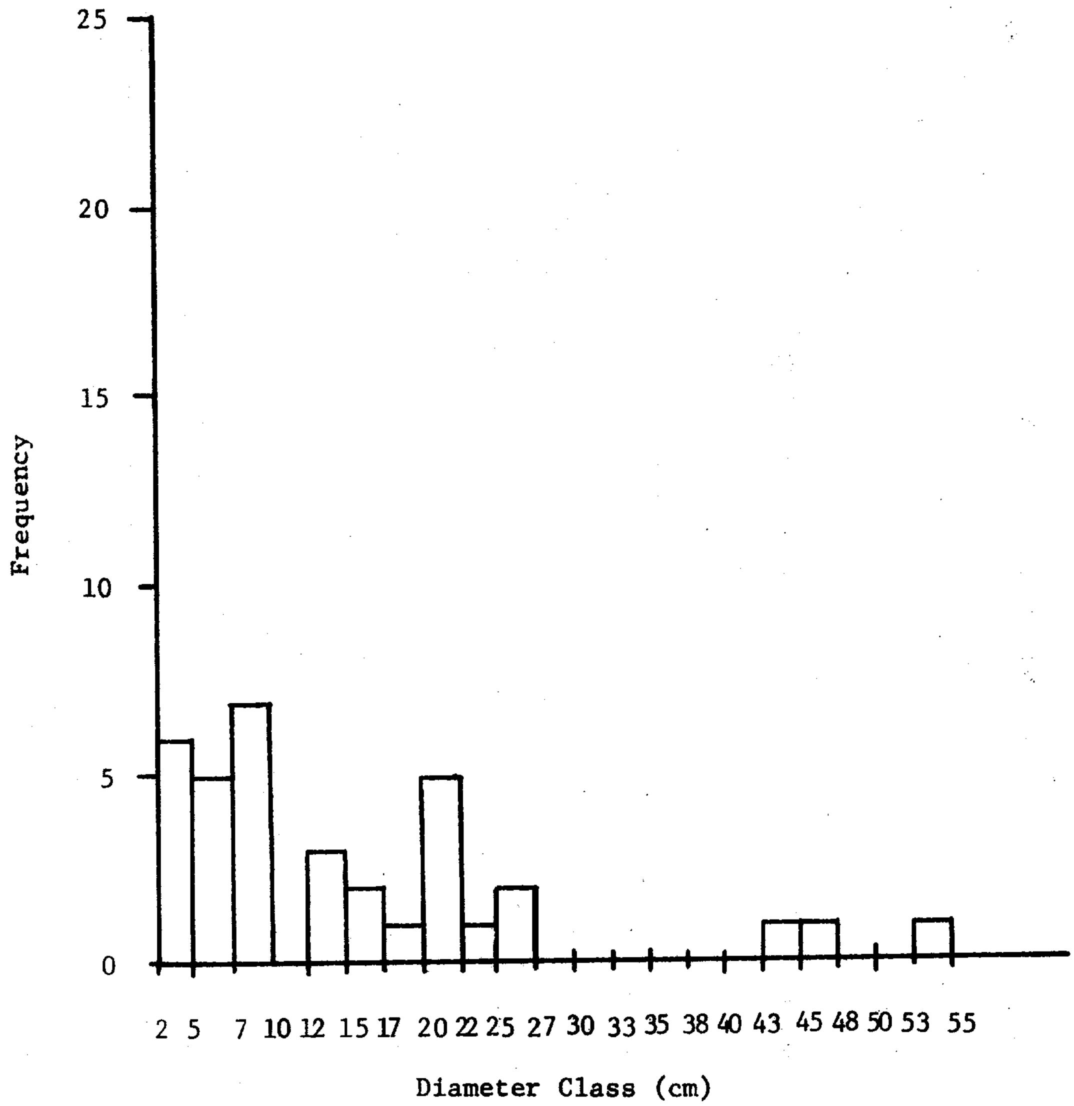


Figure 25. Size-frequency distribution of live oak on the Route 3 Hammock site.

Figure 26. Dominance-diversity curve based on shrubs, vines and tree seedlings of Indian Mound Hammock. Importance values are based on relative density and frequency, summer, 1976.

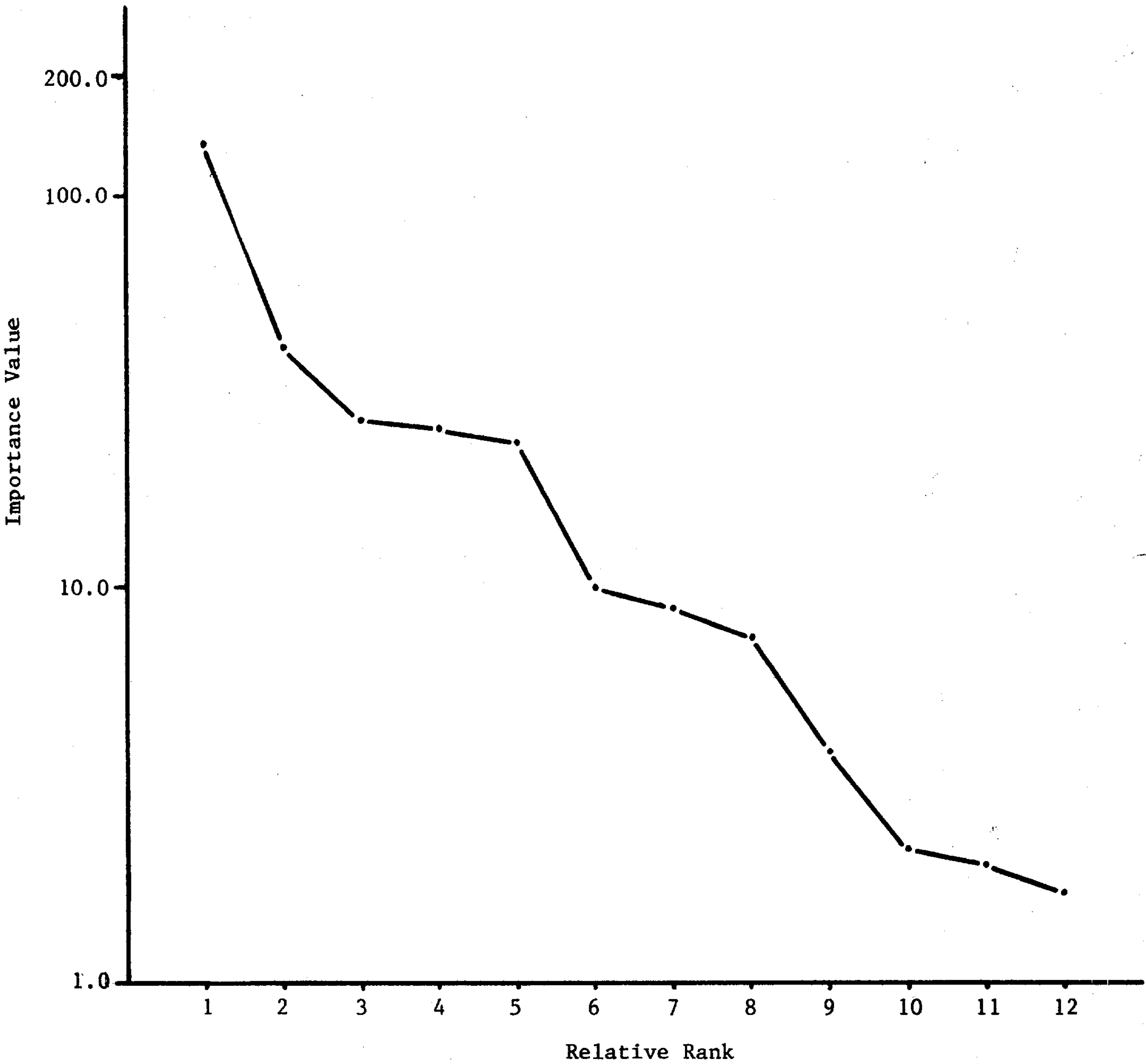


Figure 27. Dominance-diversity curve based on tree species of Indian Mound Hammock. Importance values are based on relative density, frequency and dominance (basal area), summer, 1976.

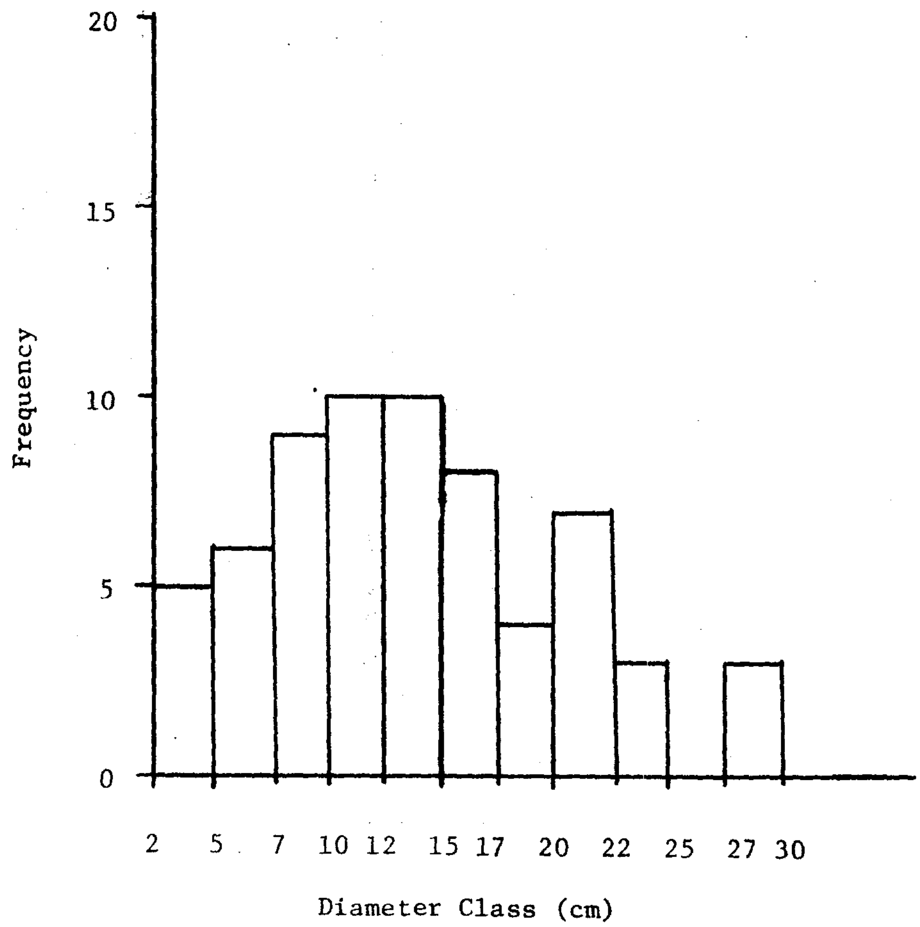


Figure 28. Size-frequency distribution of Persea on the Indian Mound site.

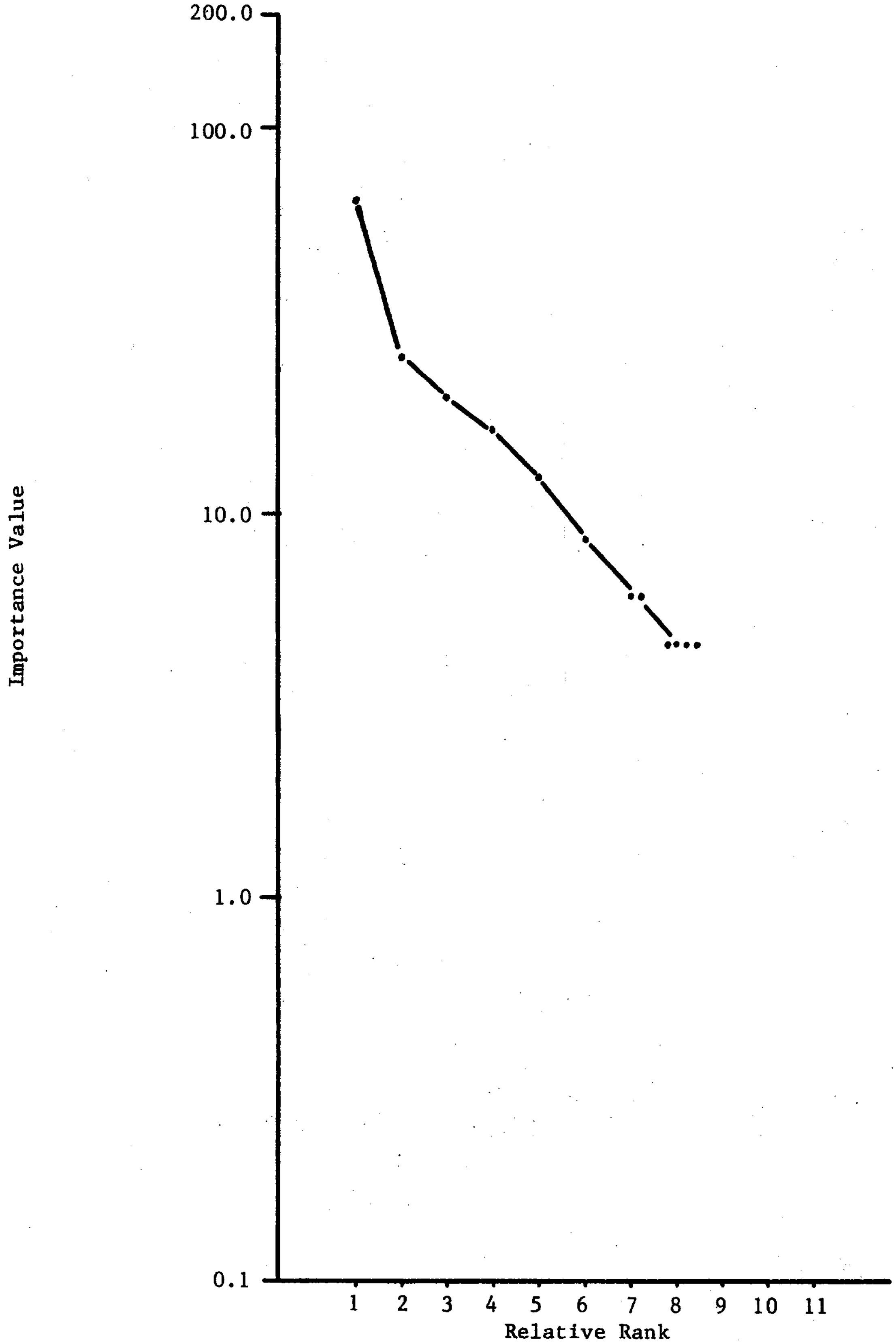


Figure 29. Dominance-diversity curve based on shrubs, vines and tree seedlings of Black Hammock. Importance values are based on relative density and frequency, fall, 1977.

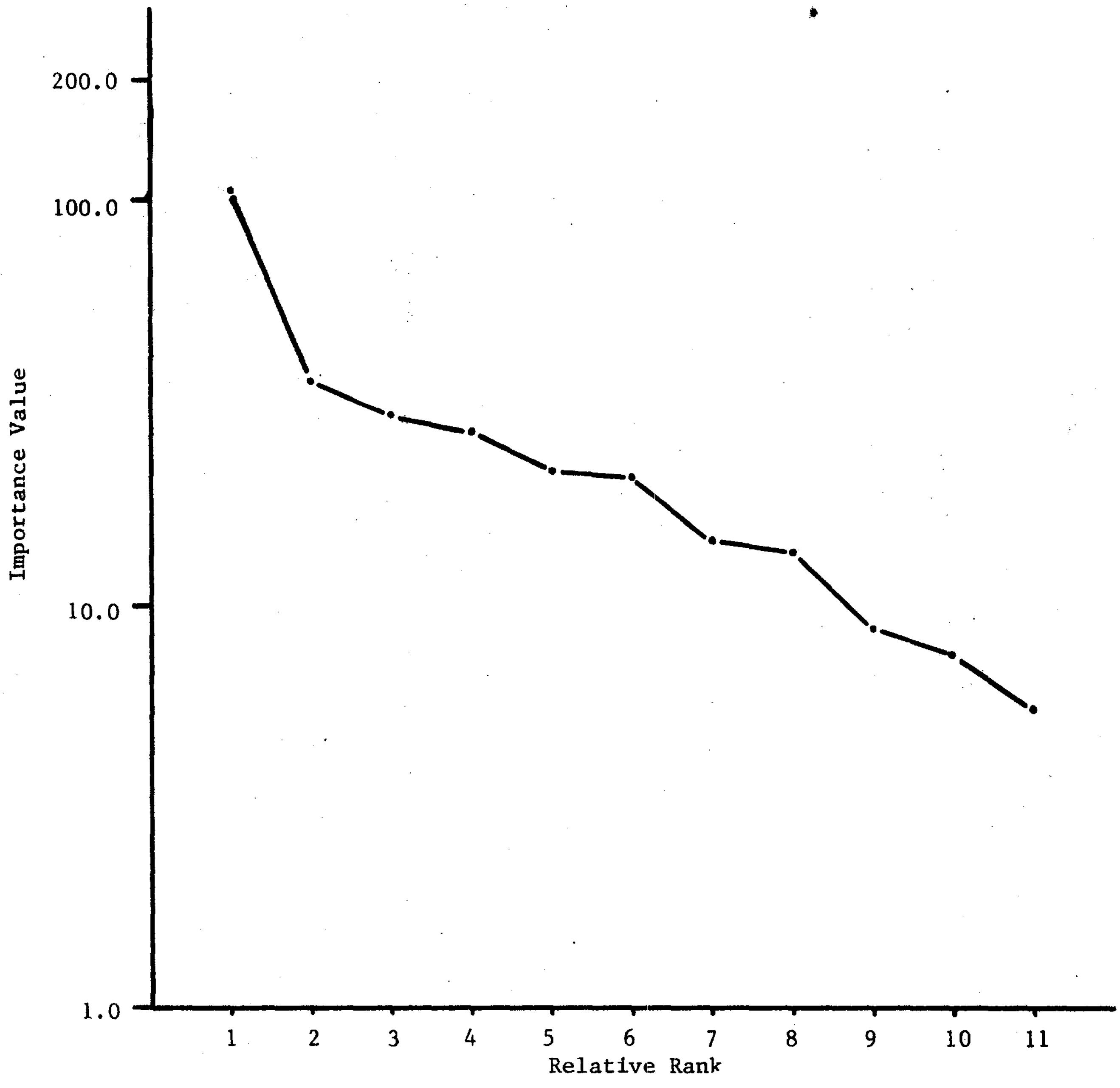


Figure 30. Dominance-diversity curve based on tree species of Black Hammock. Importance values are based on relative density, frequency and dominance (basal area), fall, 1977.

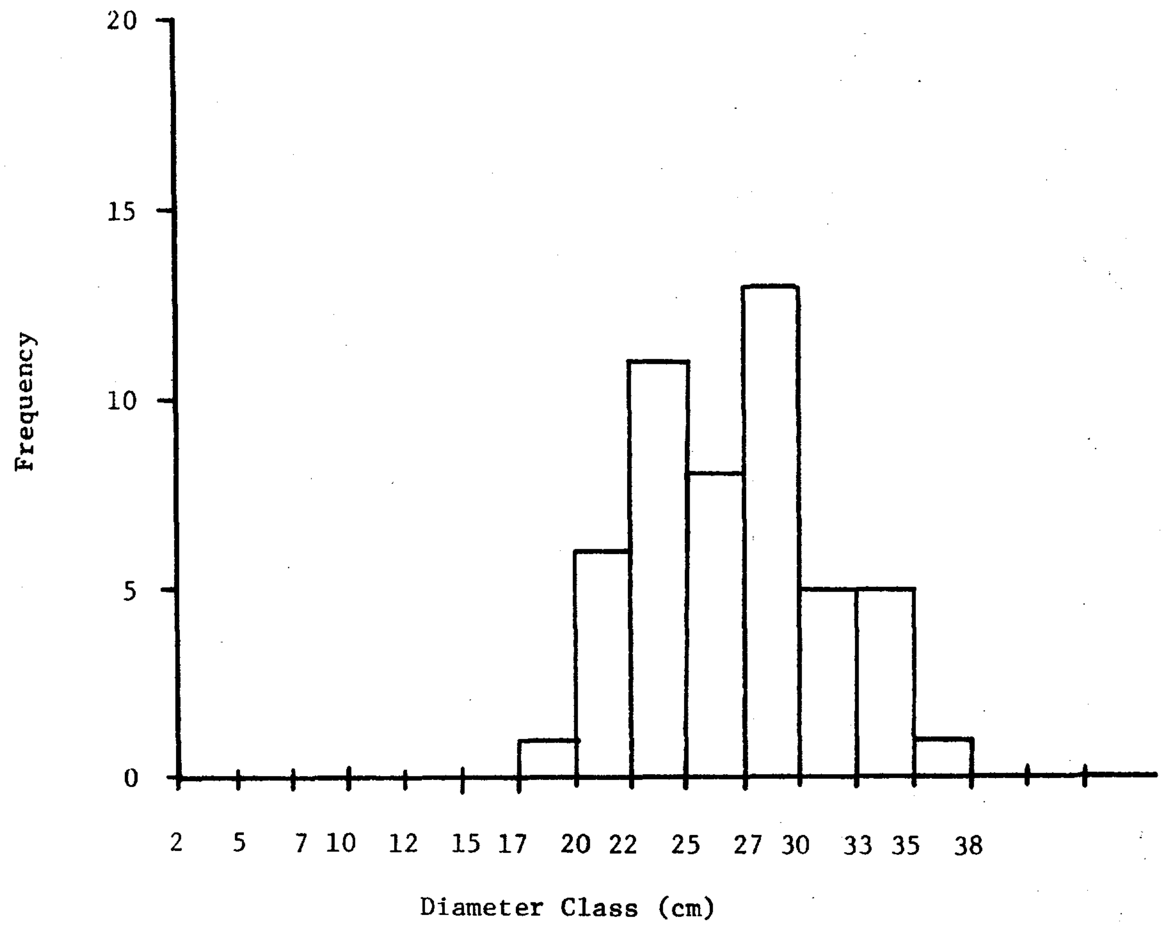


Figure 31. Size-frequency distribution of sabal palm on the Black Hammock site.

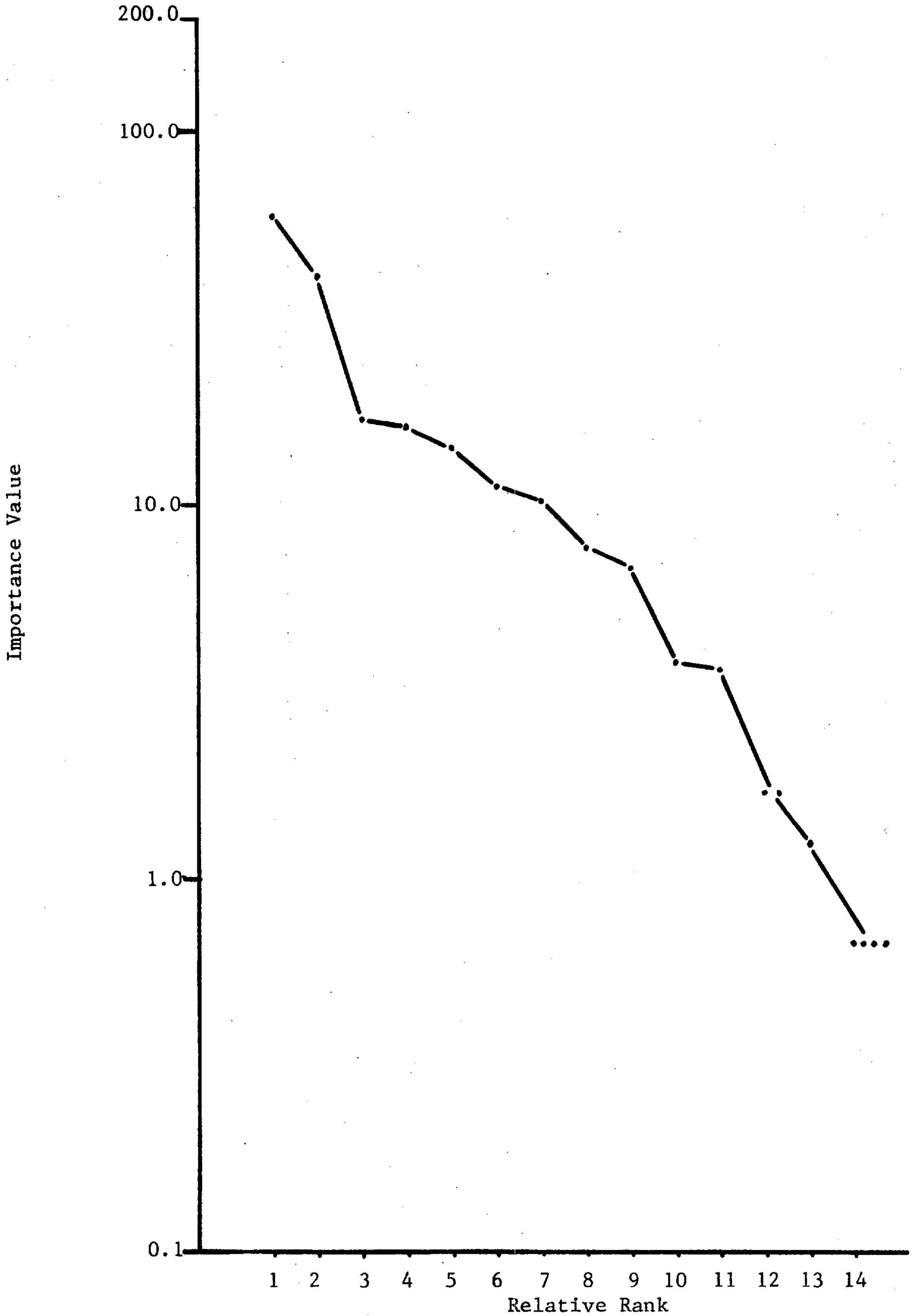


Figure 32. Dominance-diversity curve based on shrubs, vines and tree seedlings of Castle Windy Hammock. Importance values are based on relative density and frequency, fall, 1977.

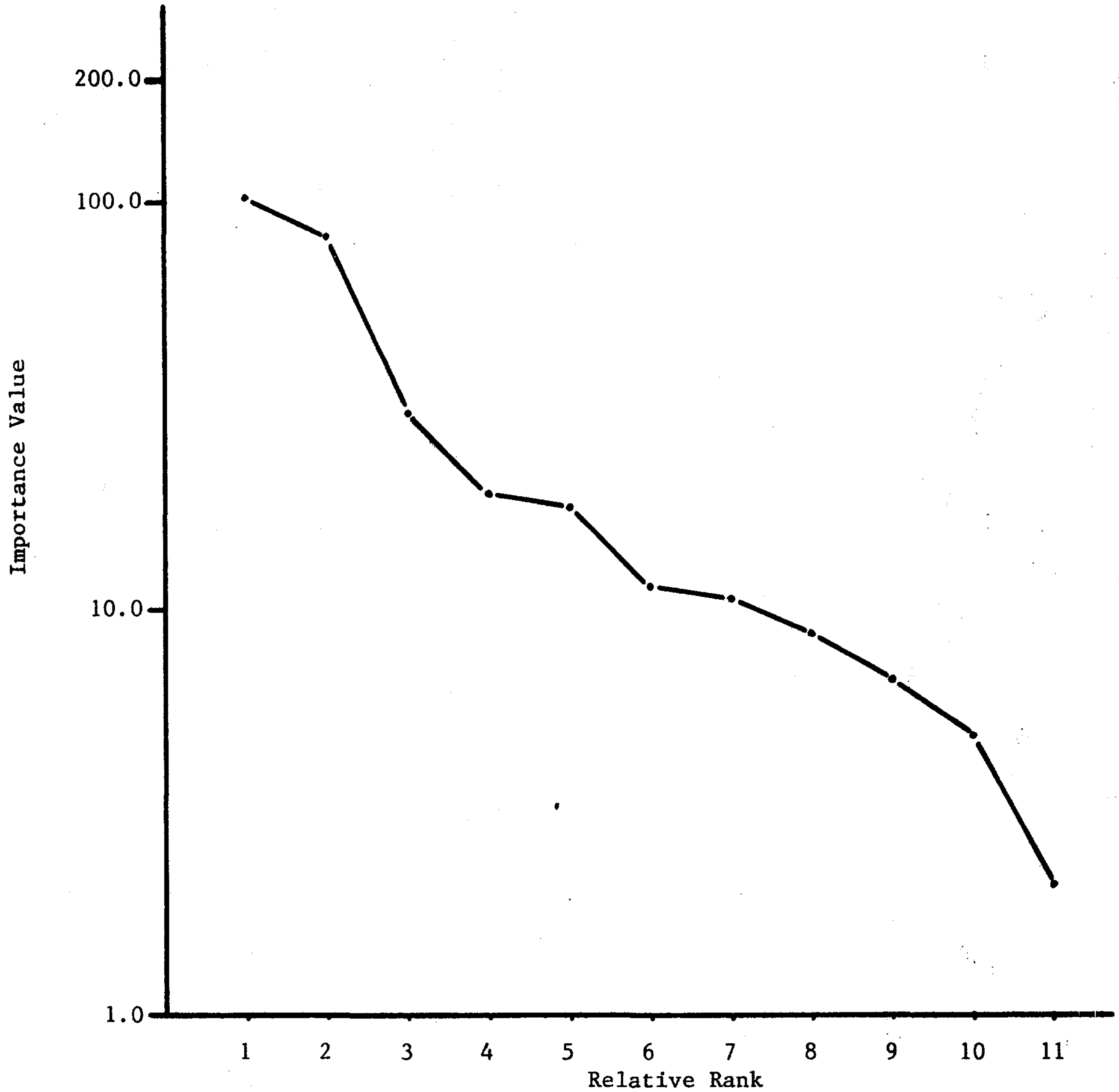


Figure 33. Dominance-diversity curve based on tree species of Castle Windy Hammock. Importance values are based on relative density, frequency and dominance (basal area), fall, 1977.

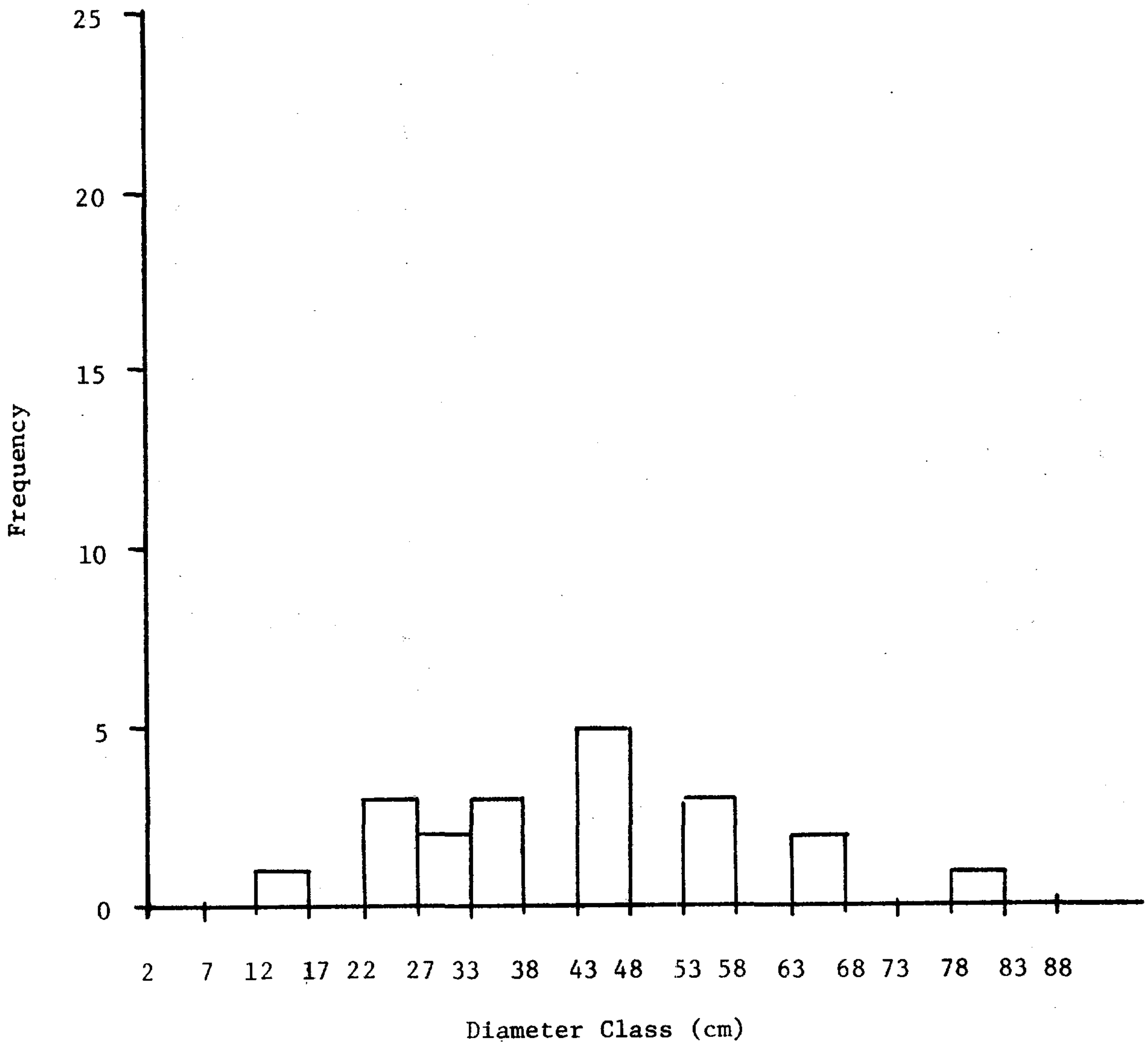


Figure 34. Size-frequency distribution of live oak on the Castle Windy Hammock site.

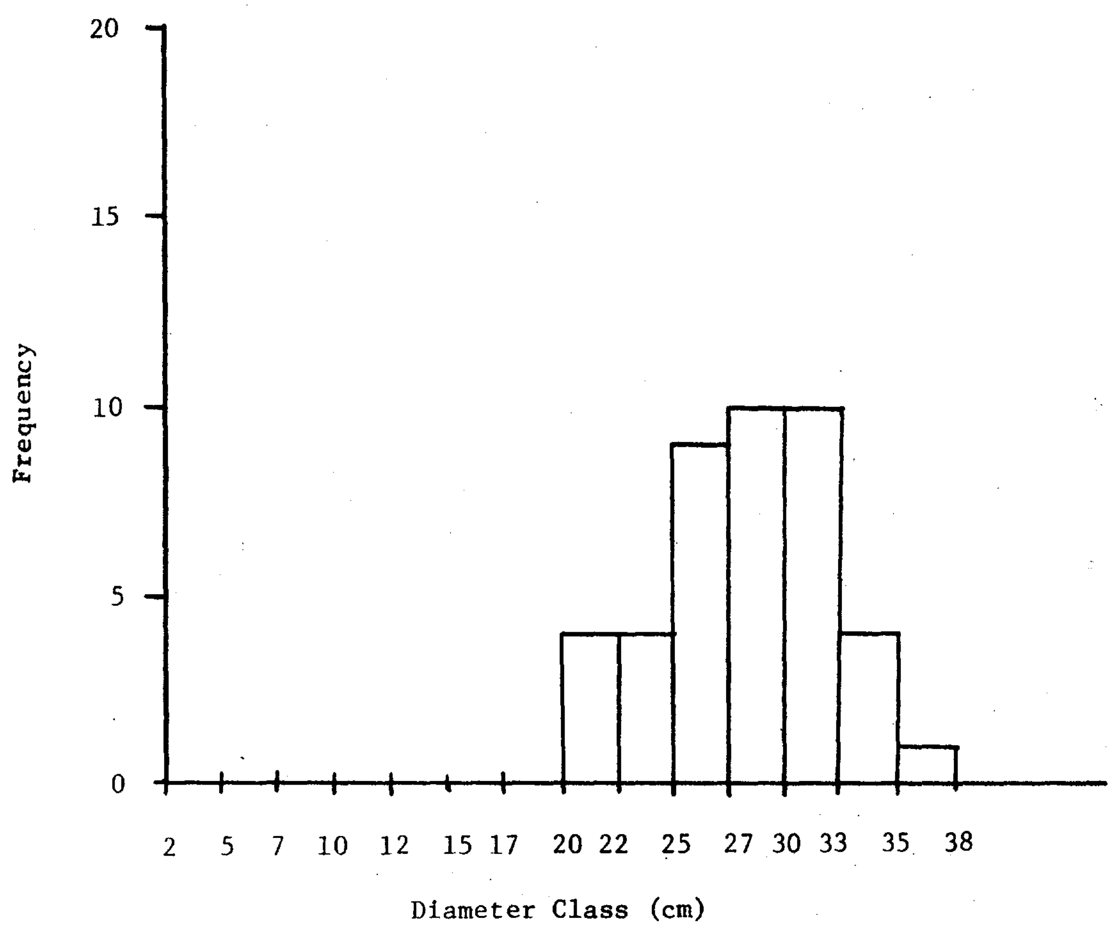


Figure 35. Size-frequency distribution of sabal palm on the Castle Windy Hammock site.

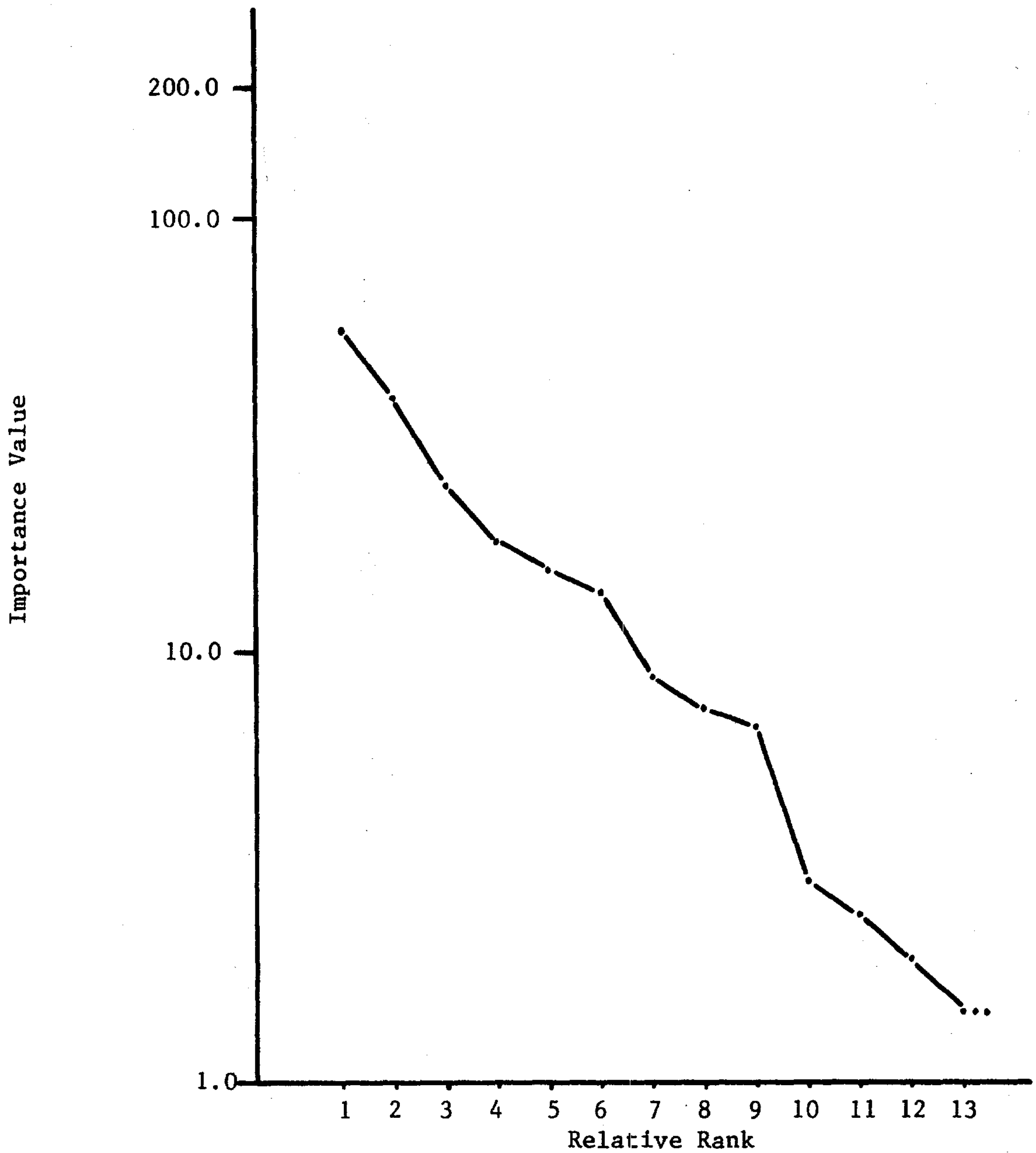


Figure 36. Dominance-diversity curve based on shrubs, vines, and tree seedlings of Jerome Road Hammock. Importance values are based on relative density and frequency, fall, 1977.

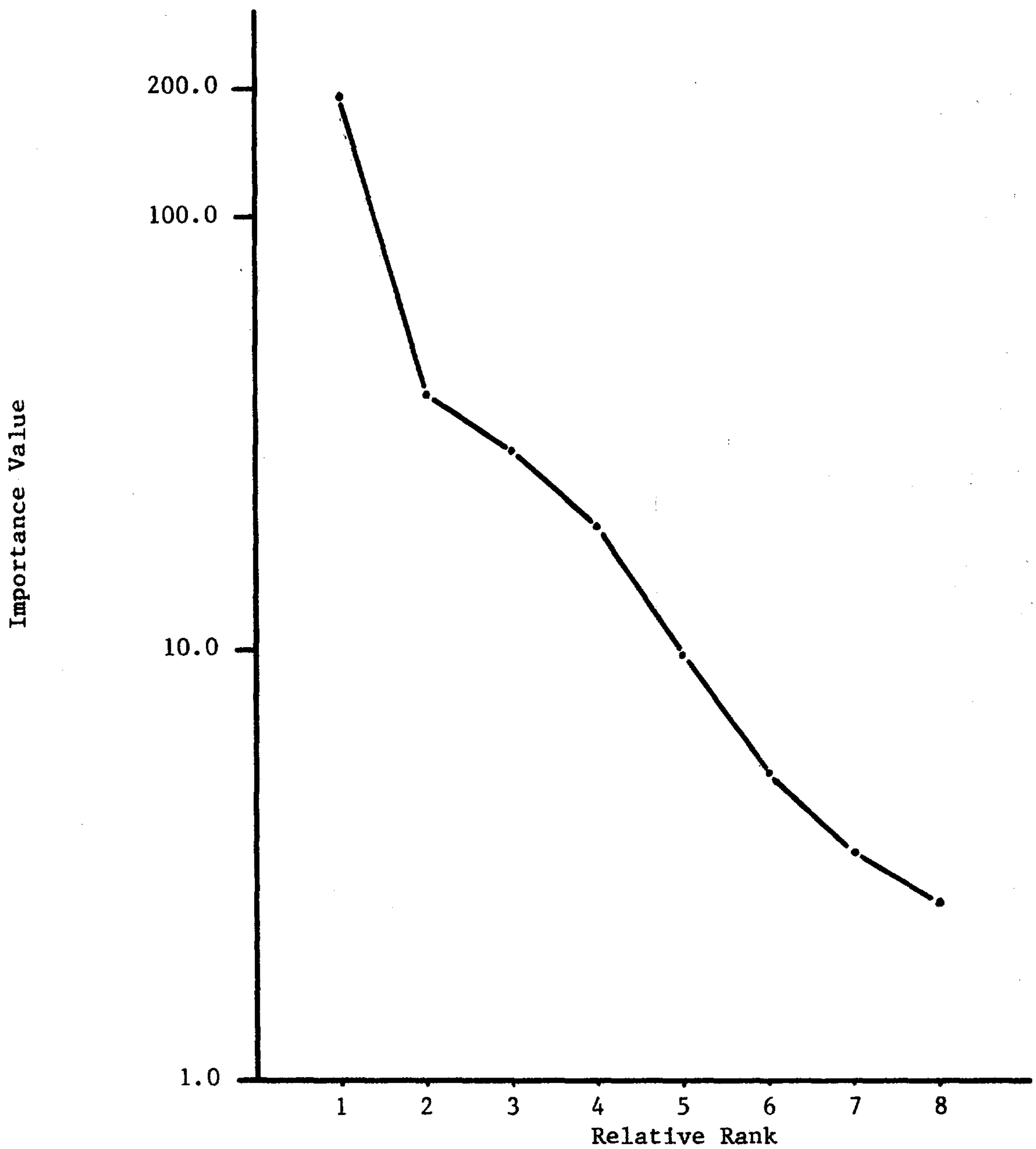


Figure 37. Dominance-diversity curve based on tree species of Jerome Road Hammock. Importance values are based on relative density, frequency and dominance (basal area), fall, 1977.

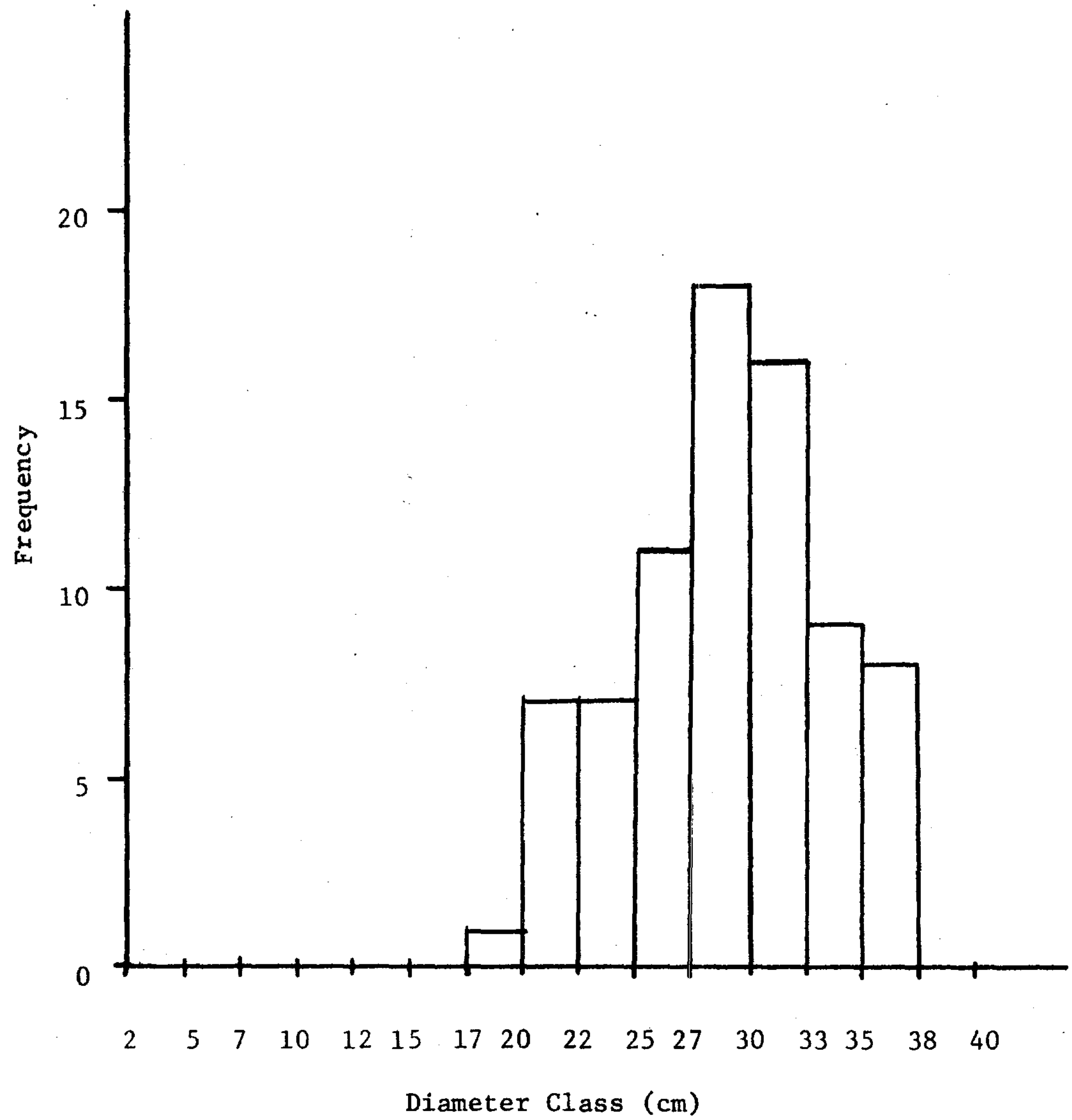


Figure 38. Size-frequency distribution of sabal palm on the Jerome Road Hammock site.

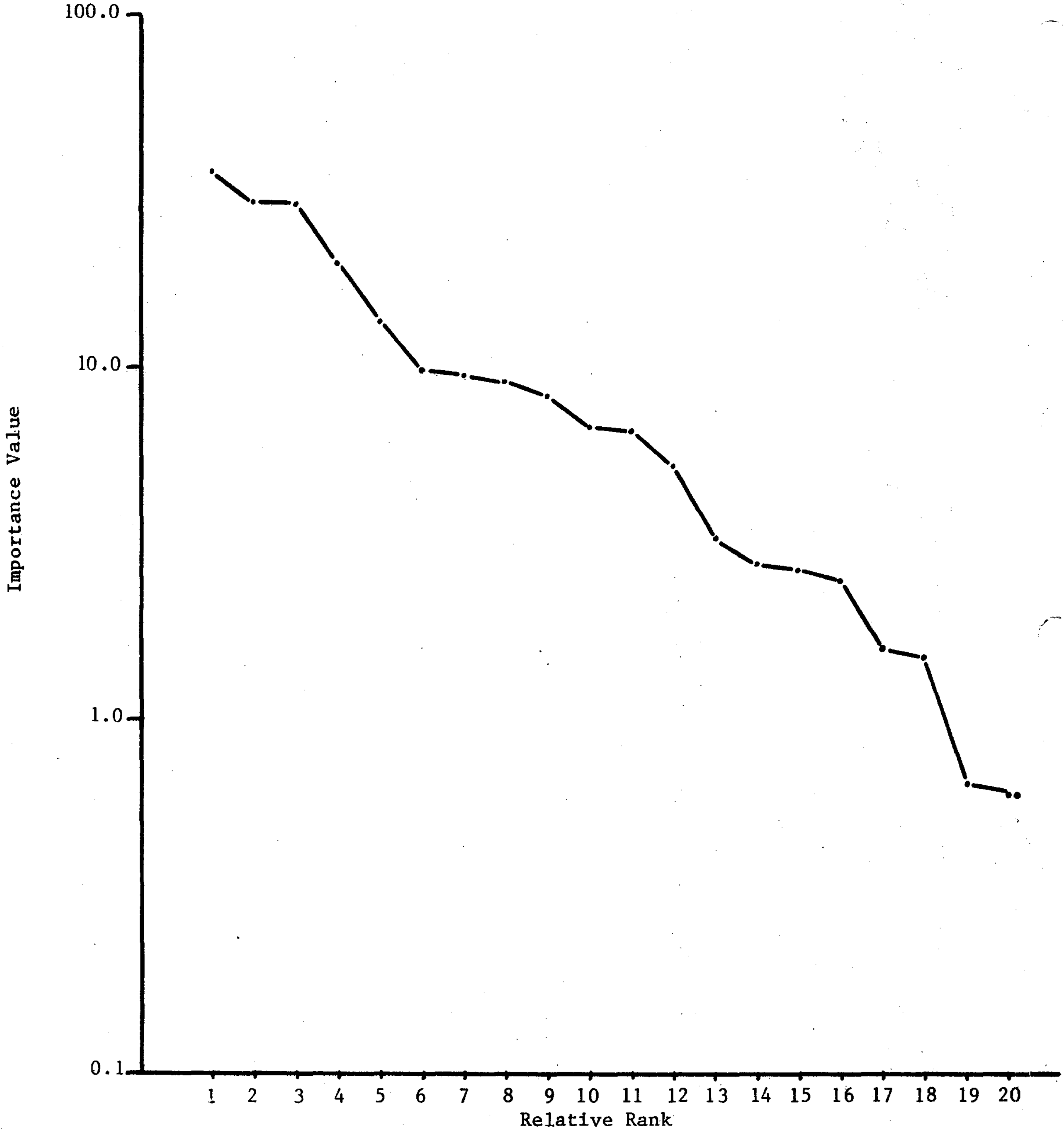


Figure 39. Dominance-diversity curve for plants of pine-less flatwoods at Wisconsin Village grid. Importance values are based on relative coverage and relative frequency, summer, 1976.

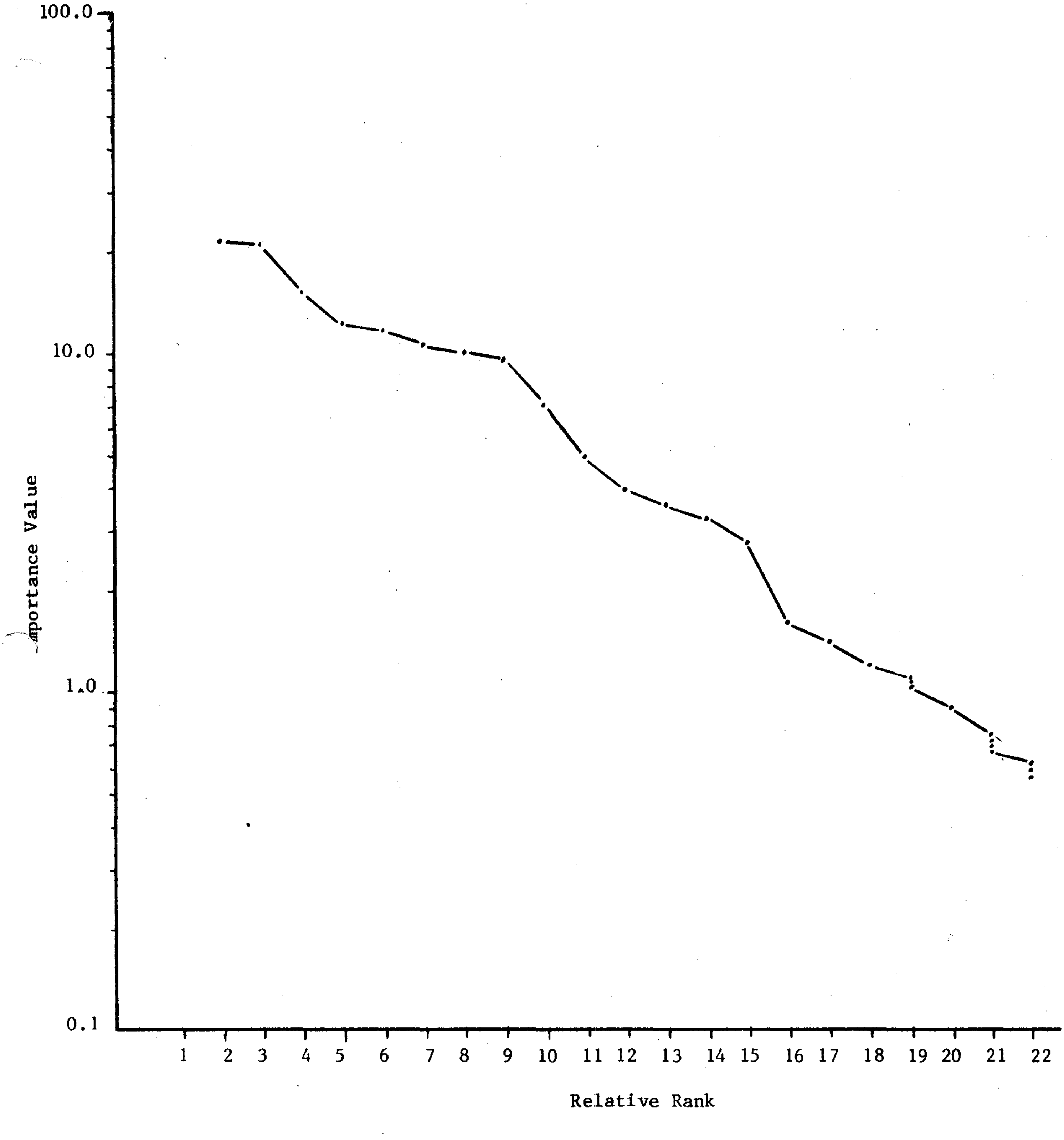


Figure 40. Dominance-diversity curve for understory plants of the Headquarters Pine Flatwoods. Importance values are based on relative coverage and relative frequency, Summer, 1977.

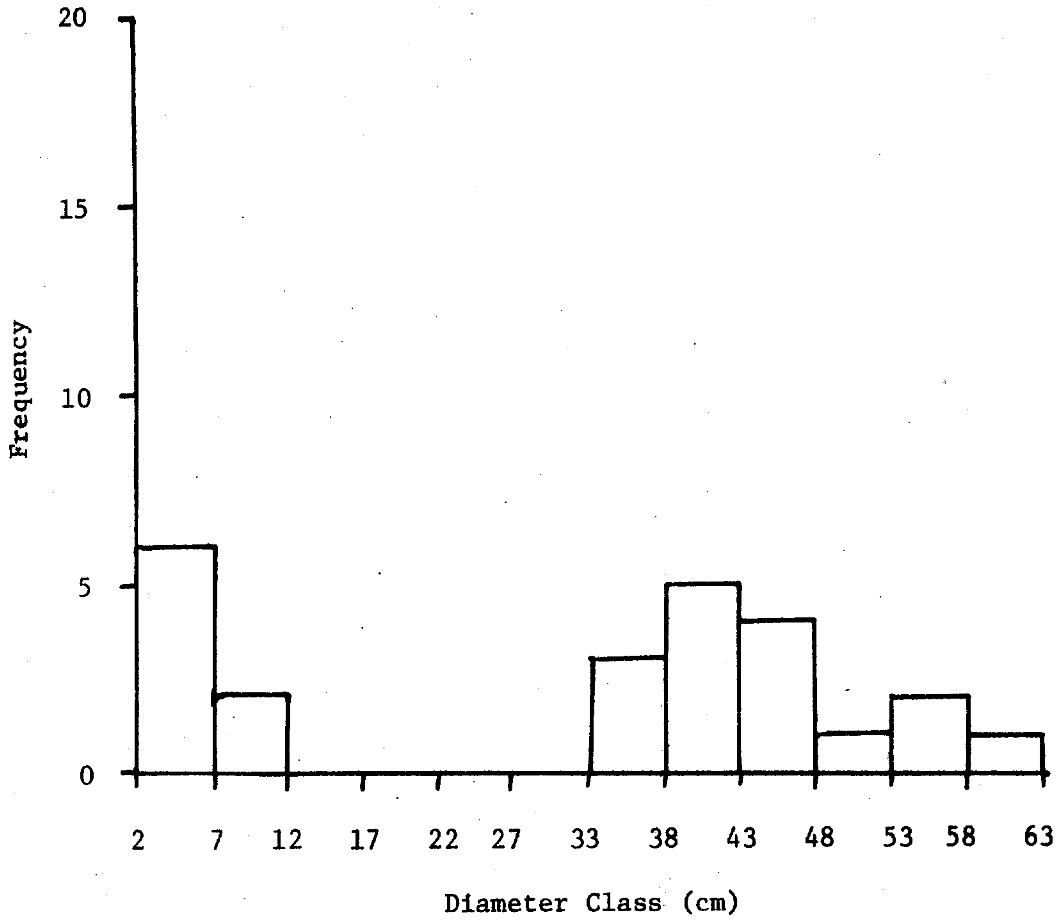


Figure 41. Size-frequency distribution of slash pine on the Headquarters Pine Flatwoods site.

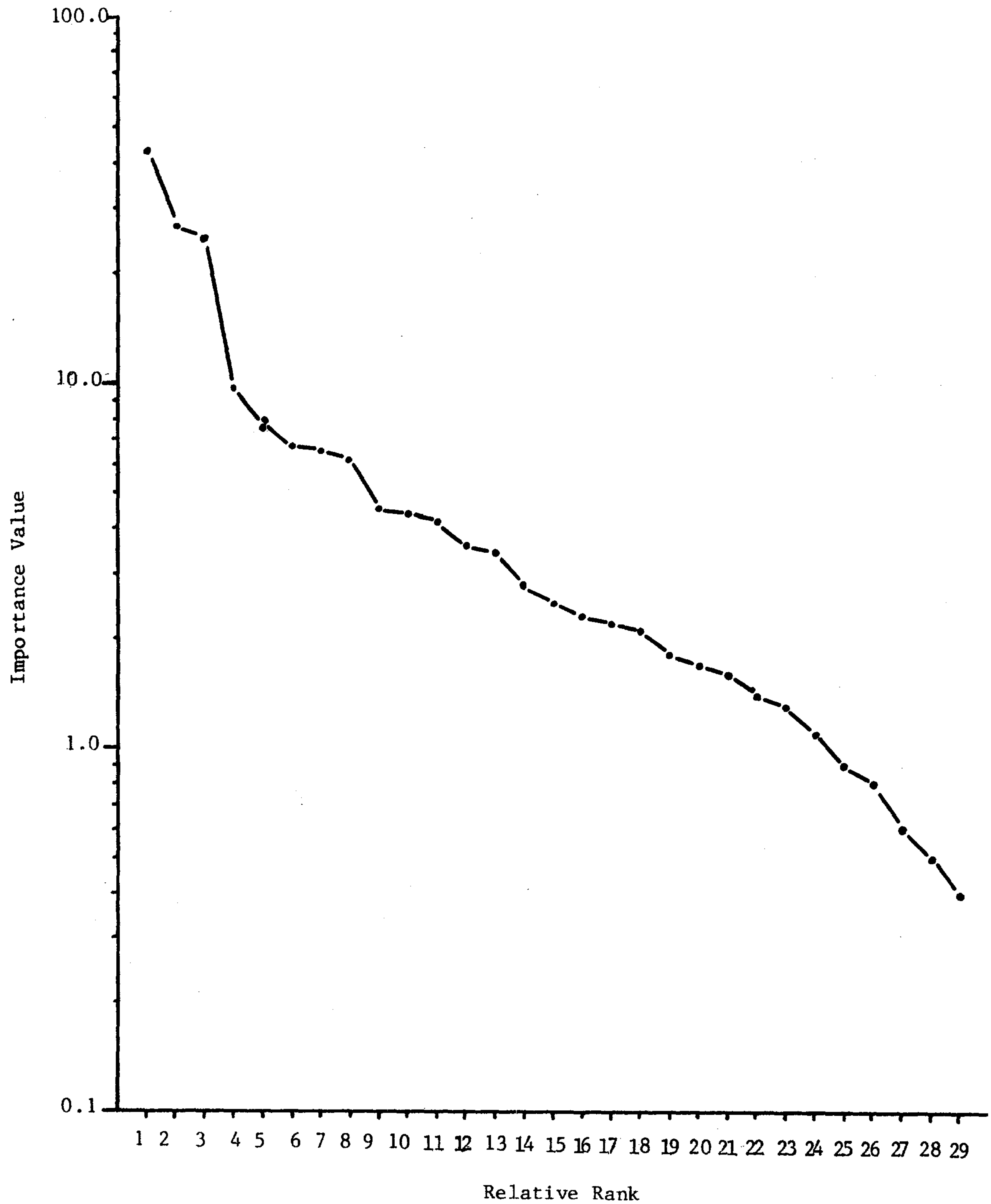


Figure 42. Dominance-diversity curve for understory plants of the UCF Pine Flatwoods. Importance values are based on relative coverage and relative frequency, Summer, 1977.

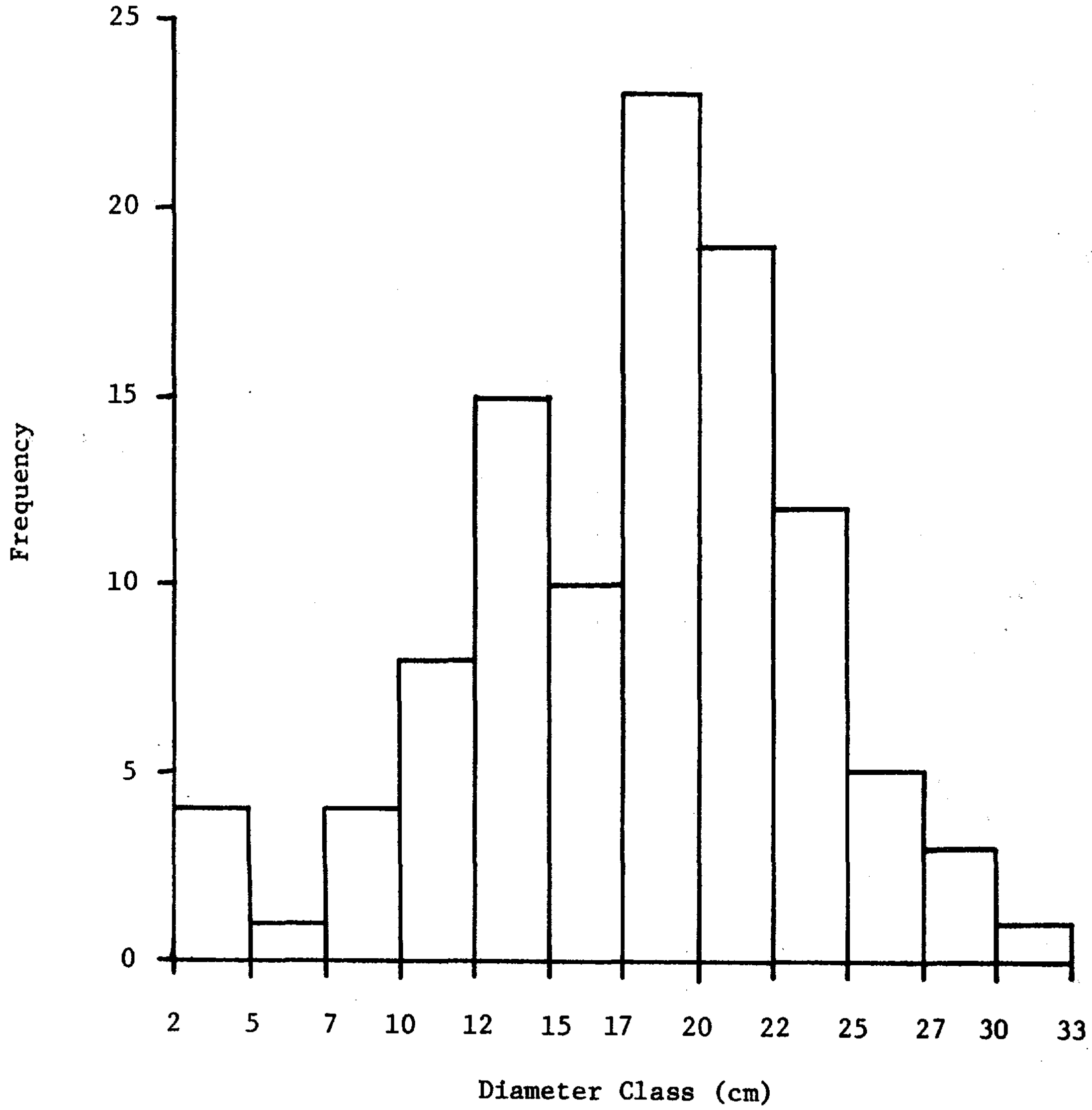


Figure 43. Size-frequency distribution of longleaf pine on the UCF Pine Flatwoods site.

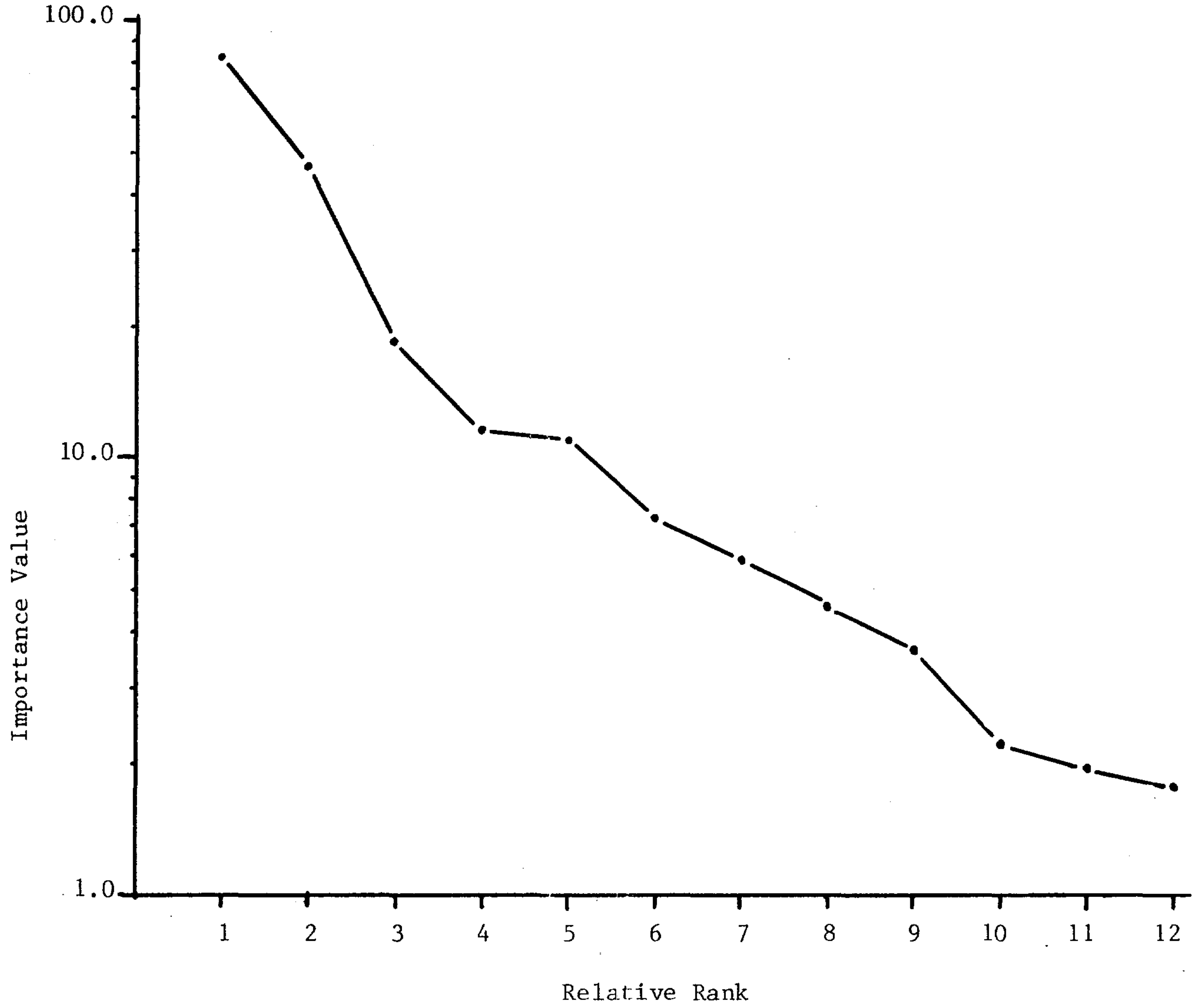


Figure 44. Dominance-diversity curve based on shrubs, vines and tree seedlings of the UCF Pond Pine. Importance values are based on relative density and frequency, Summer, 1977.

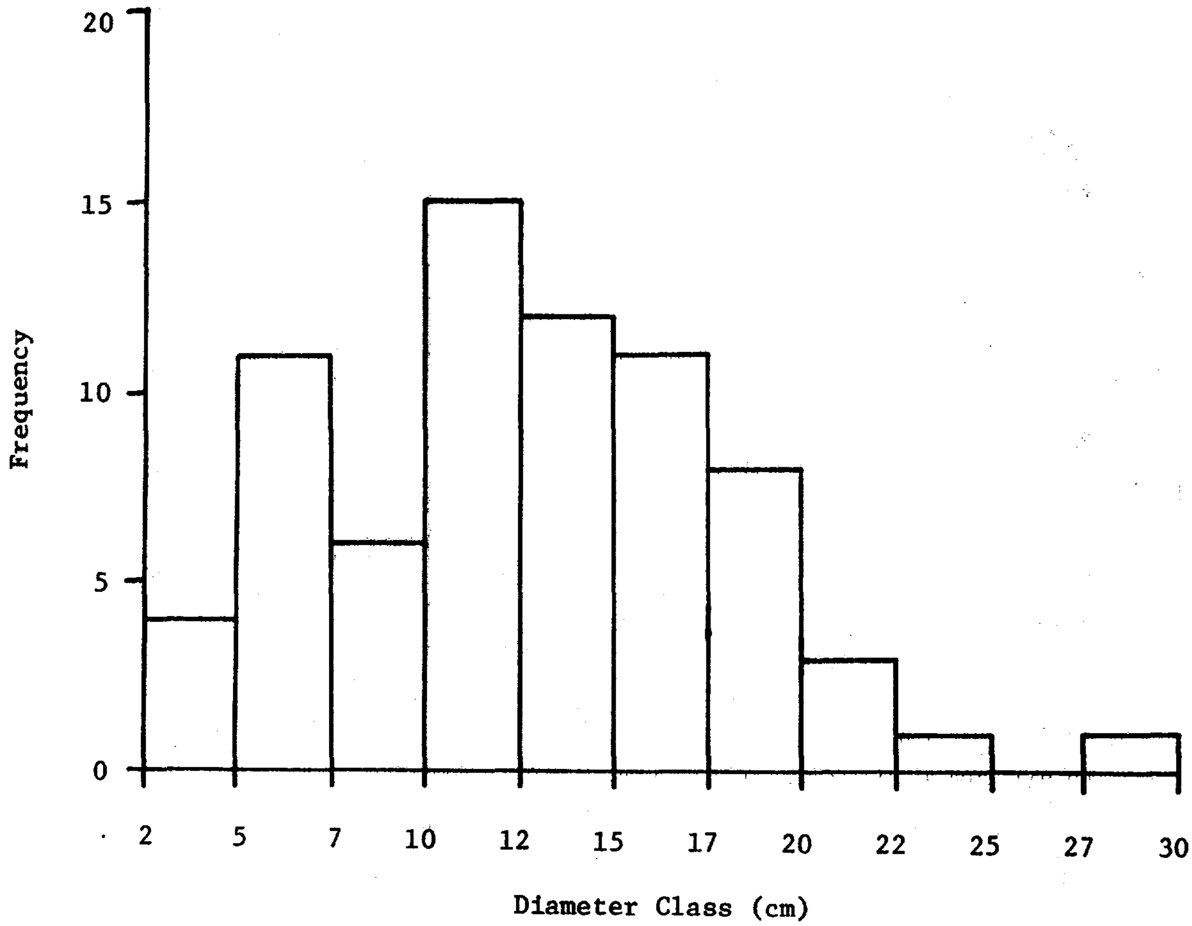


Figure 45. Size-frequency distribution of pond pine on the UCF Pond Pine site.

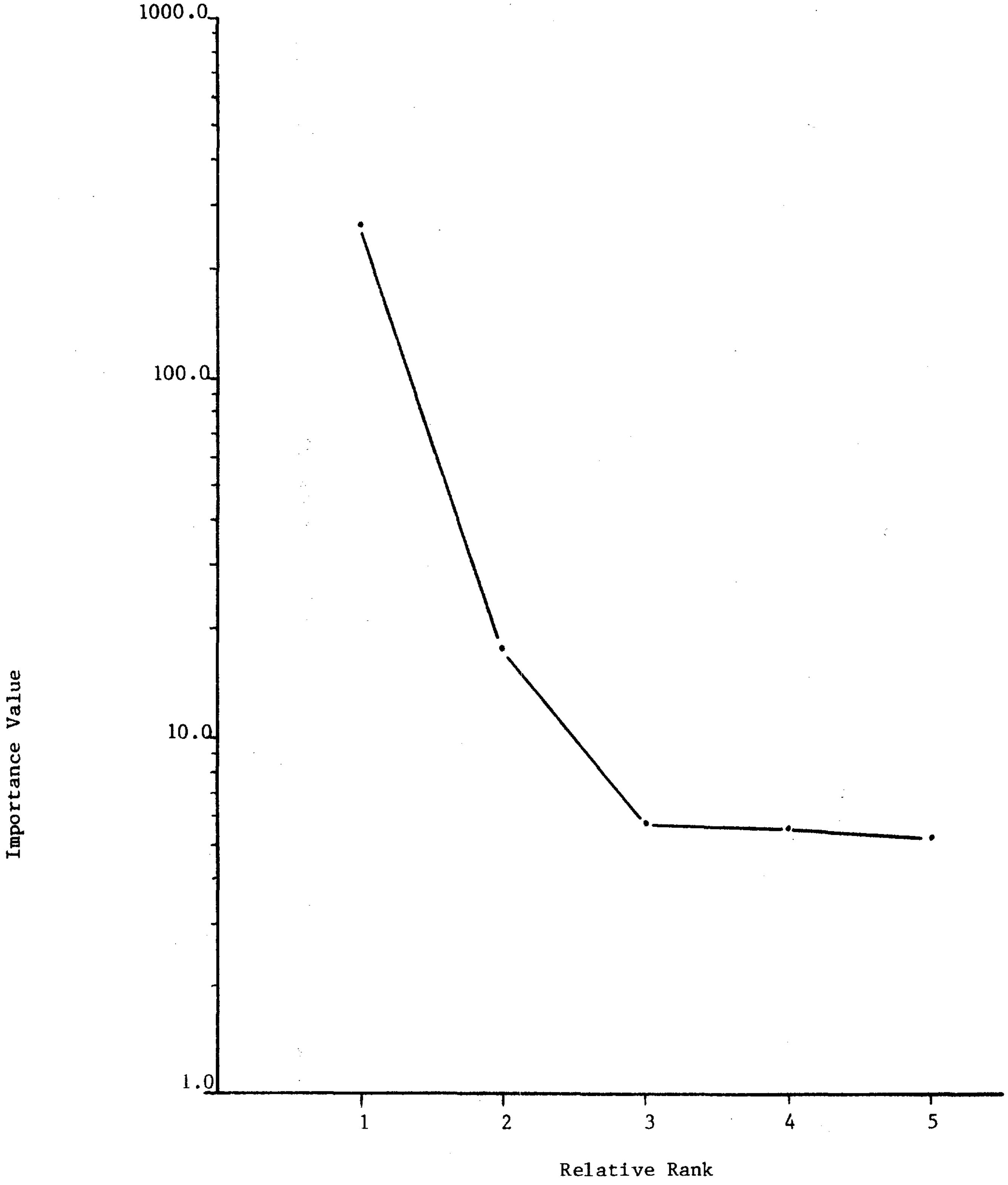


Figure 46. Dominance-diversity for tree species in the UCF Pond Pine. Importance values are based on relative density, relative frequency, and relative dominance, Summer, 1977.

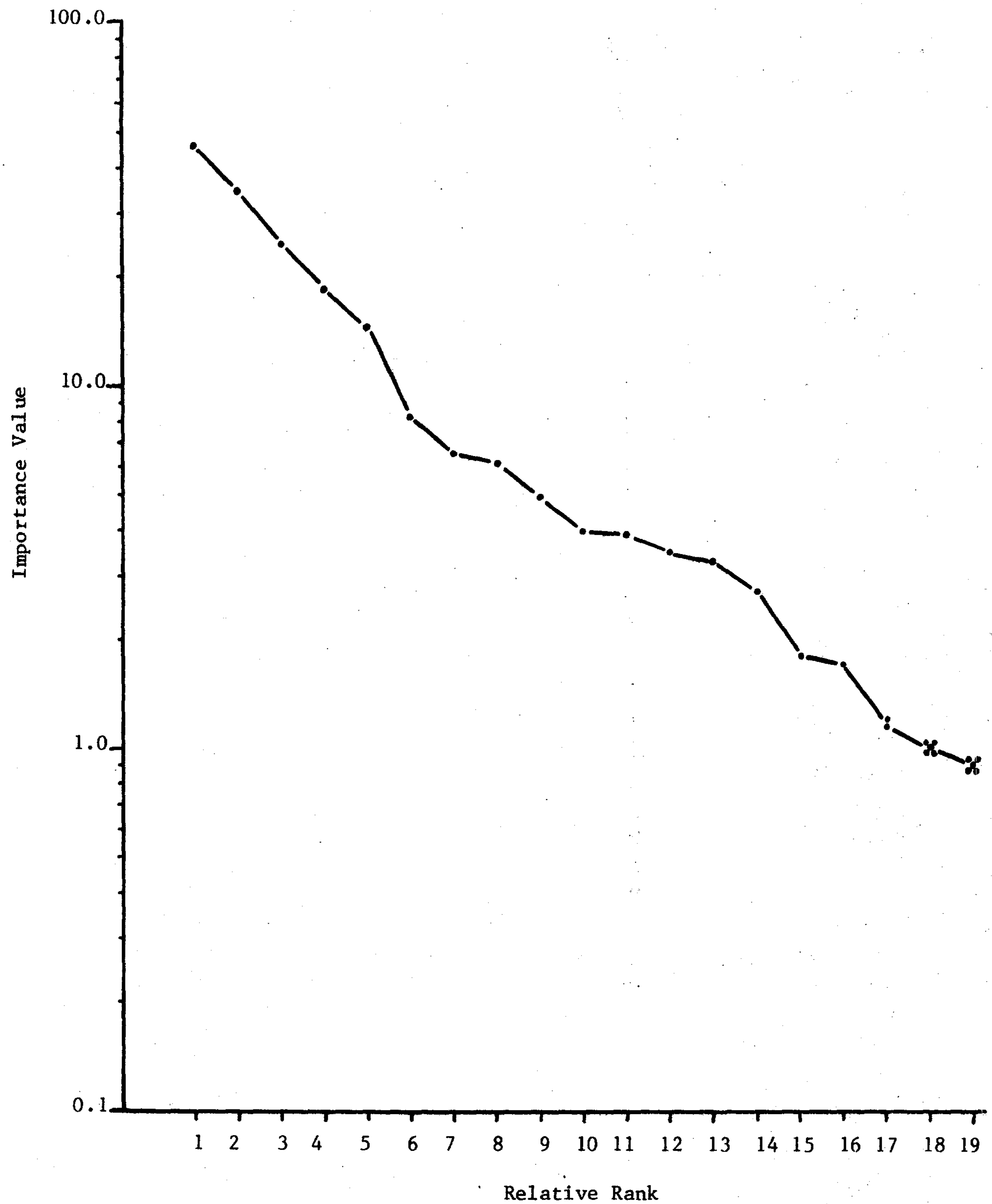


Figure 47. Dominance-diversity curve for understory plants of the Volusia Pine Flatwoods. Importance values are based on relative coverage and relative frequency, Summer, 1977.

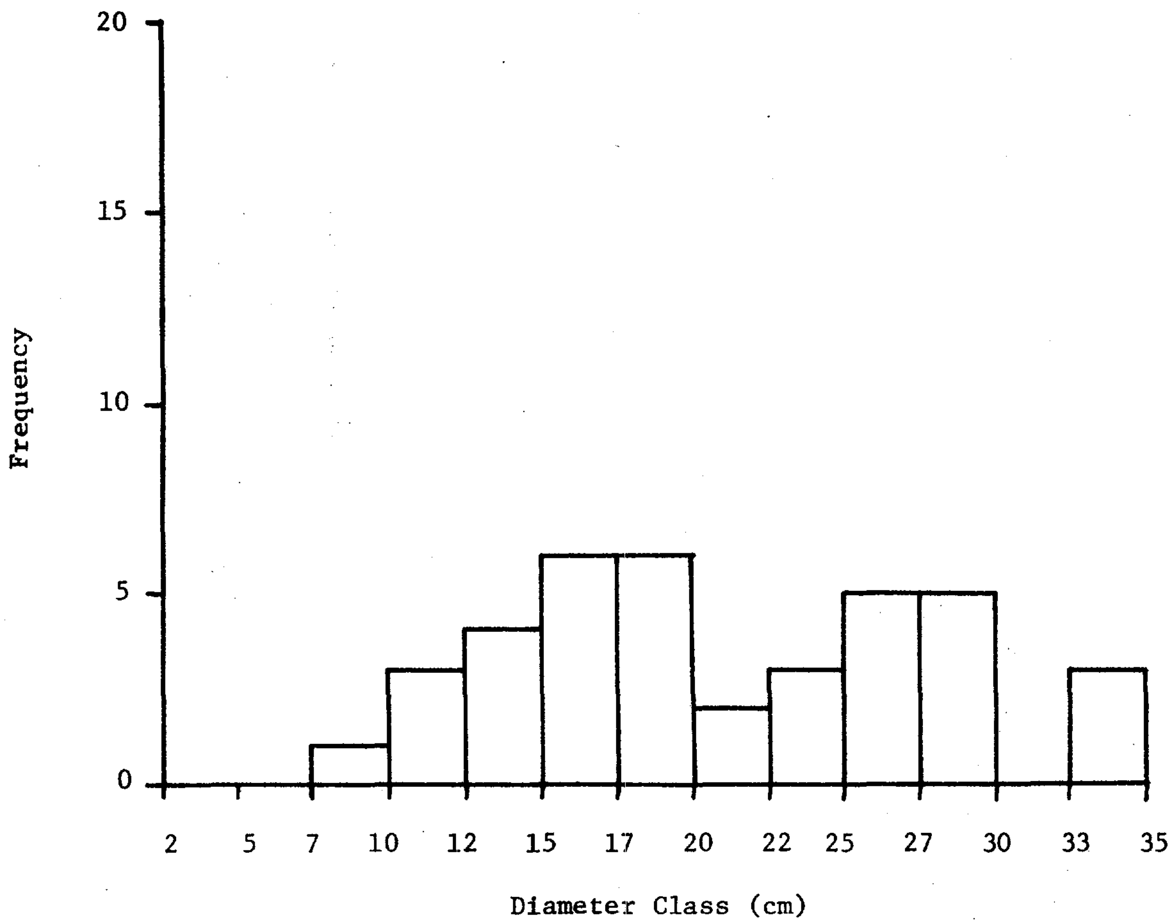


Figure 48. Size-frequency distribution of slash pine on the Volusia Pine Flatwoods site.

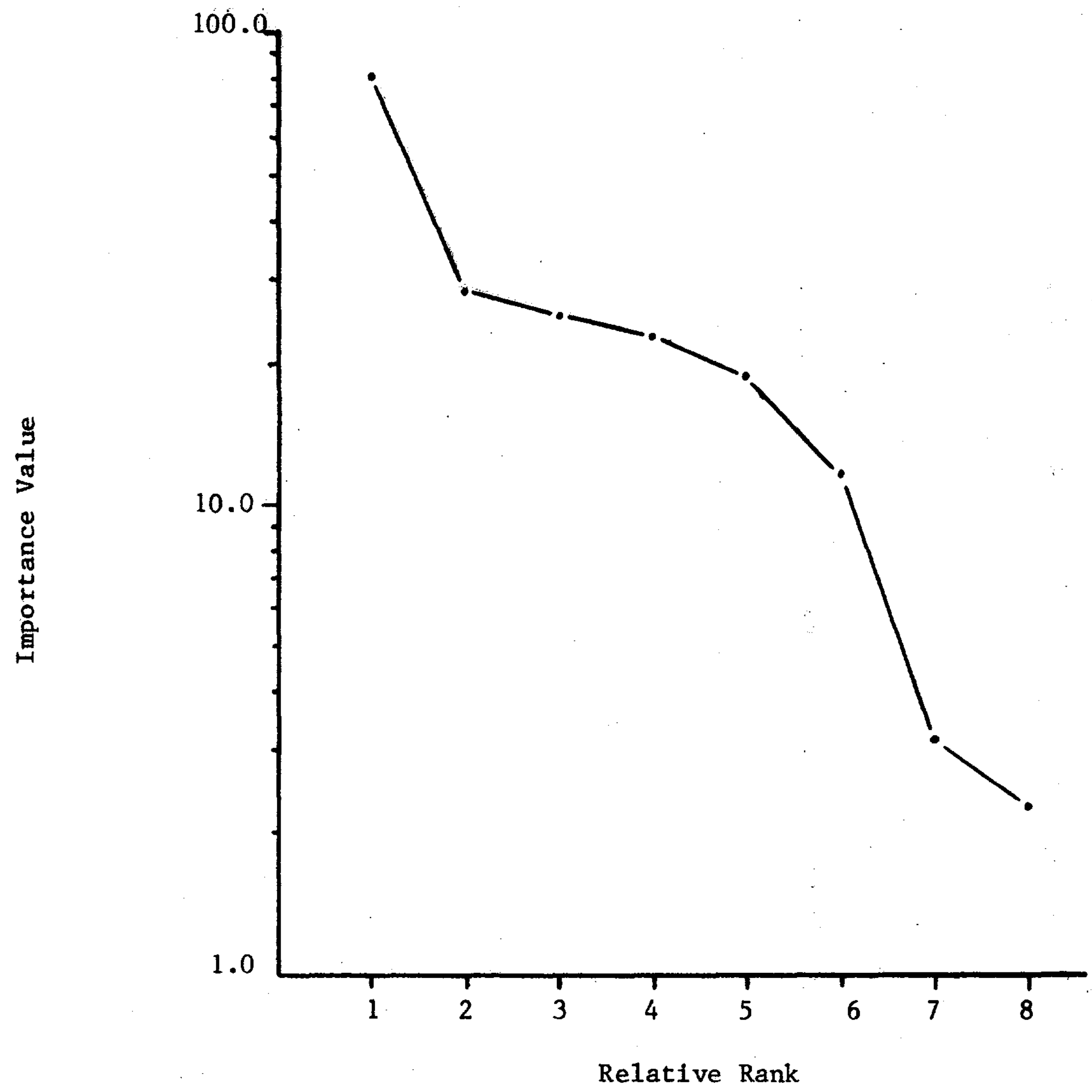


Figure 49. Dominance-diversity curve for shrub species $\geq$ .5m tall on the UCF Sand Pine Scrub. Importance values are based on relative density and relative frequency, Fall, 1977.

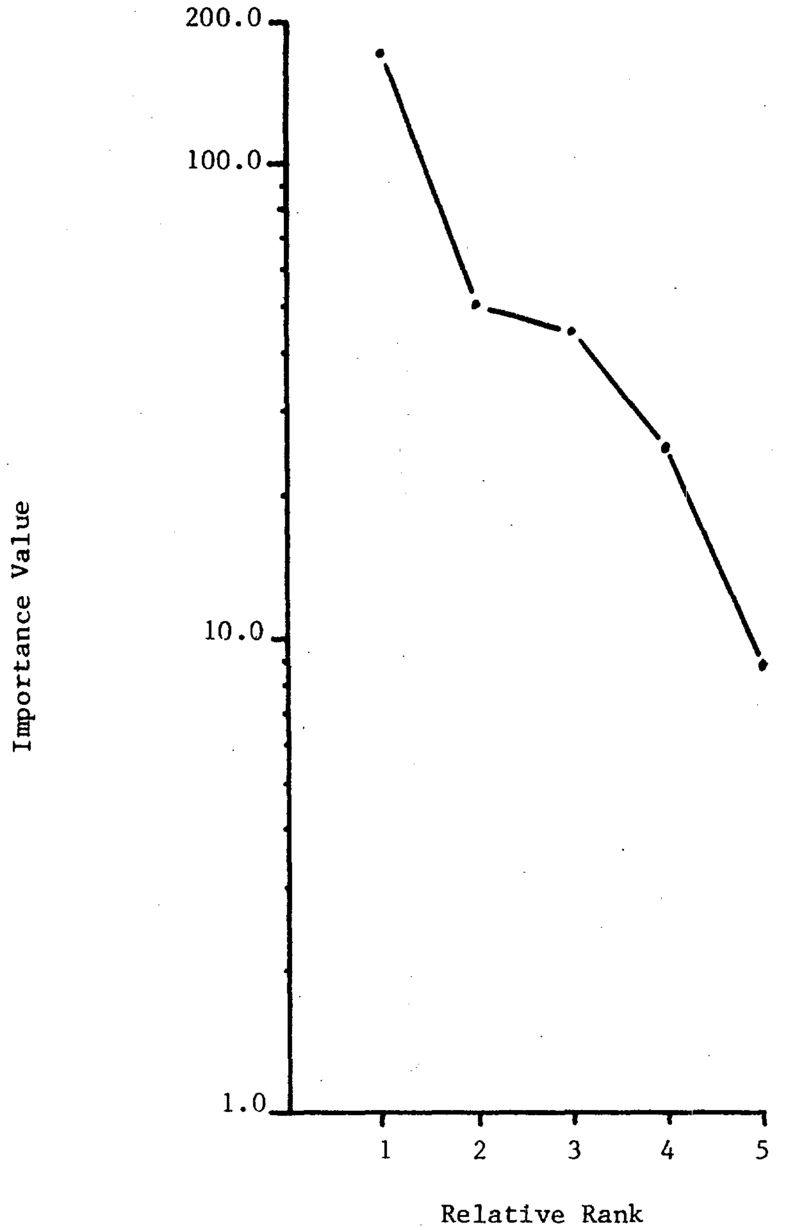


Figure 50. Dominance-diversity curves for trees on the UCF Sand Pine Scrub. Importance values are based on relative density, relative frequency and relative dominance, Fall, 1977.

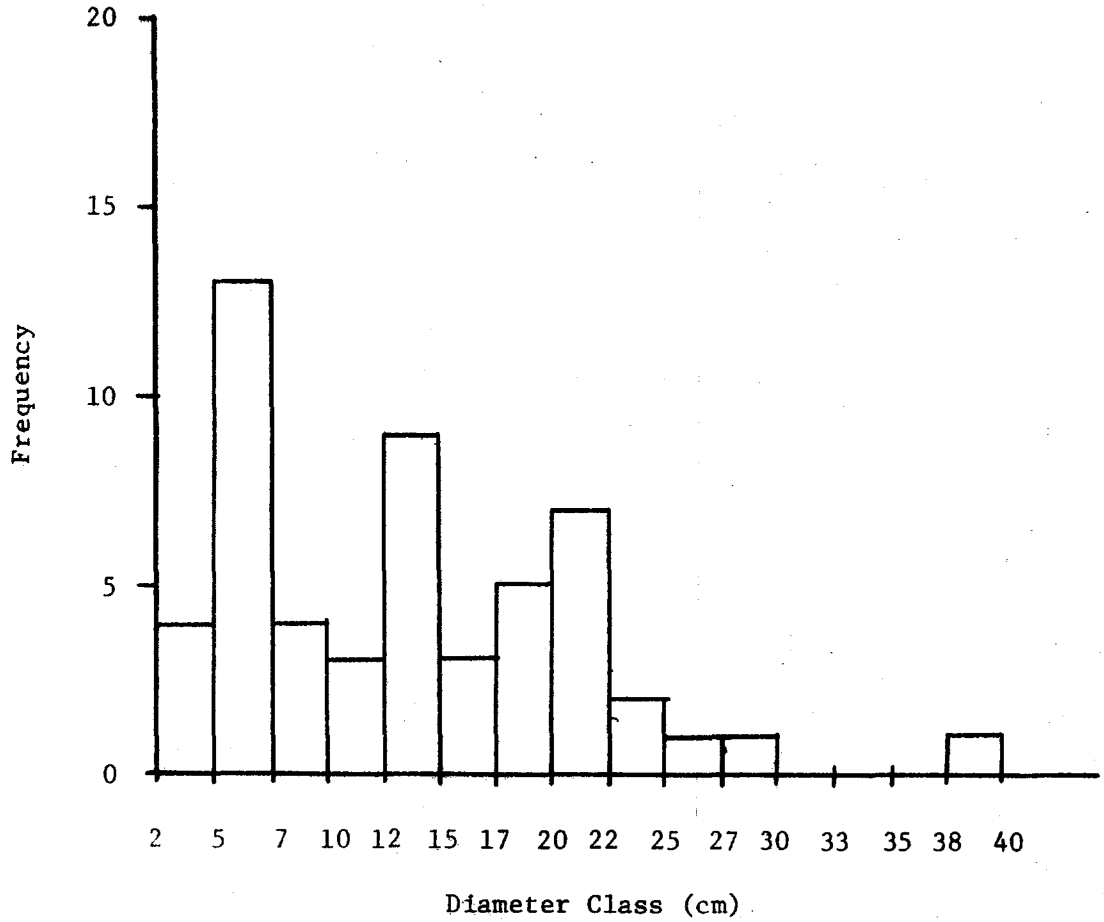


Figure 51. Size-frequency distribution of sand pine on the UCF Sand Pine Scrub site.

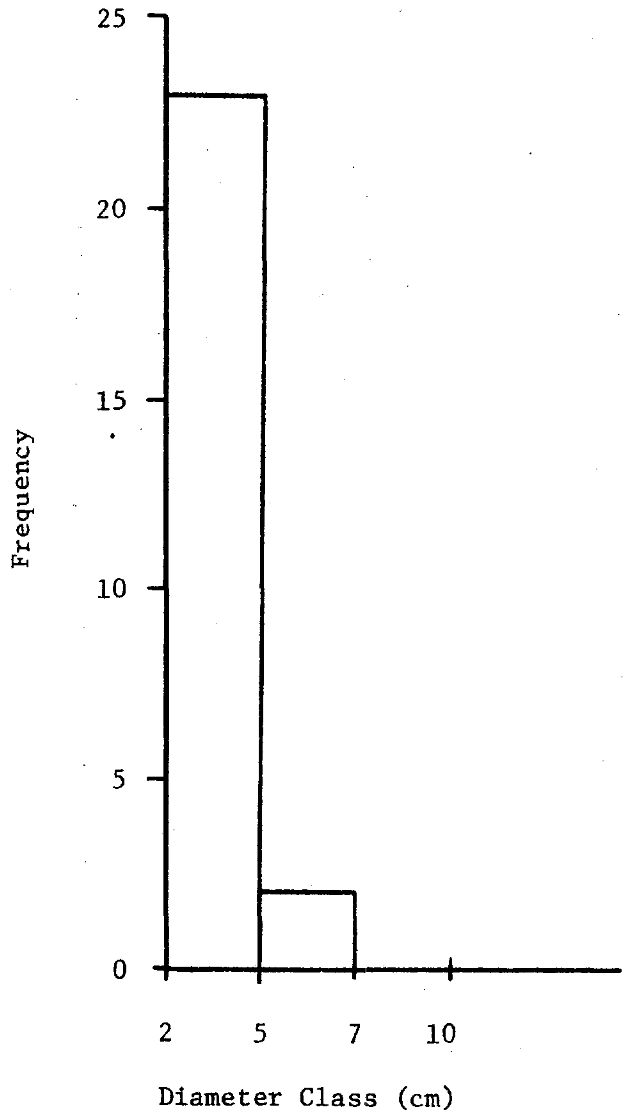


Figure 52. Size-frequency distribution of myrtle oak on the UCF Sand Pine Scrub site.

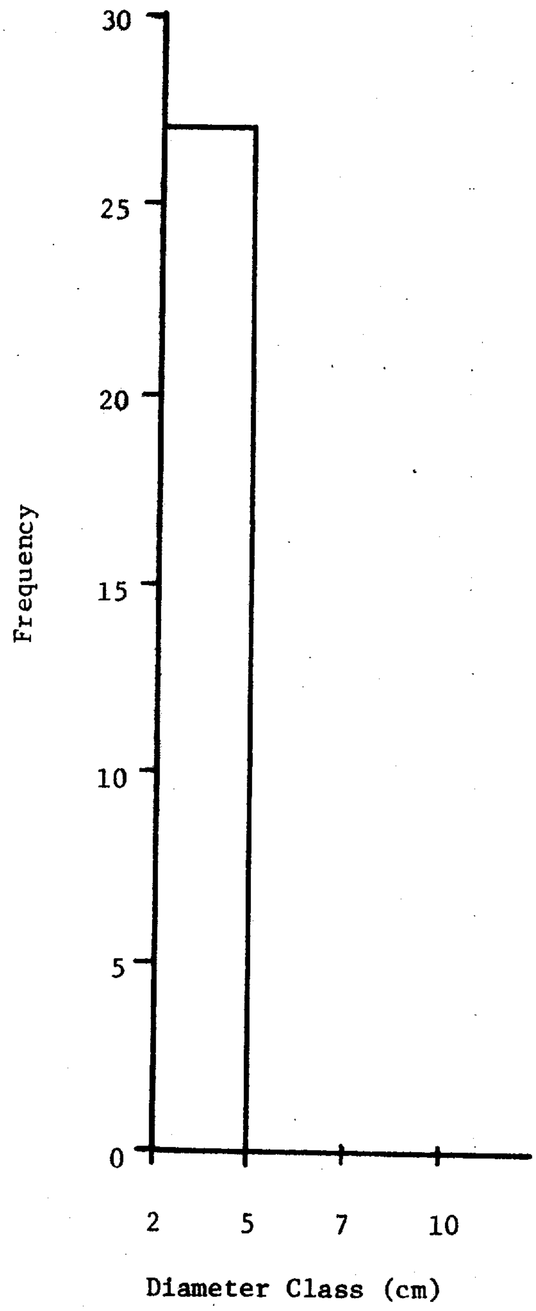


Figure 53. Size-frequency distribution of rusty lyonia on the UCF Sand Pine Scrub site.

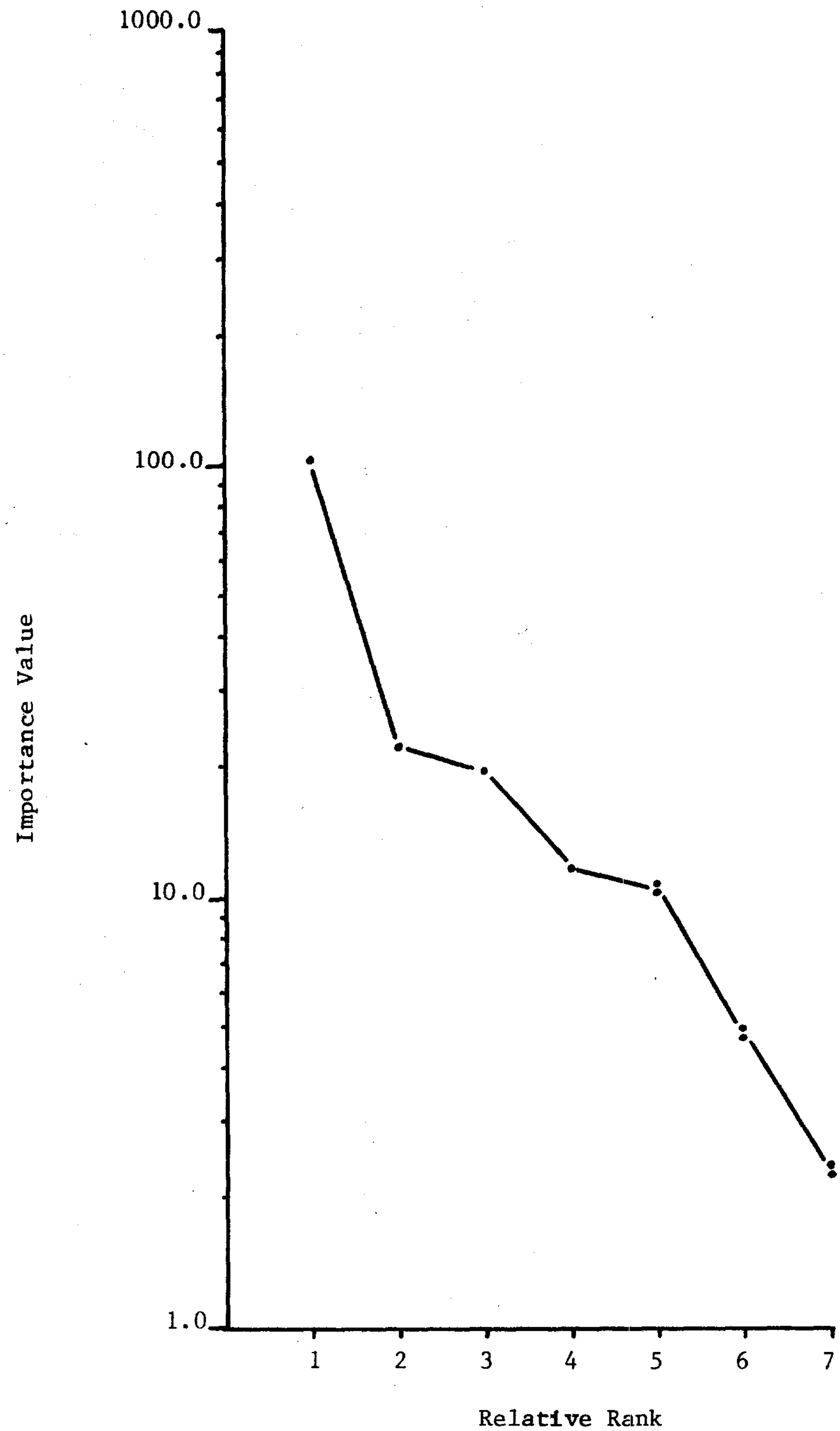


Figure 54. Dominance-diversity curve for shrubs ≥ .5m tall on the Debary Sand Pine Scrub. Importance values are based on relative density and relative frequency, Fall, 1977.

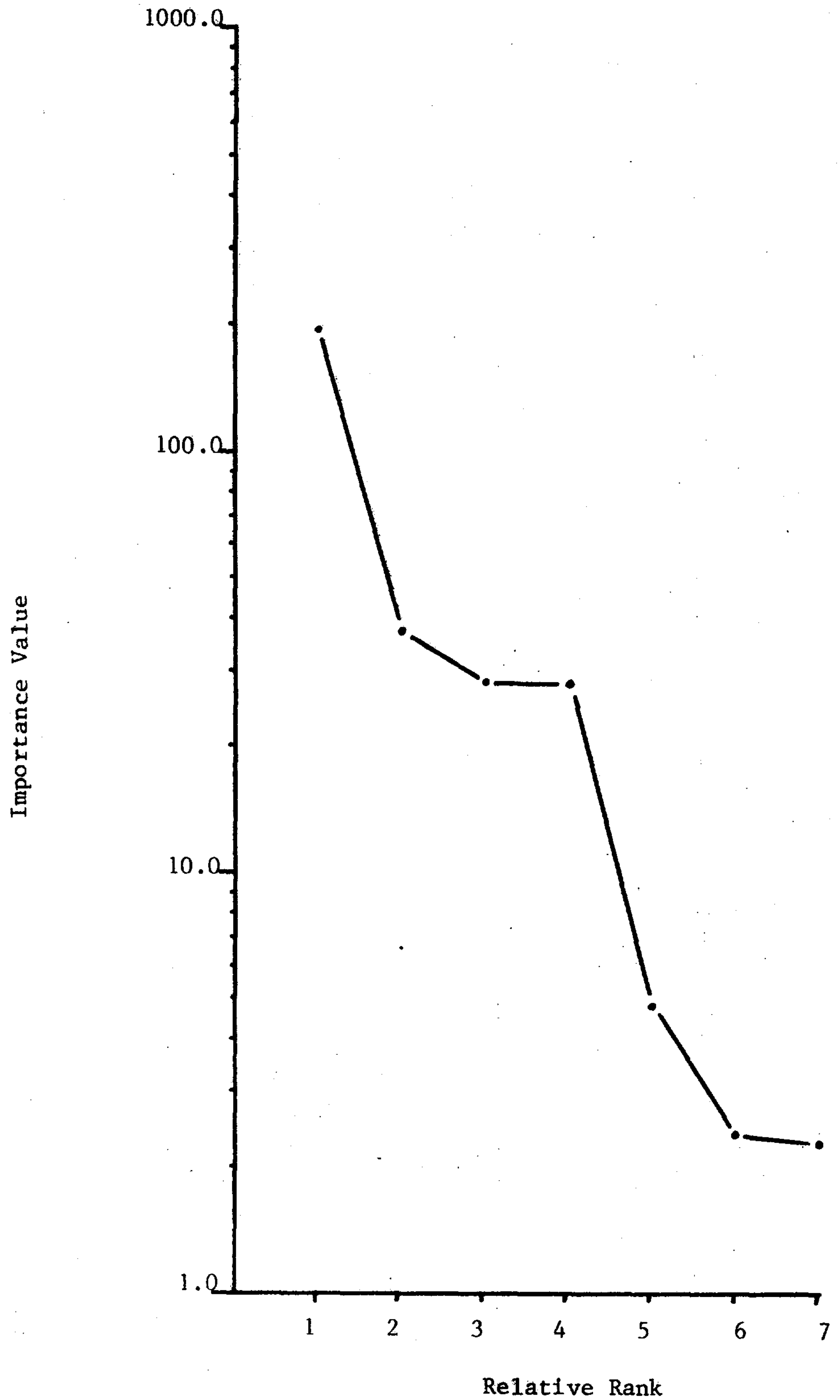


Figure 55. Dominance-diversity curves for trees on the Debary Sand Pine Scrub. Importance values are based on relative density, relative frequency and relative dominance, Fall, 1977.

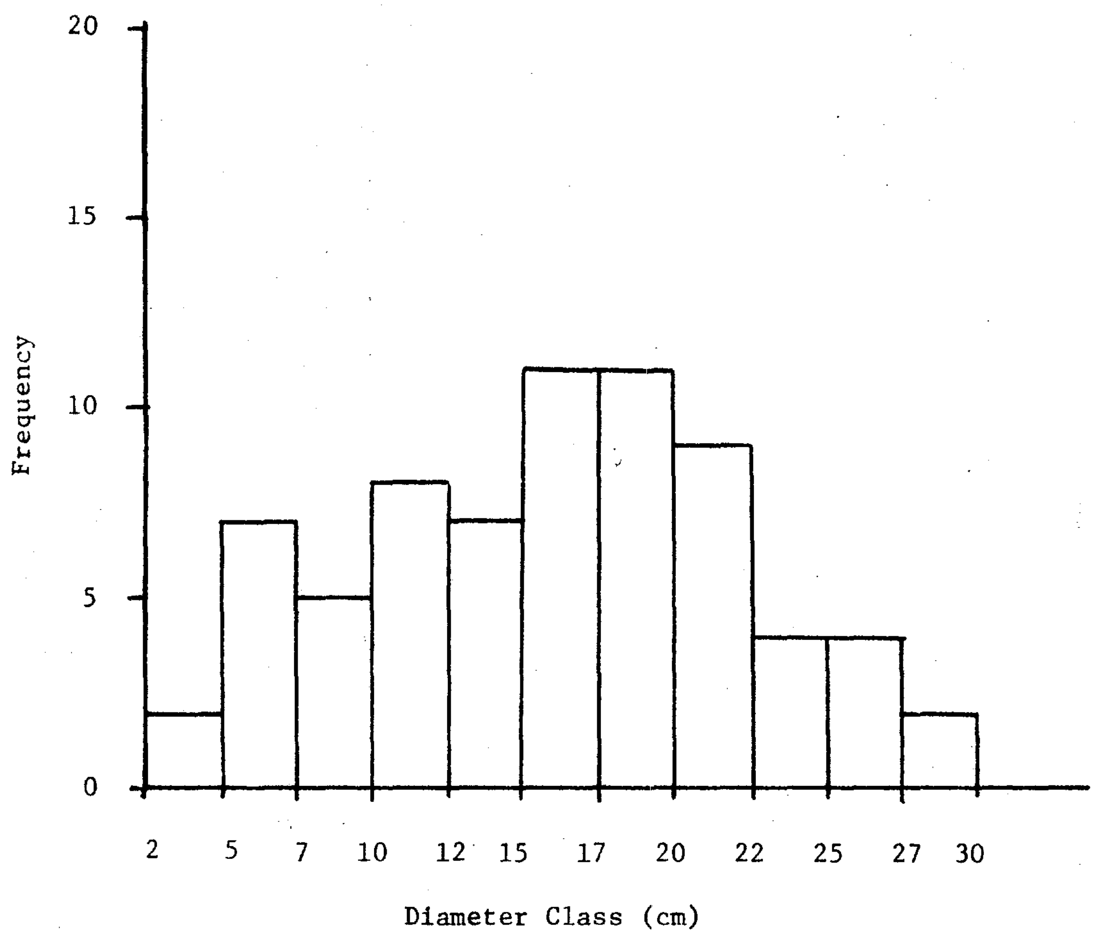


Figure 56. Size-frequency distribution of sand pine on the Debary Sand Pine Scrub site.

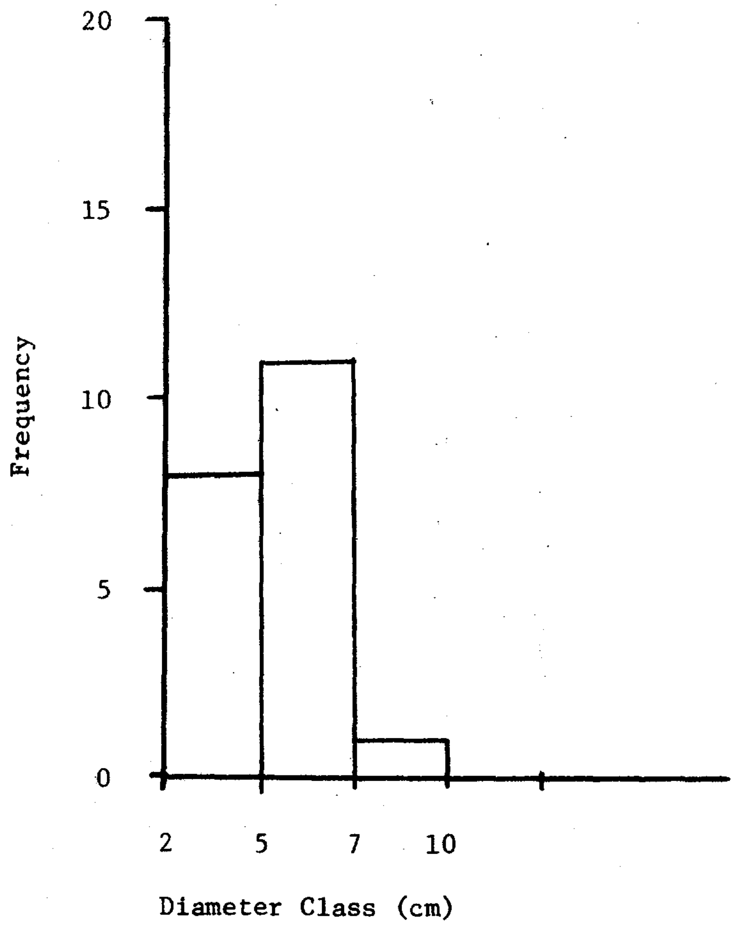


Figure 57. Size-frequency distribution of myrtle oak on the Debary Sand Pine Scrub site.

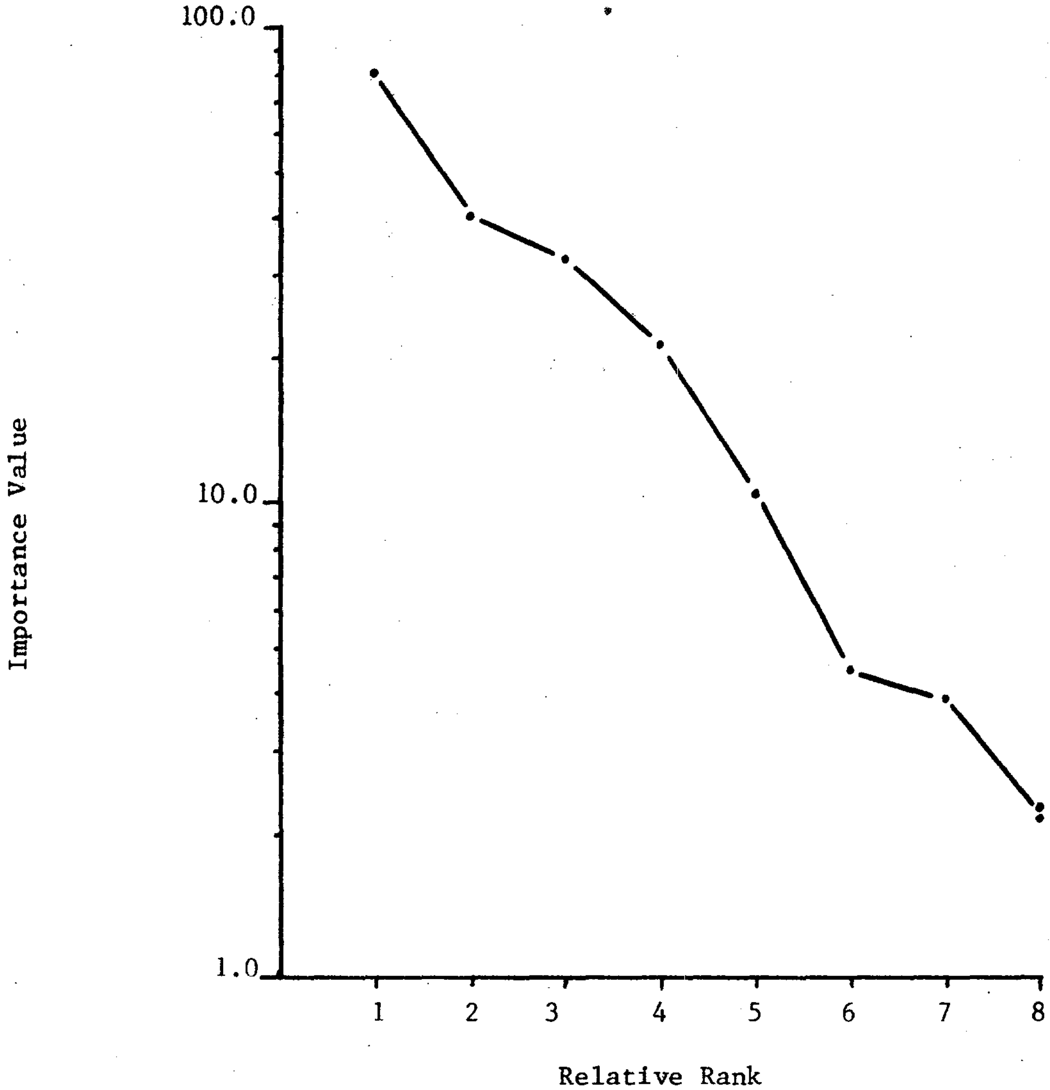


Figure 58. Dominance-diversity curve for shrubs ≥ .5m tall on the Route 50 Sand Pine Scrub. Importance values are based on relative density and relative frequency, Fall, 1977.

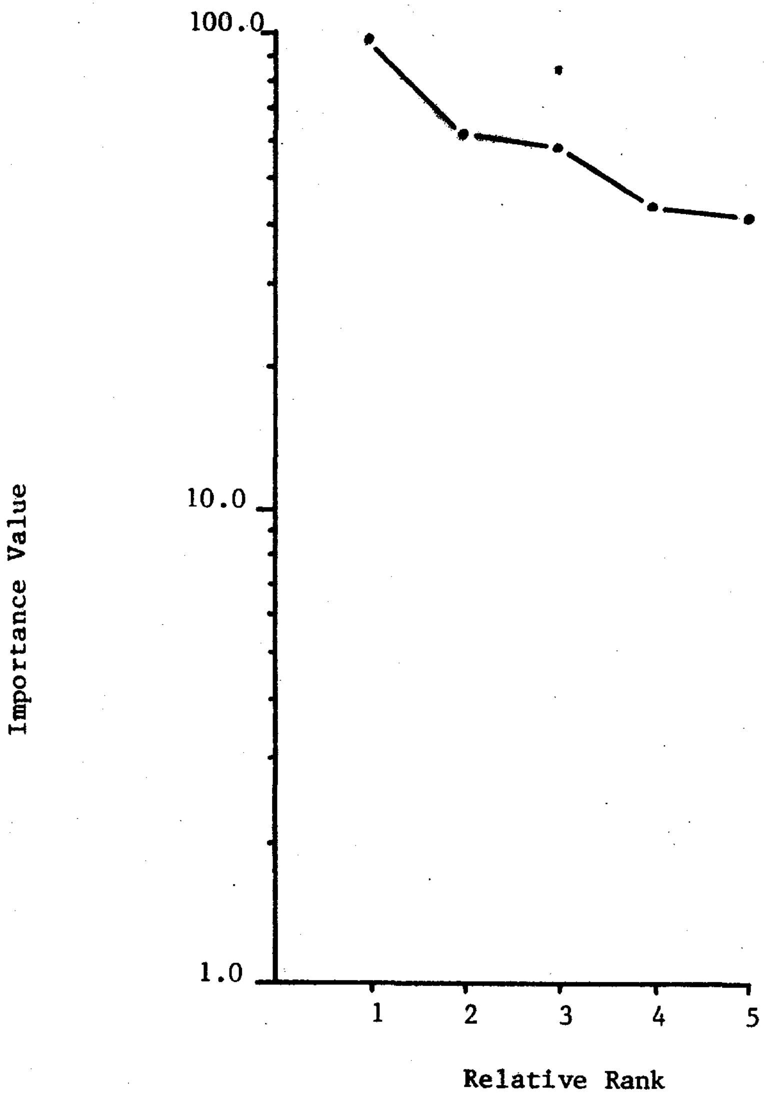


Figure 59. Dominance-diversity curve for trees on the Route 50 Sand Pine Scrub. Importance values are based on relative density, relative frequency and relative dominance, Fall, 1977.

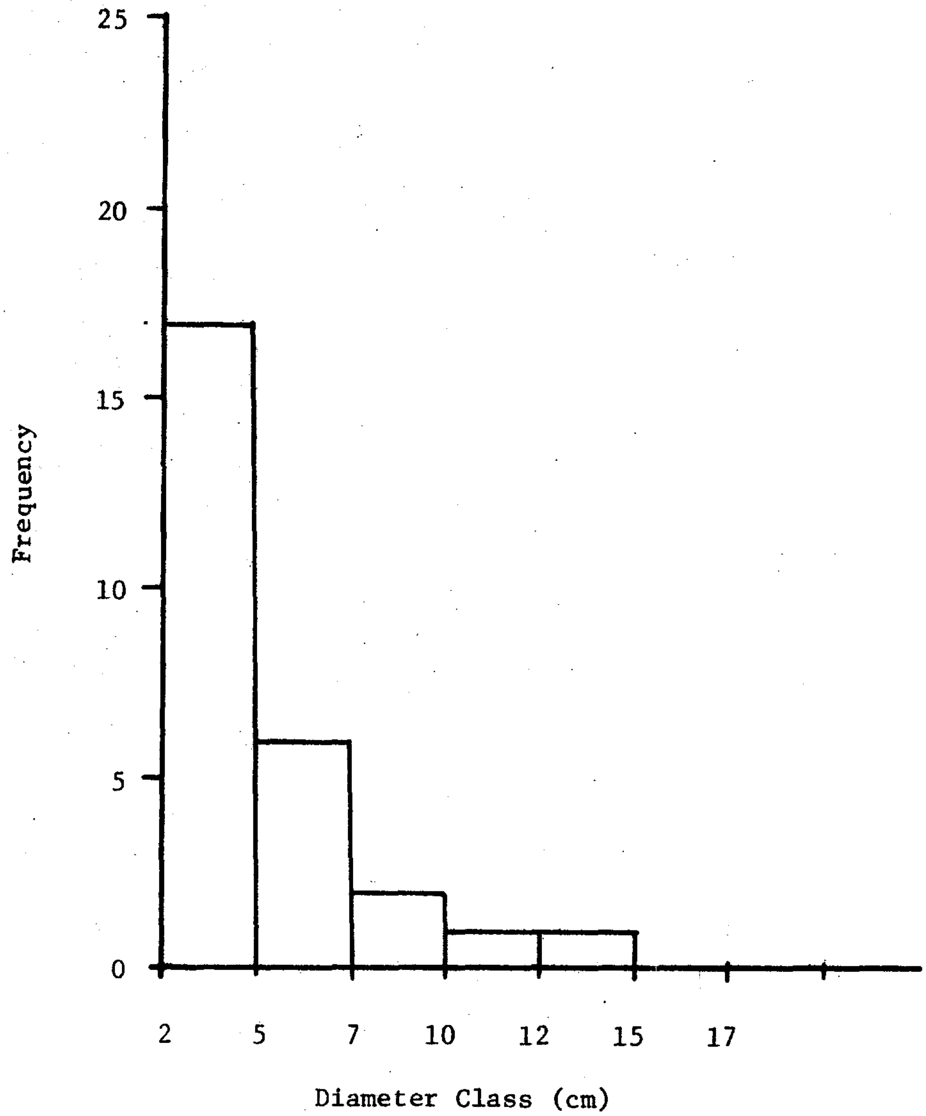


Figure 60. Size-frequency distribution of live oak on the Route 50 Sand Pine Scrub site.

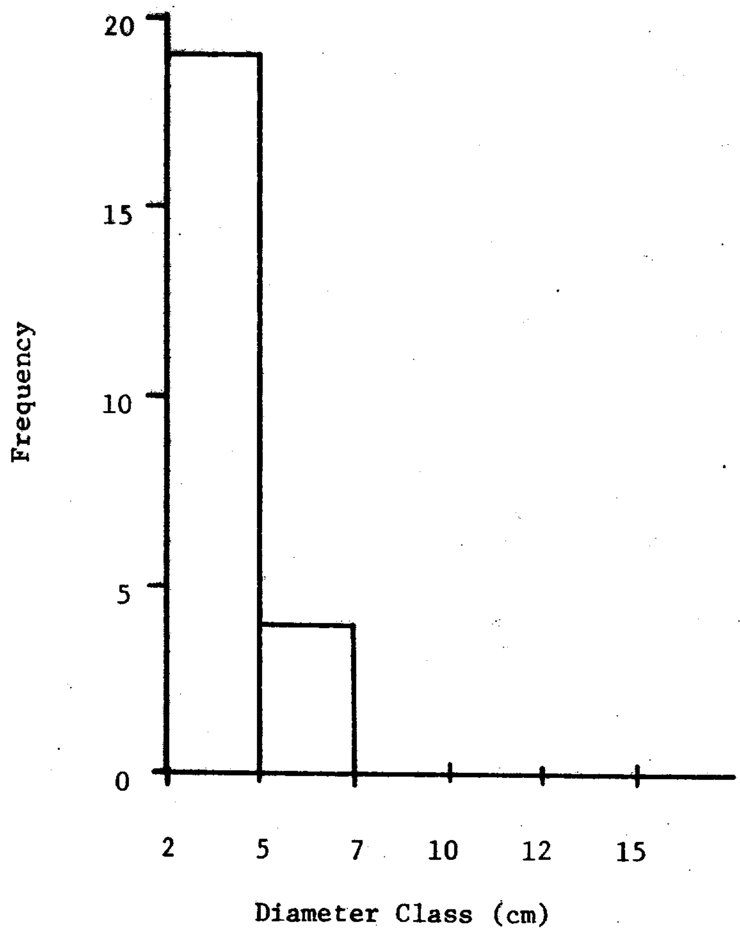


Figure 61. Size-frequency distribution of Chapman oak on the Route 50 Sand Pine Scrub site.

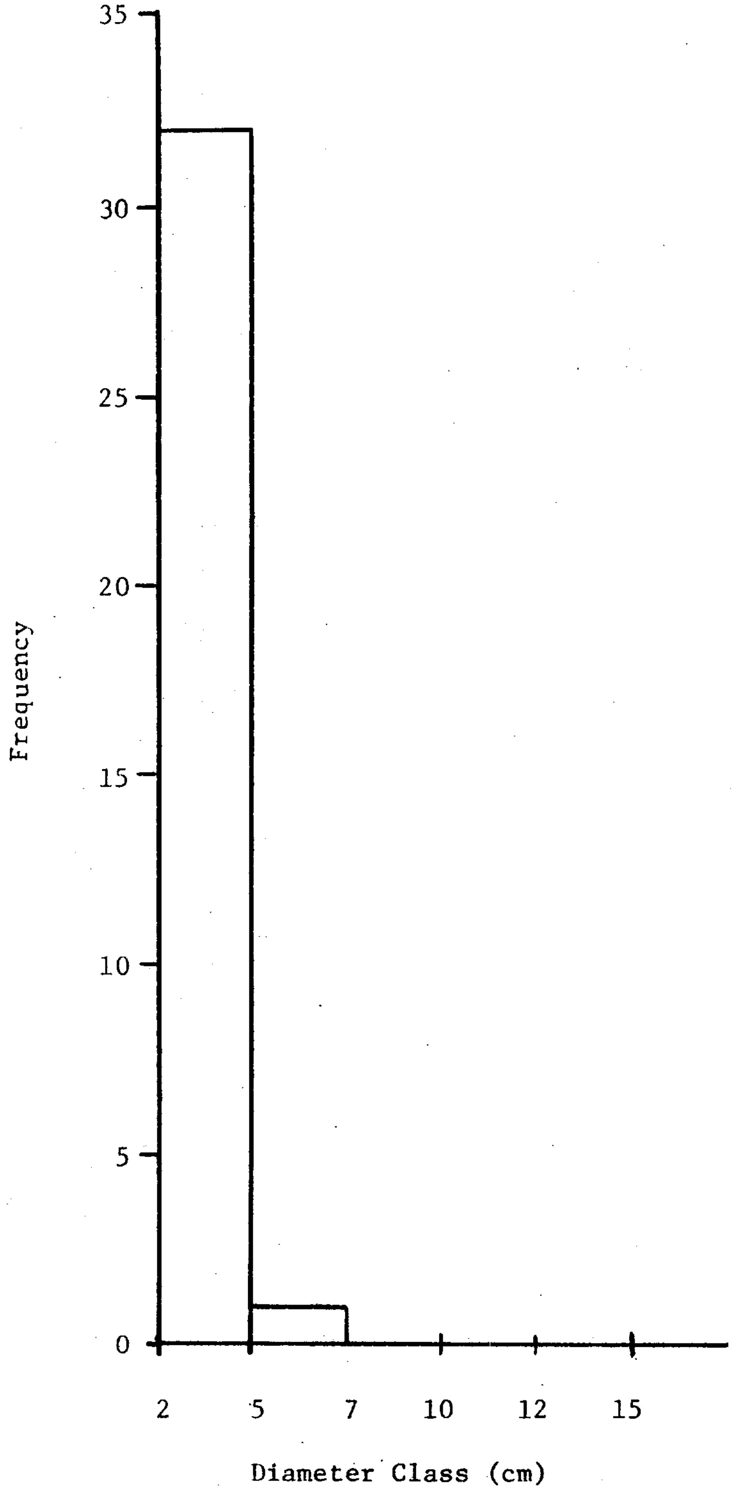


Figure 62. Size-frequency distribution of myrtle oak on the Route 50 Sand Pine Scrub site.

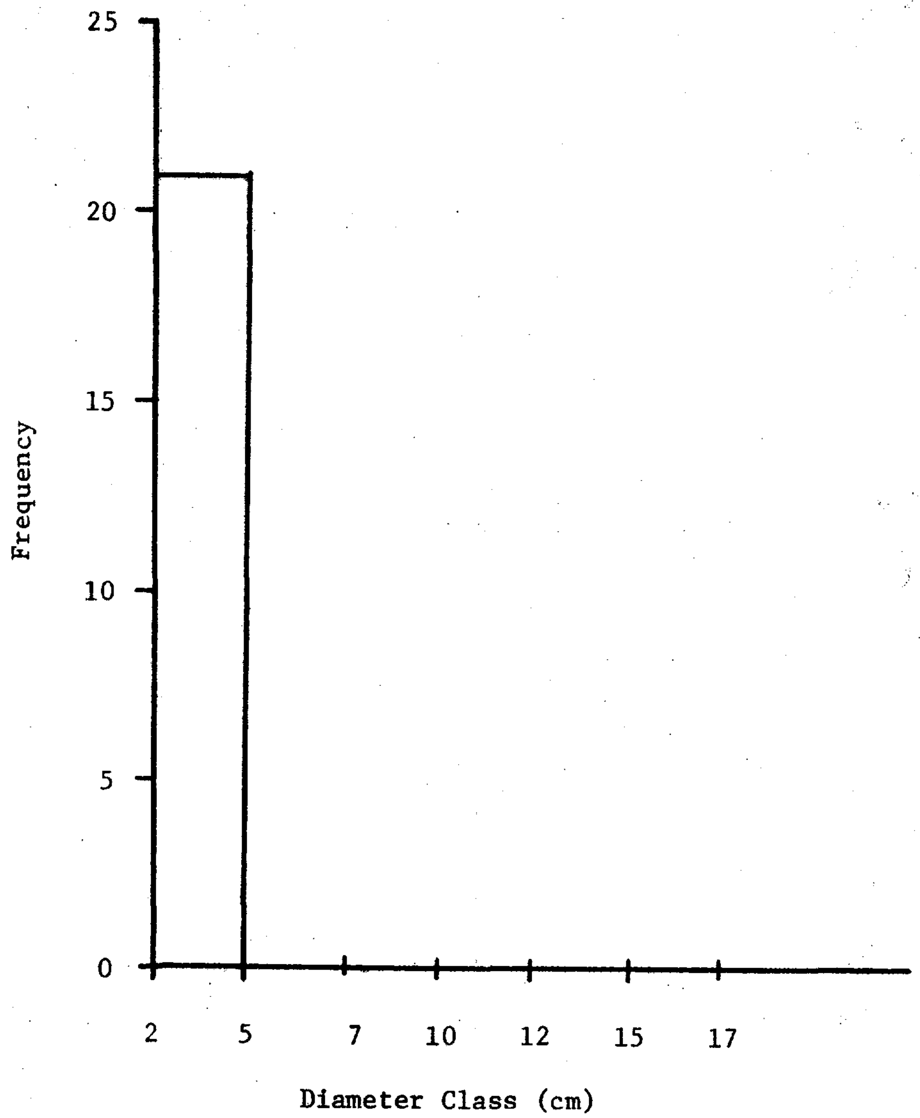


Figure 63. Size-frequency distribution of rusty lyonia on the Route 50 Sand Pine Scrub site.

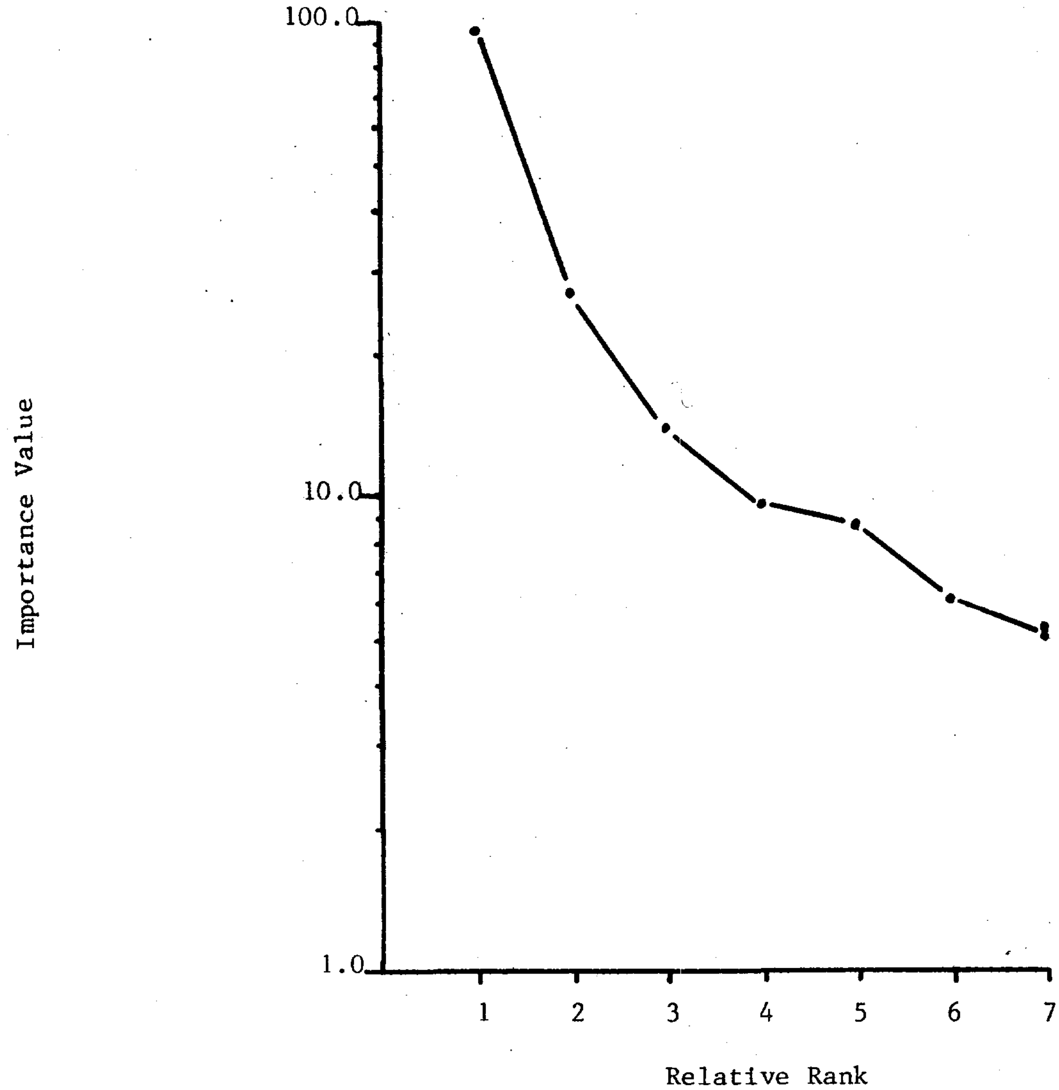


Figure 64. Dominance-diversity curves for shrubs $\geq$.5m tall on the Route 405 Sand Pine Scrub. Importance values are based on relative density and relative frequency, Spring, 1978.

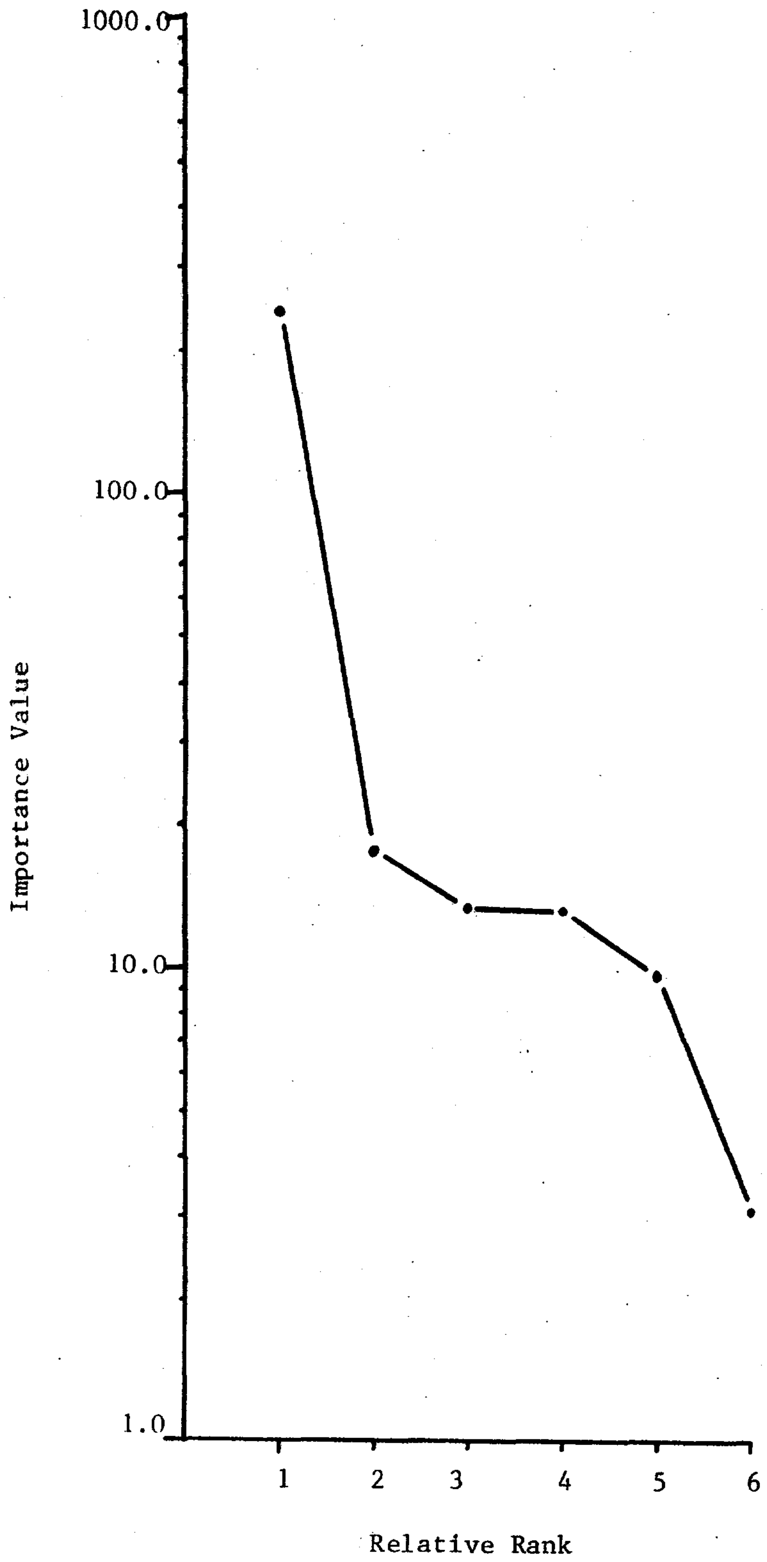


Figure 65. Dominance-diversity curves for trees on the Route 405 Sand Pine Scrub. Importance values are based on relative density, relative frequency and relative dominance, Spring, 1978.

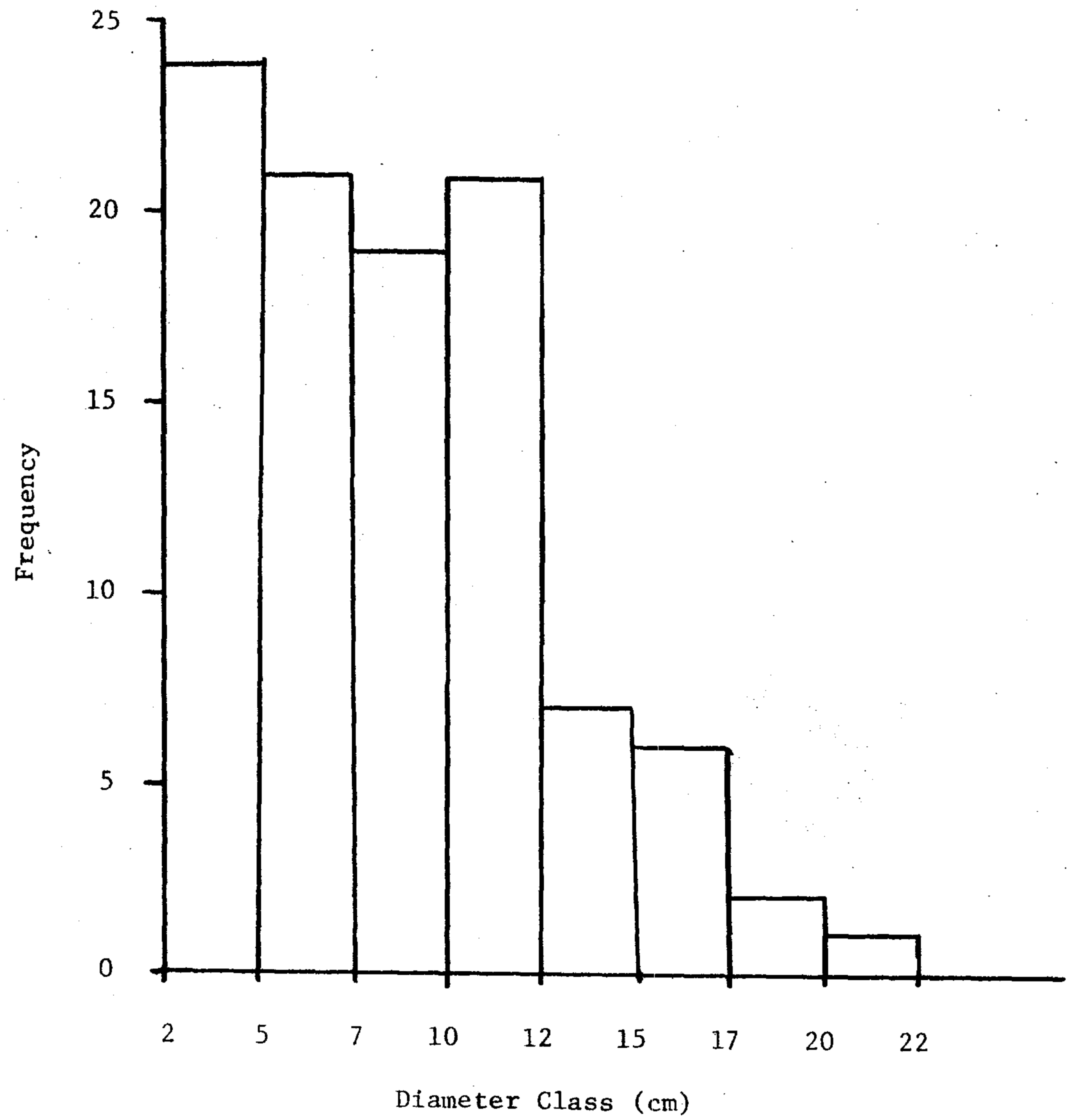


Figure 66. Size-frequency distribution of sand pine on the Route 405 Sand Pine Scrub site.

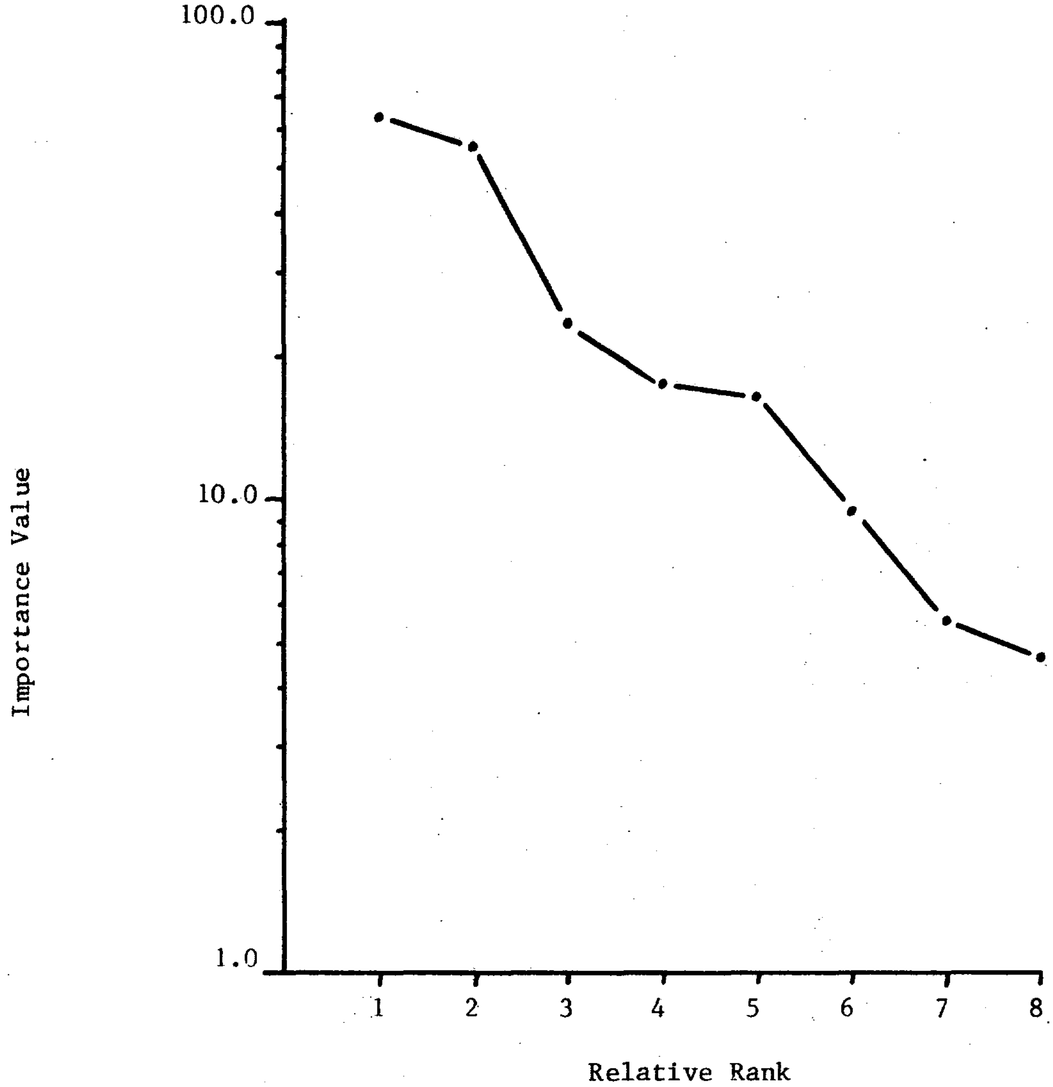


Figure 67. Dominance-diversity curve for shrubs ≥ .5m on the Rockledge Sand Pine Scrub. Importance values are based on relative density and relative frequency, Fall, 1978.

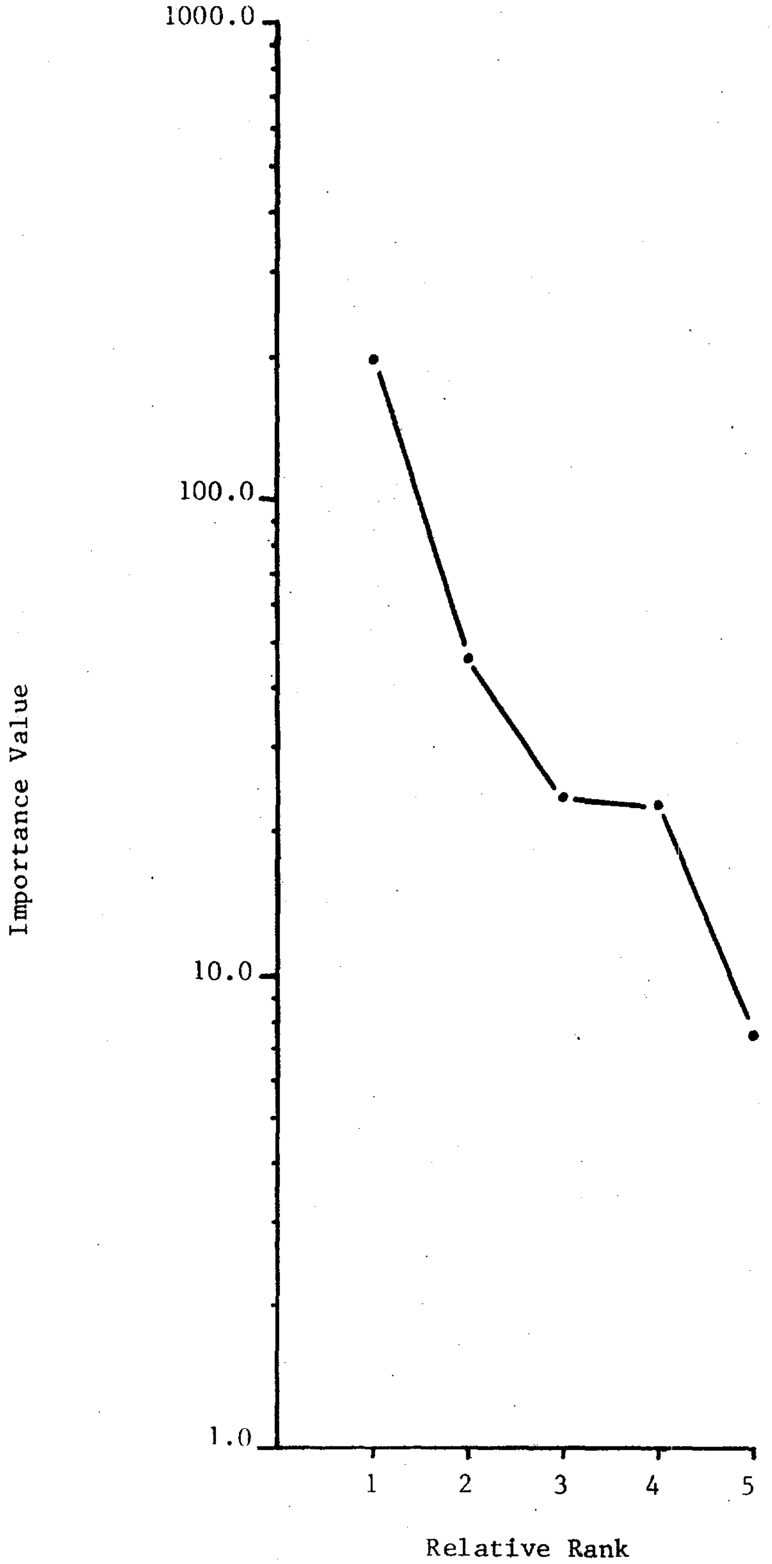


Figure 68. Dominance-diversity curve for trees on the Rockledge Sand Pine Scrub. Importance values are based on relative density, relative frequency and relative dominance, Fall, 1978.

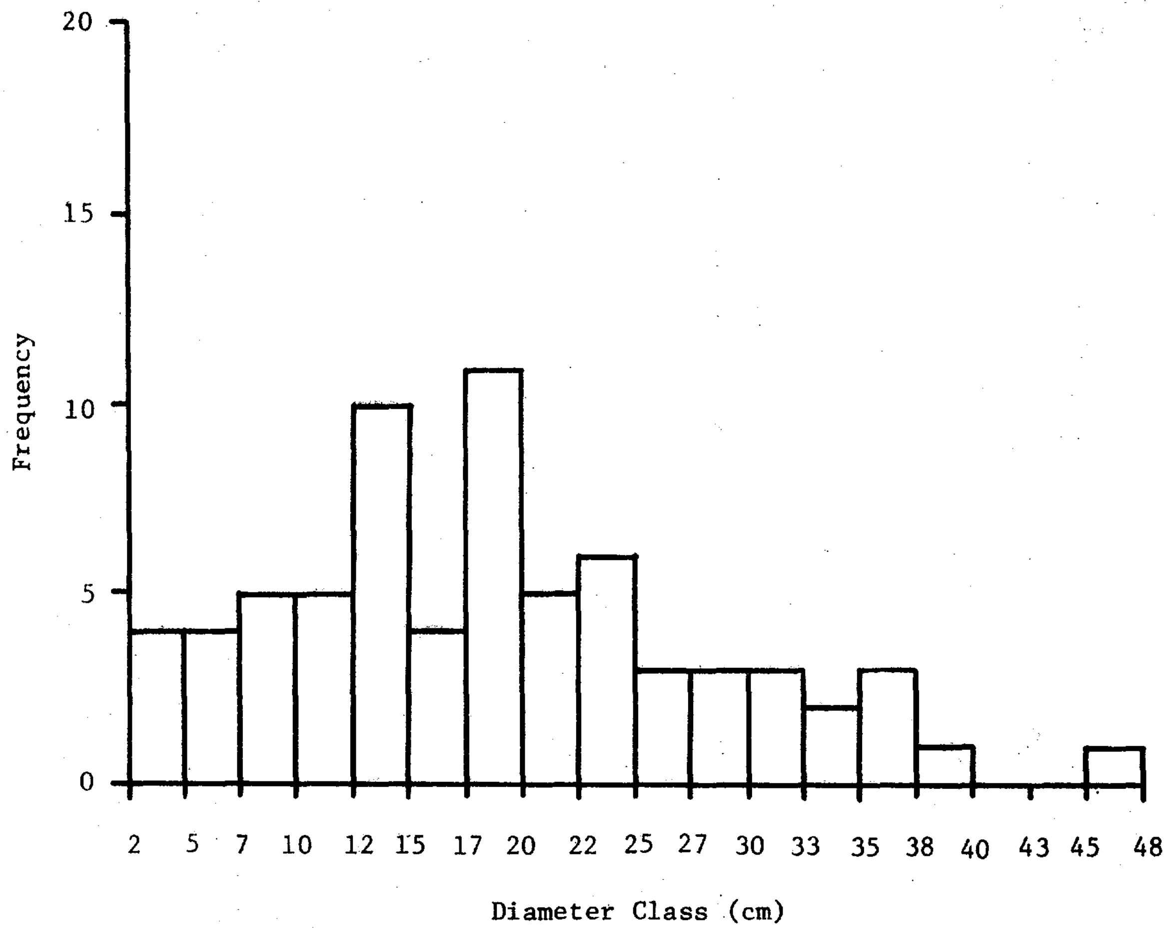


Figure 69. Size-frequency distribution of sand pine on the Rockledge Sand Pine Scrub site.

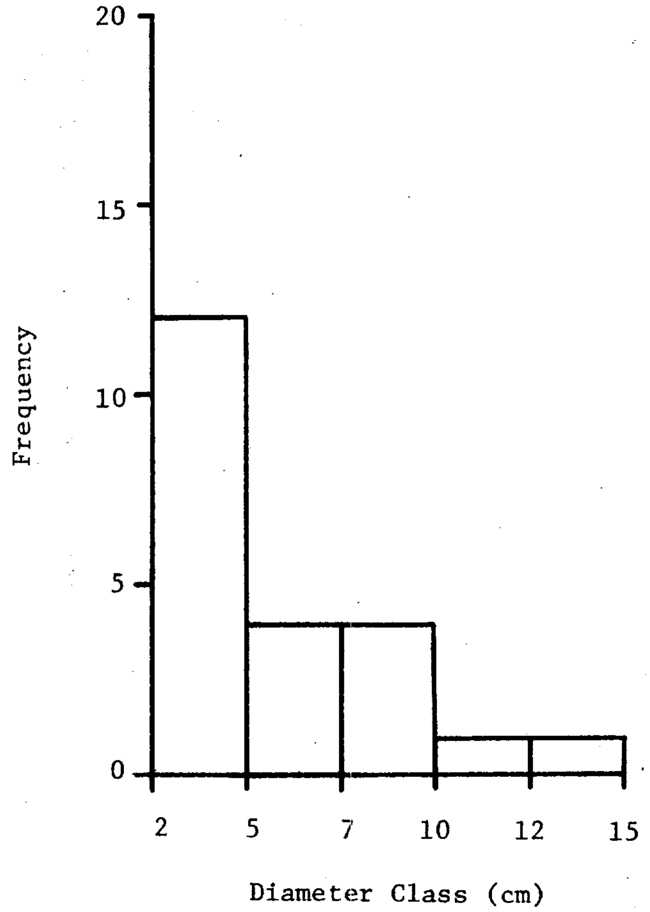


Figure 70. Size-frequency distribution of live oak on the Rockledge Sand Pine Scrub site.

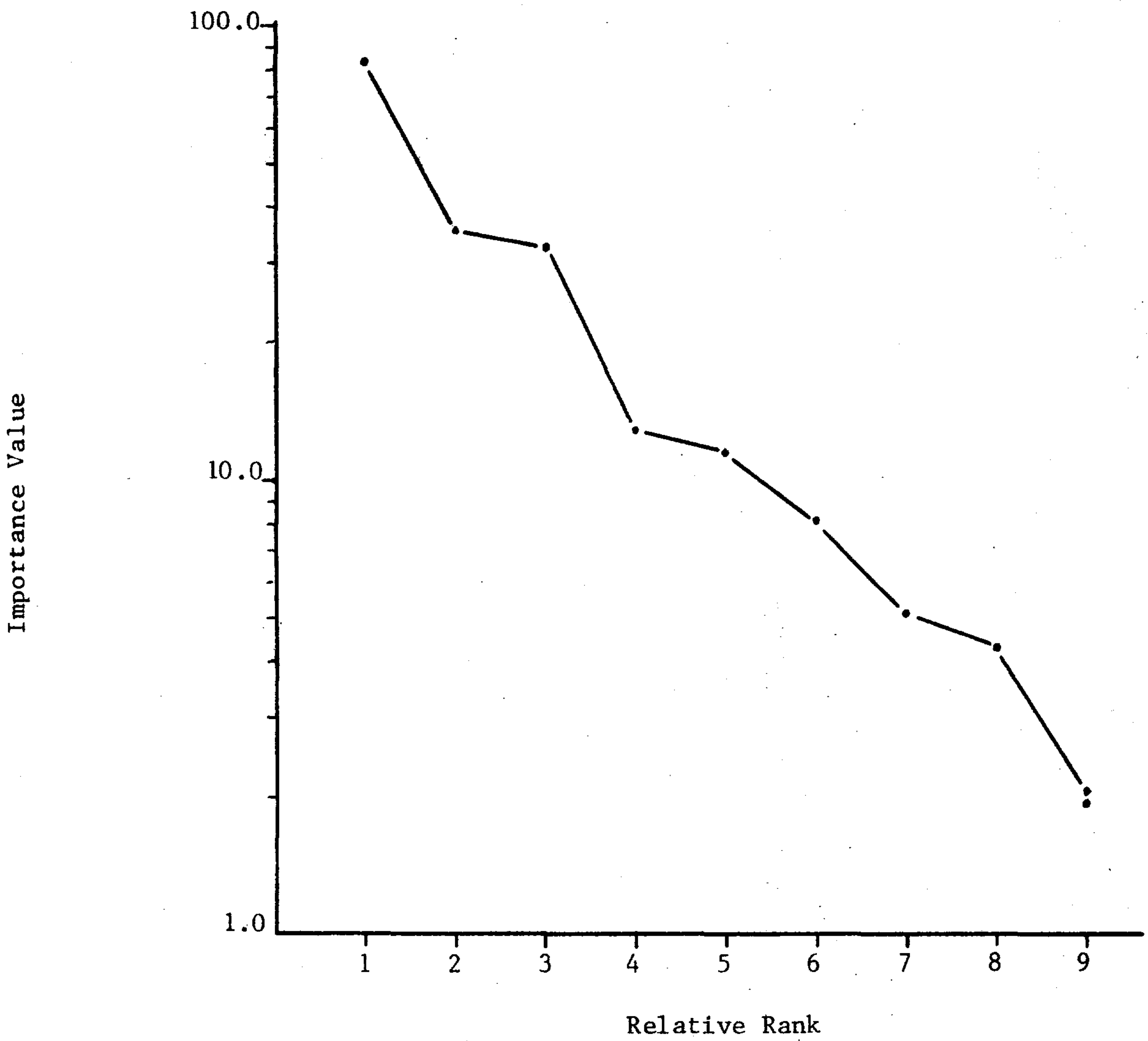


Figure 71. Dominance-diversity curve for shrub species $\geq$ .5m tall on the Wekiva Sand Pine Scrub. Importance values are based on relative density and relative frequency, Fall, 1978.

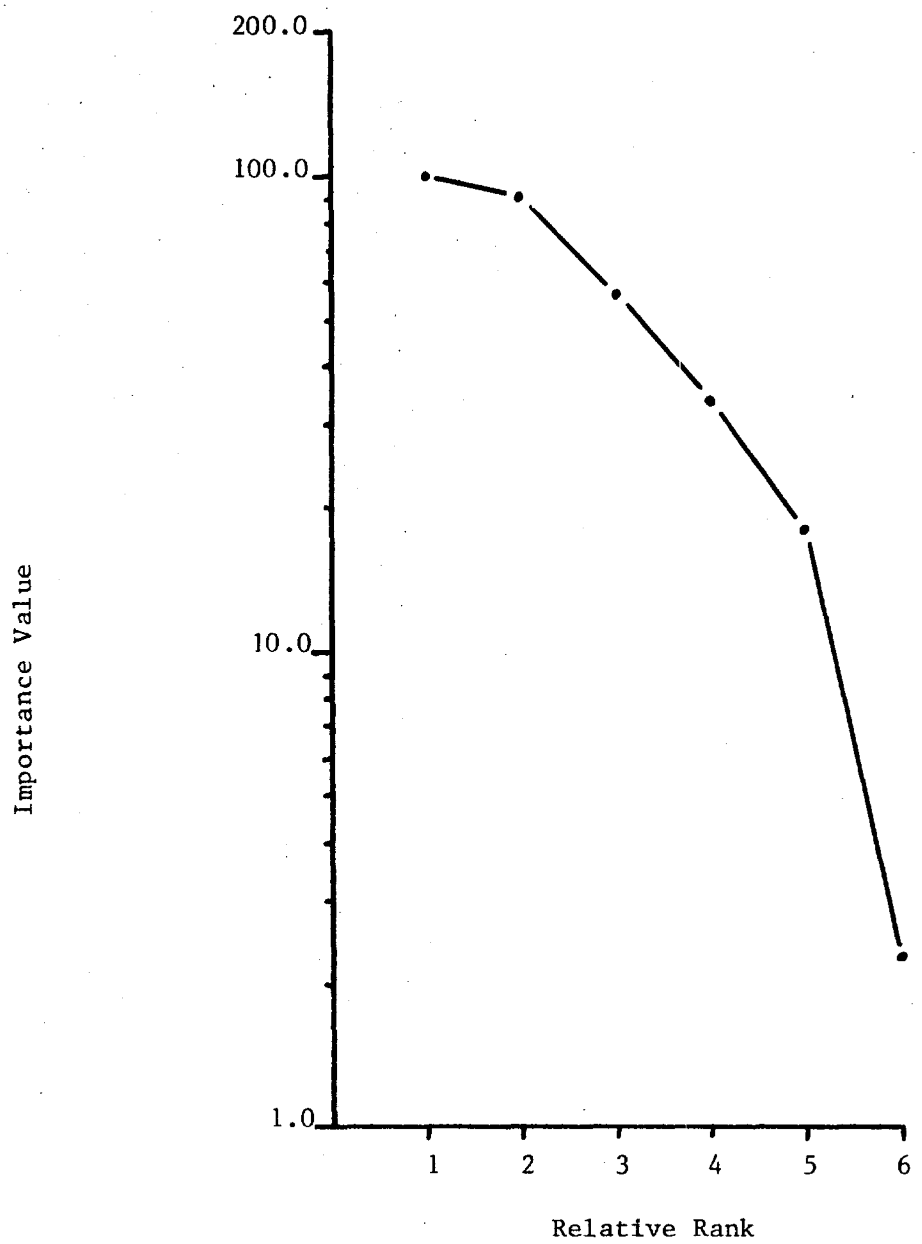


Figure 72. Dominance-diversity curves for trees on the Wekiva Sand Pine Scrub. Importance values are based on relative density, relative frequency and relative dominance, Fall, 1978.

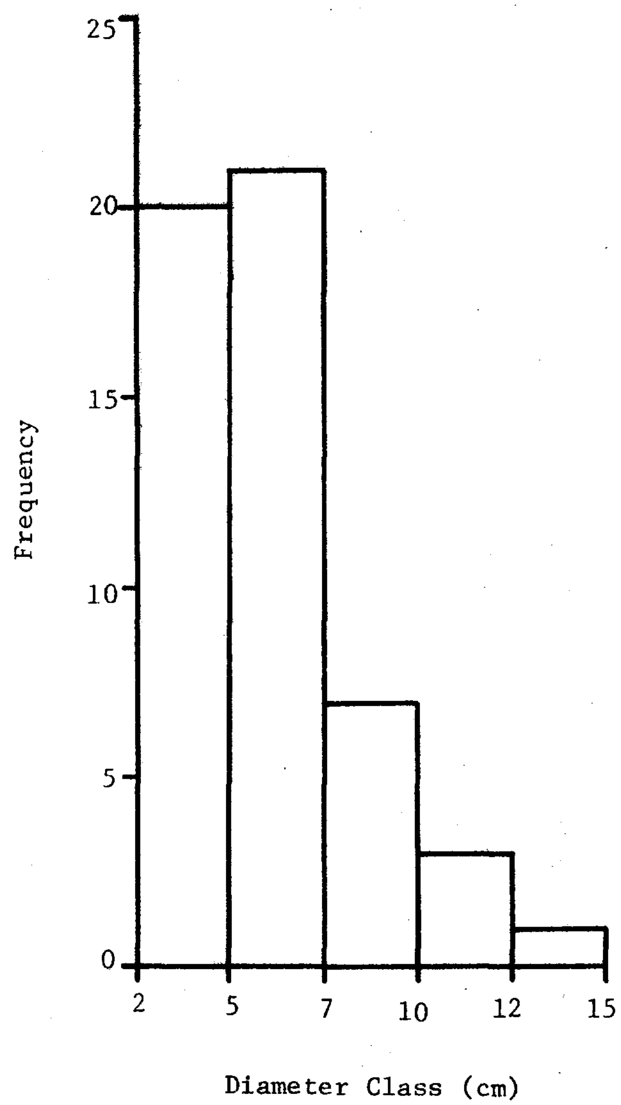


Figure 73. Size-frequency distribution of myrtle oak on the Wekiva Sand Pine Scrub site.

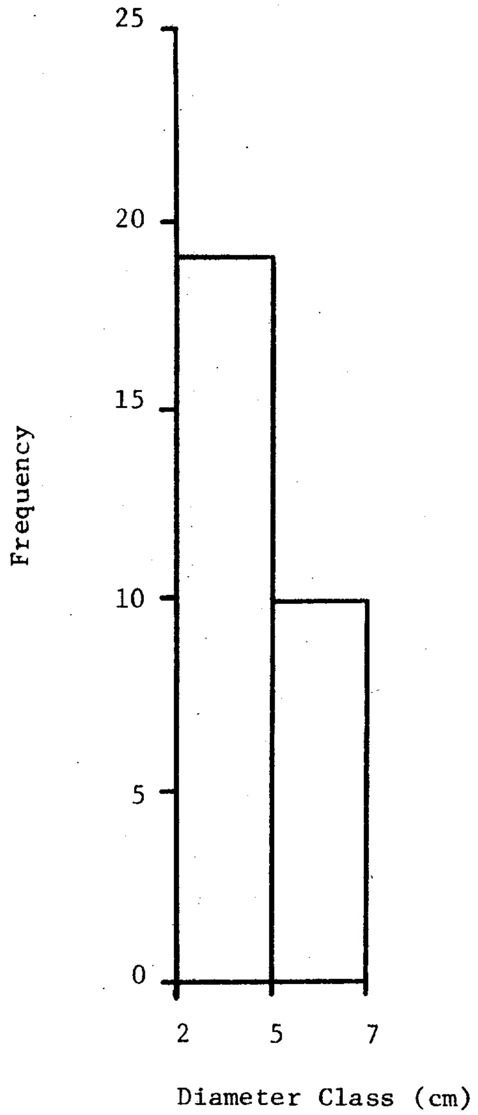


Figure 74. Size-frequency distribution of Chapman oak on the Wekiva Sand Pine Scrub site.

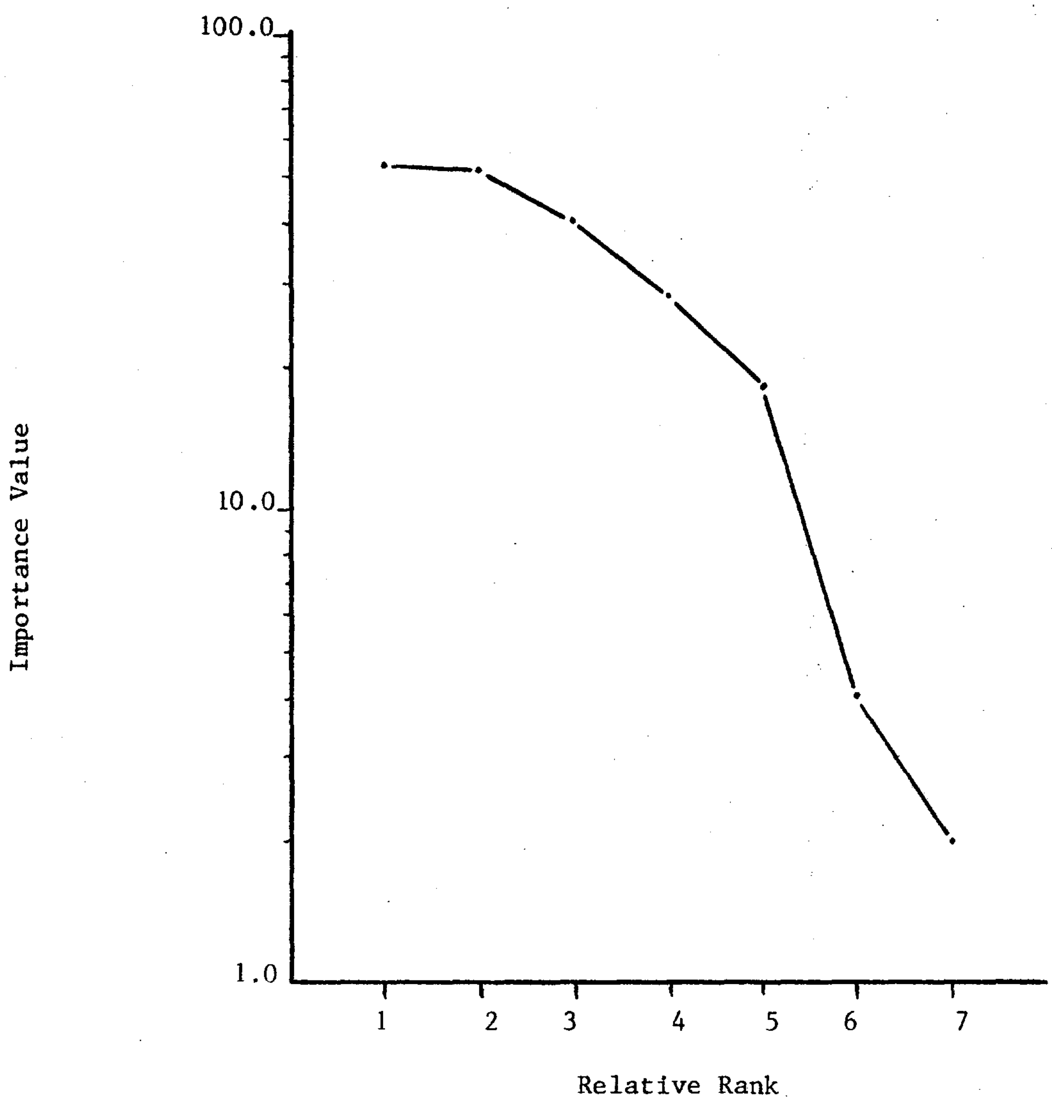


Figure 75. Dominance-diversity curve for shrub species ≥ .5m tall on the Dune Scrub. Importance values are based on relative density and relative frequency, Fall, 1977.

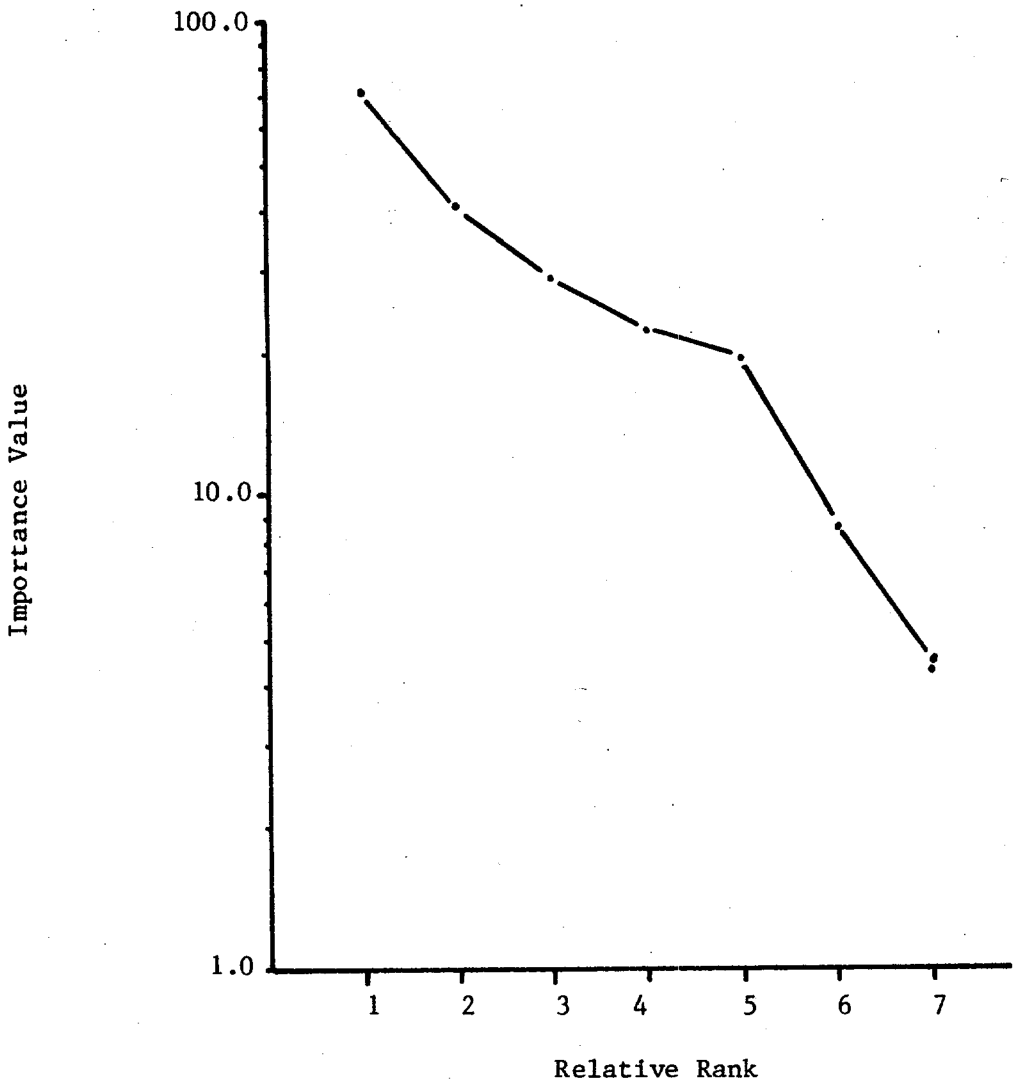


Figure 76. Dominance-diversity curve for shrub species $\geq$ .5m tall on the Happy Creek Scrub. Importance values are based on relative density and relative frequency, Summer, 1977.

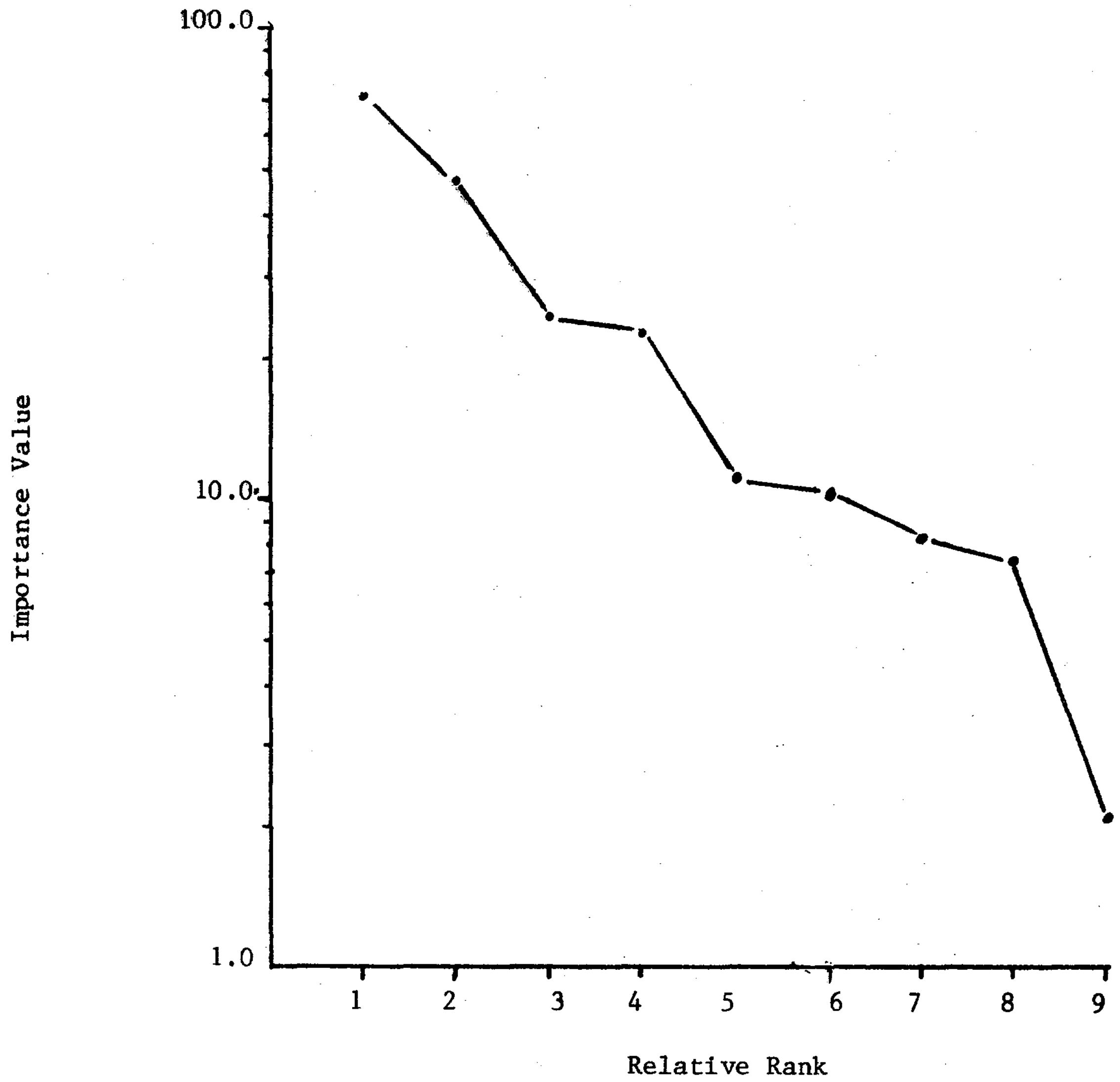


Figure 77. Dominance-diversity curve for shrub species ≥ .5m tall on the Route 3 Scrub. Importance values are based on relative density and relative frequency, Fall, 1977.

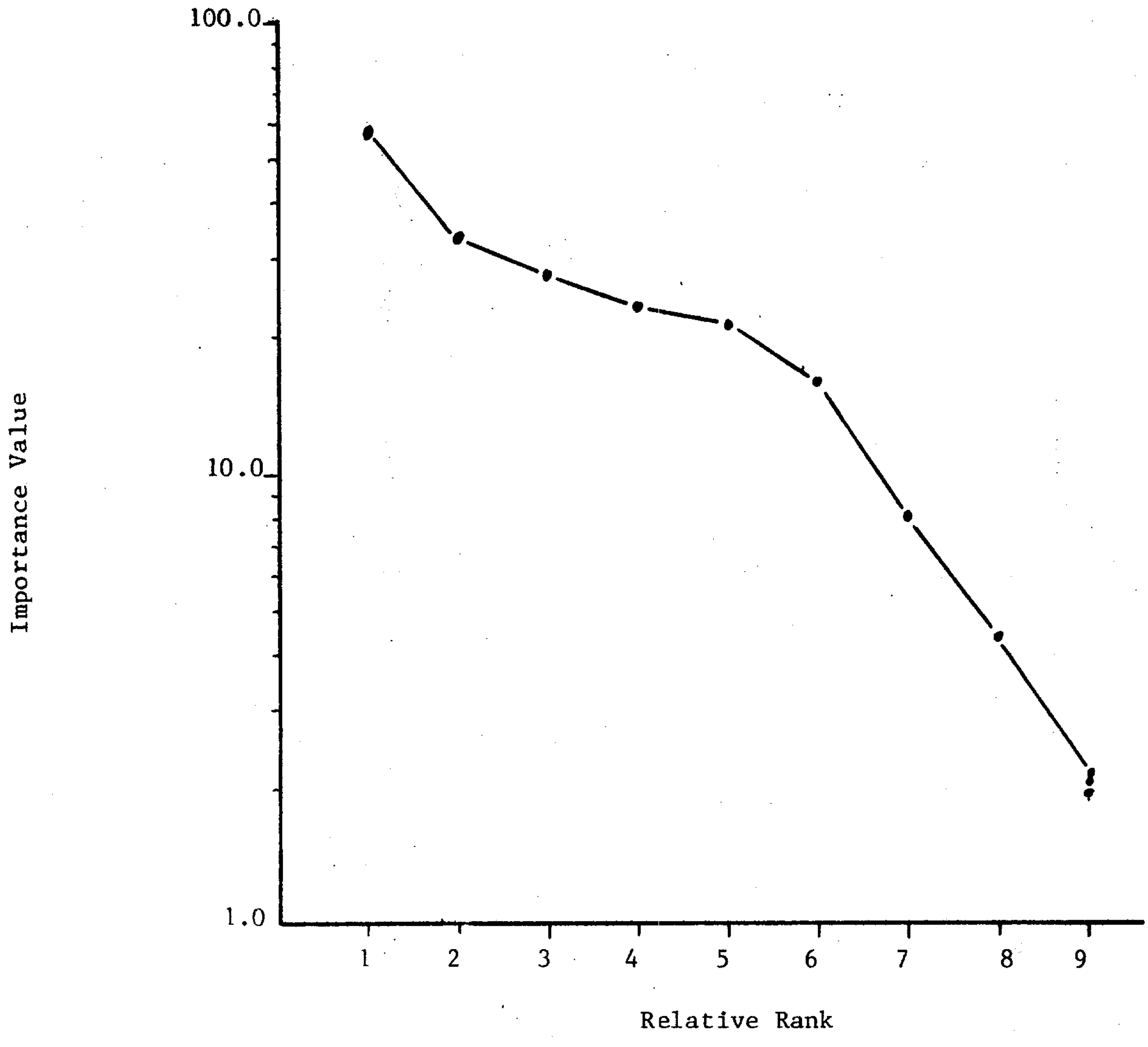


Figure 78. Dominance-diversity curve for shrub species ≥ .5m tall on the Wind Tower Scrub. Importance values are based on relative density and relative frequency, Summer, 1977.

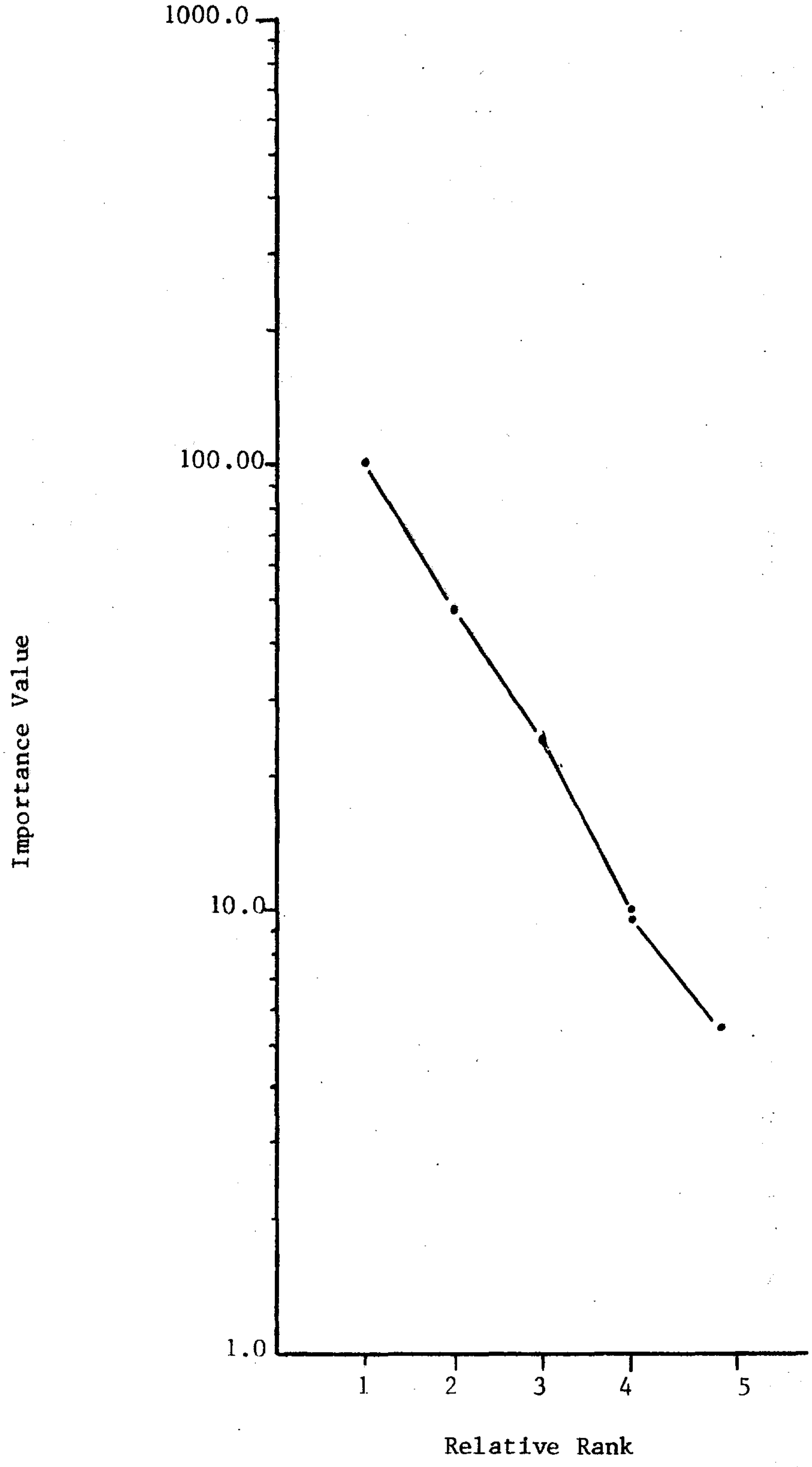


Figure 79. Dominance-diversity curve for shrub species ≥ .5m tall on the Rosemary Scrub. Importance values are based on relative density and relative frequency, Fall, 1978.

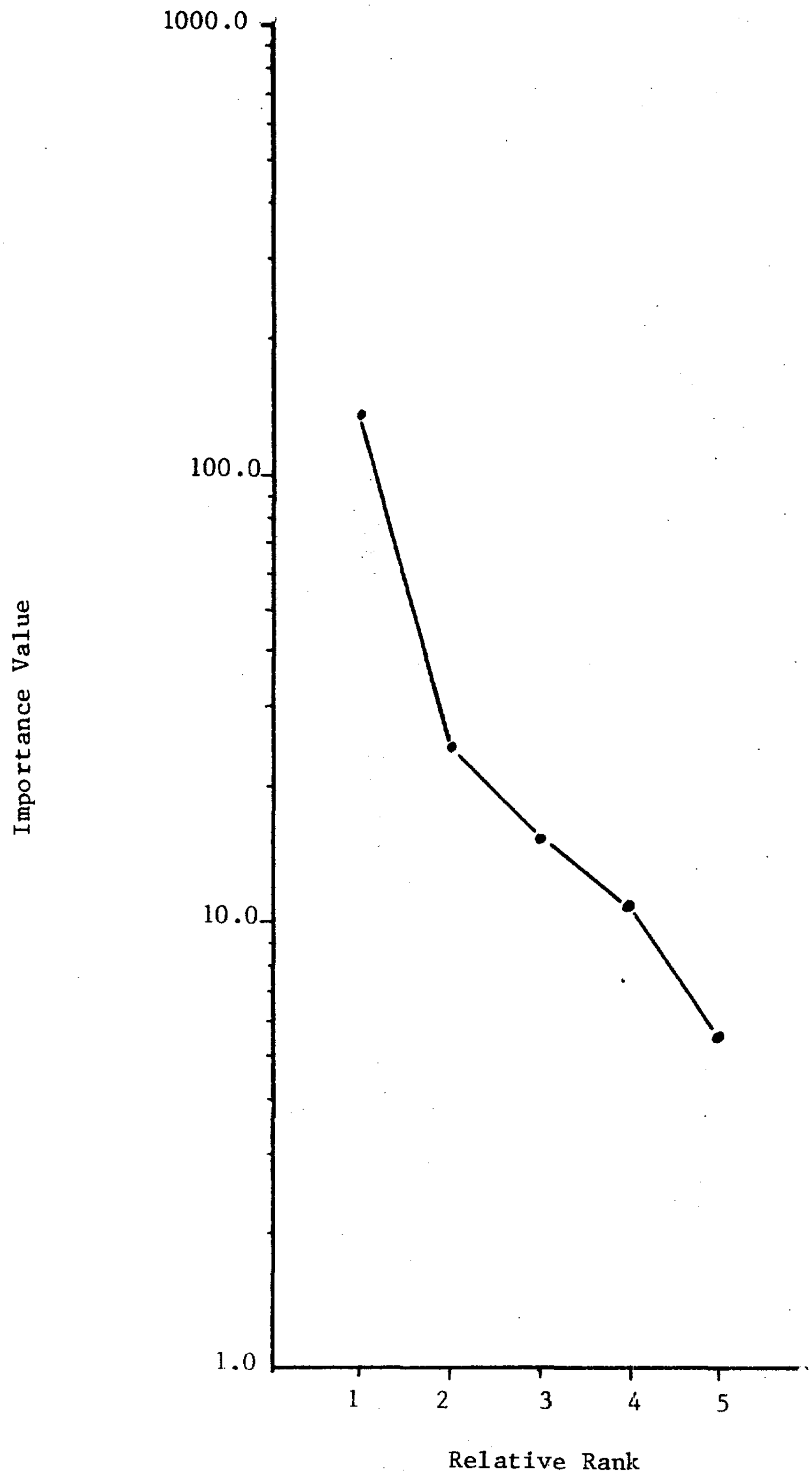


Figure 80. Dominance-diversity curve for shrub species ≥ .5m tall on the Complex 34 Coastal Scrub. Importance values are based on relative density and relative frequency, Fall, 1977.

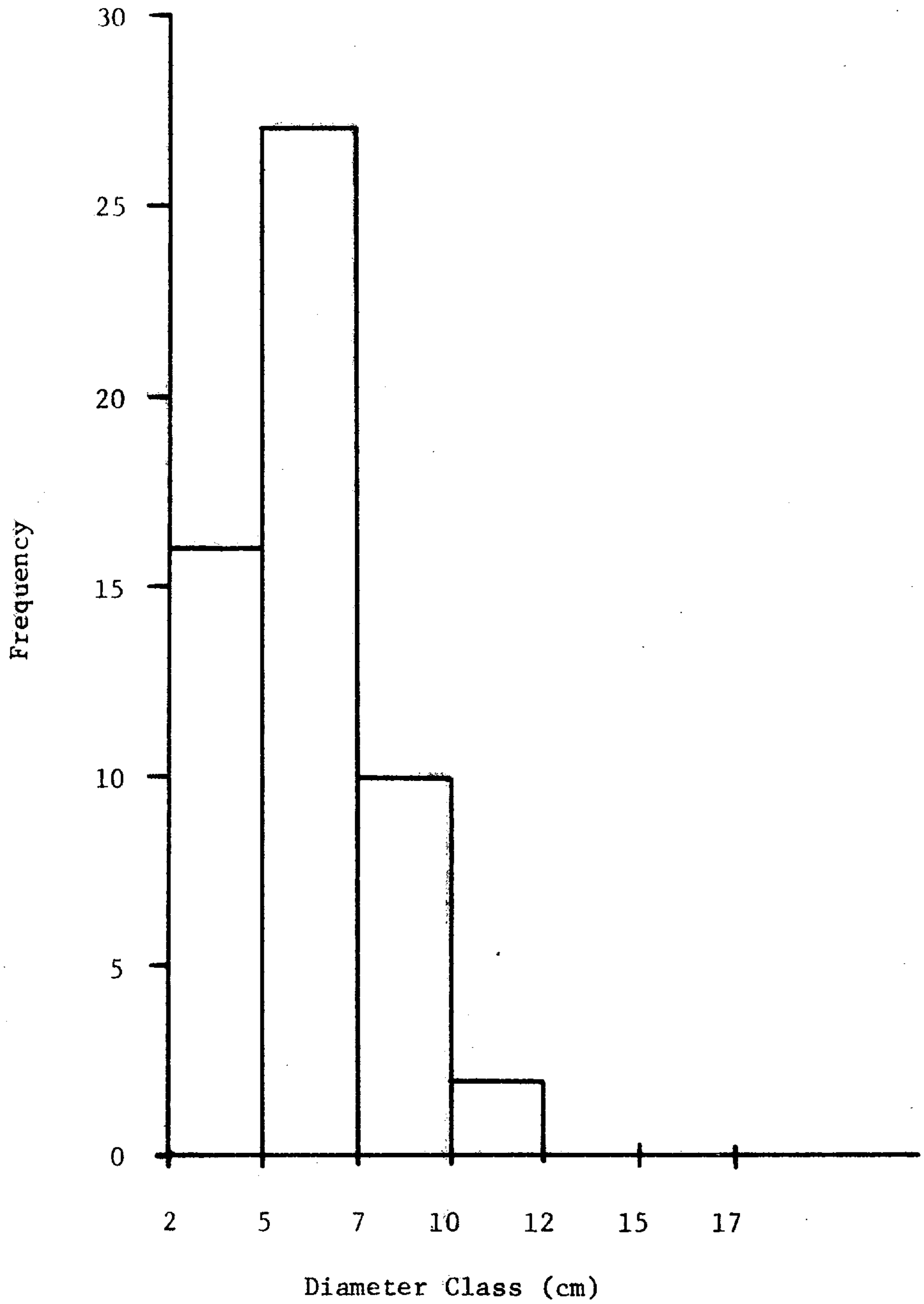


Figure 81. Size-frequency distribution of myrtle oak on the Complex 34 Coastal Scrub site.

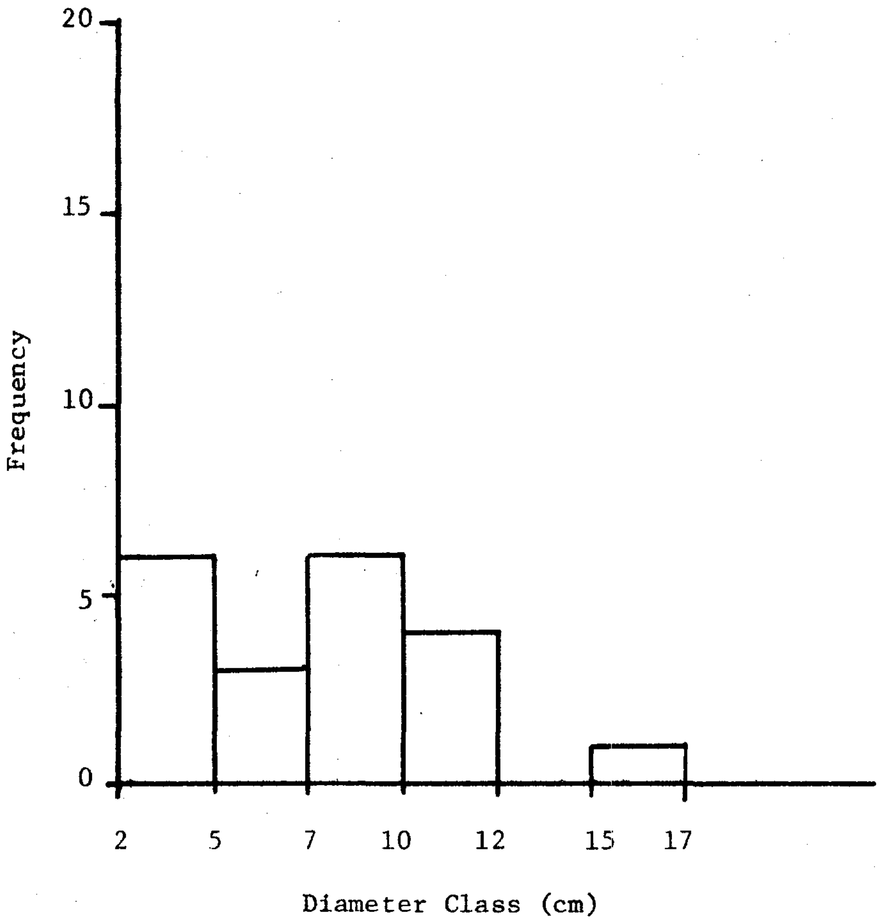


Figure 82. Size-frequency distribution of live oak on the Complex 34 Coastal Scrub size.

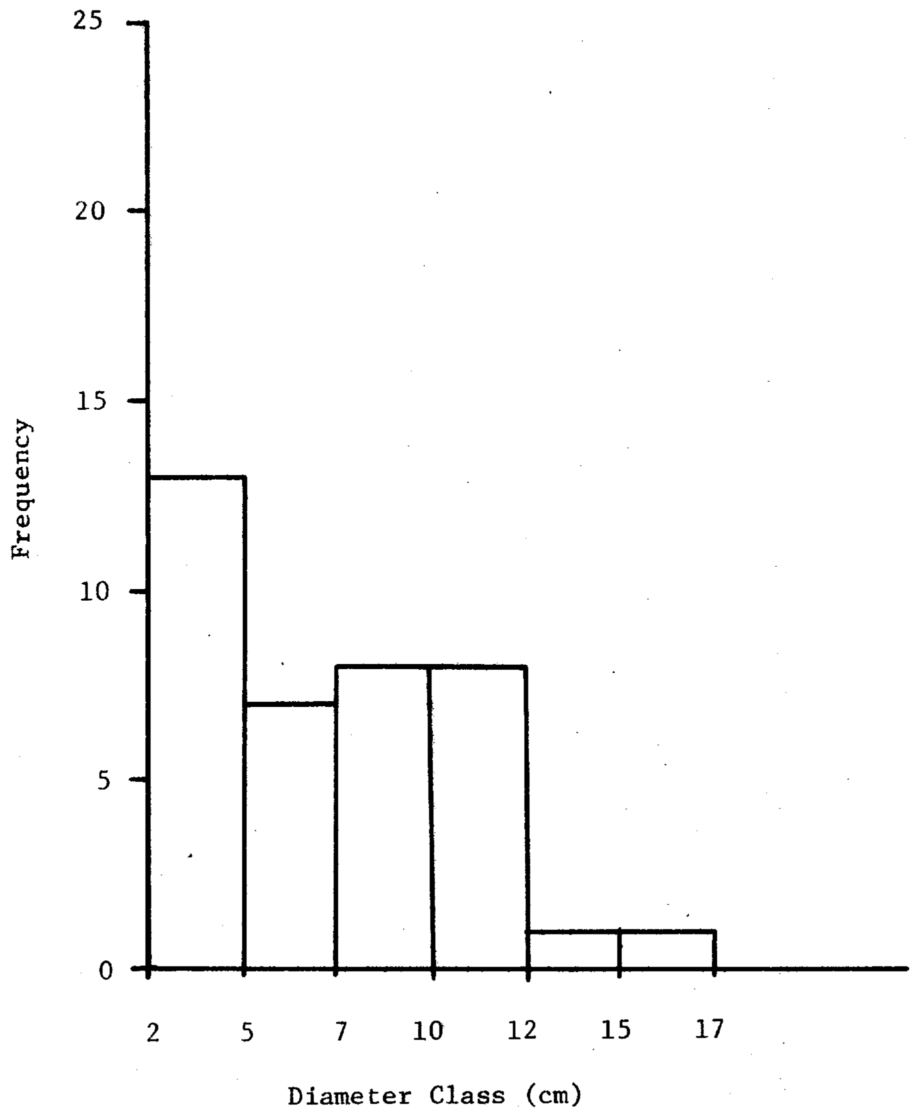


Figure 83. Size-frequency distribution of sand live oak on the Complex 34 Coastal Scrub site.

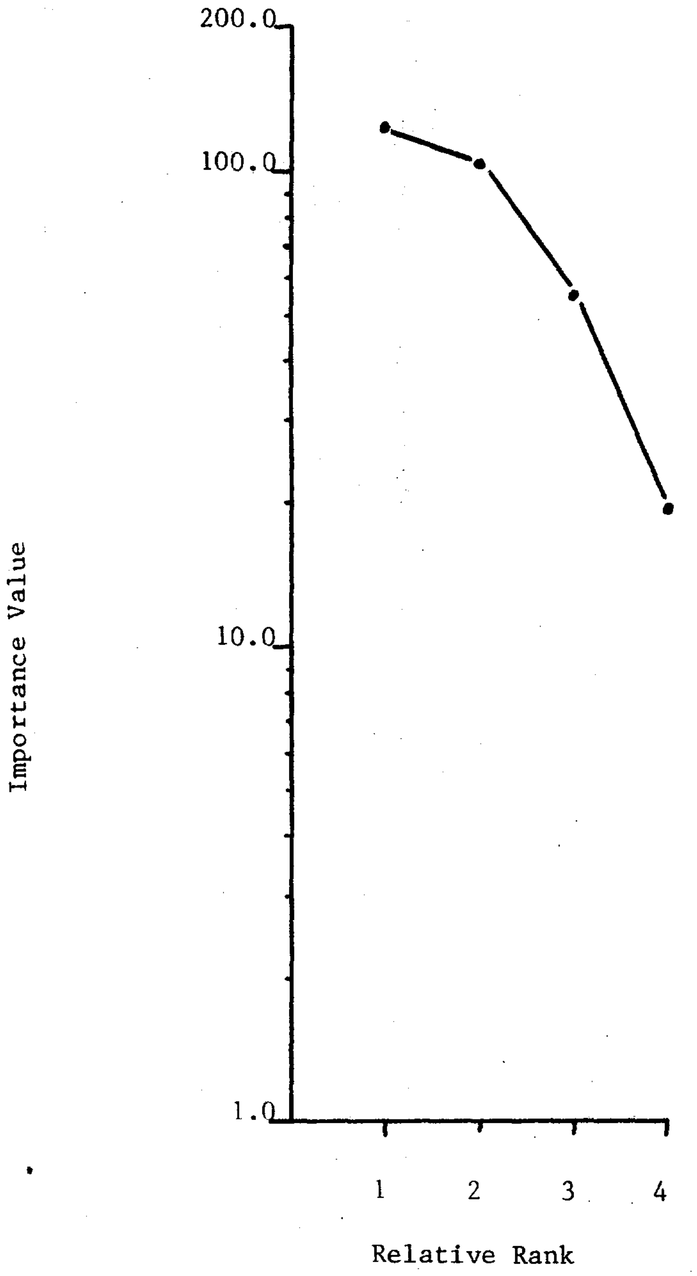


Figure 84. Dominance-diversity curves for trees on the Complex 34 Coastal Scrub. Importance values are based on relative density, relative frequency and relative dominance, Fall, 1977.

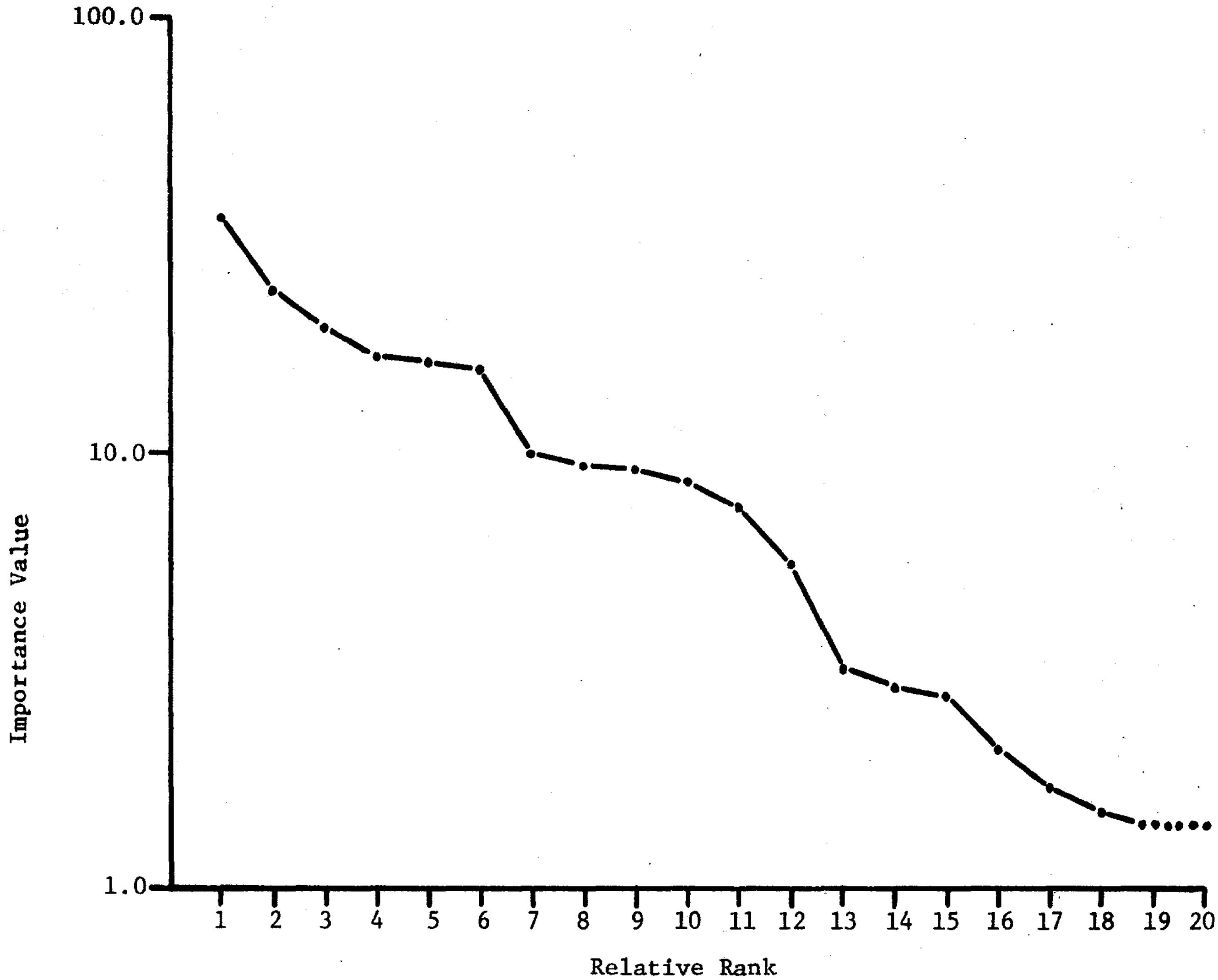


Figure 85. Dominance-diversity curve for plants on the beach grid (zone 1). Importance values are based on the sum of relative coverage and relative frequency, summer, 1976.

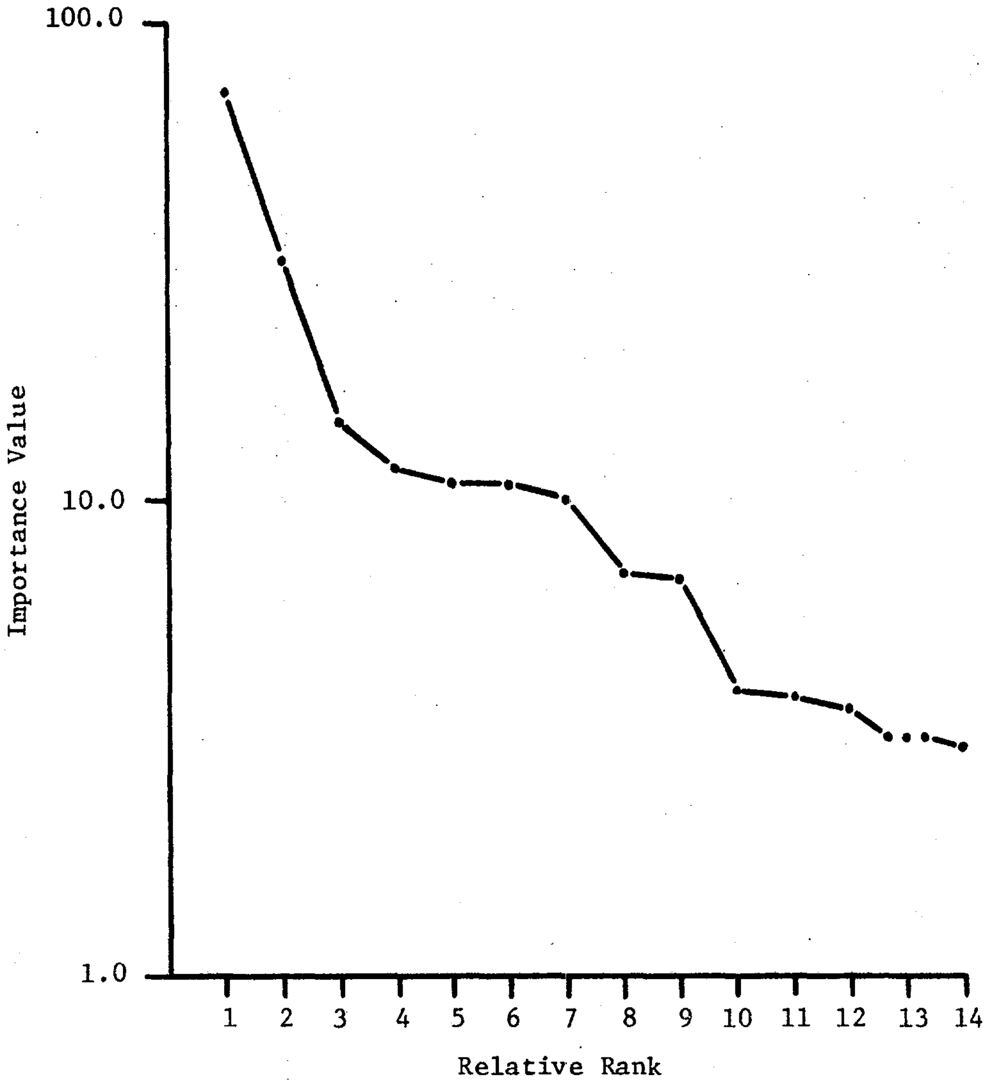


Figure 86. Dominance-diversity curve for plants on the beach grid (zone 2). Importance values are based on the sum of relative coverage and relative frequency, summer, 1976.

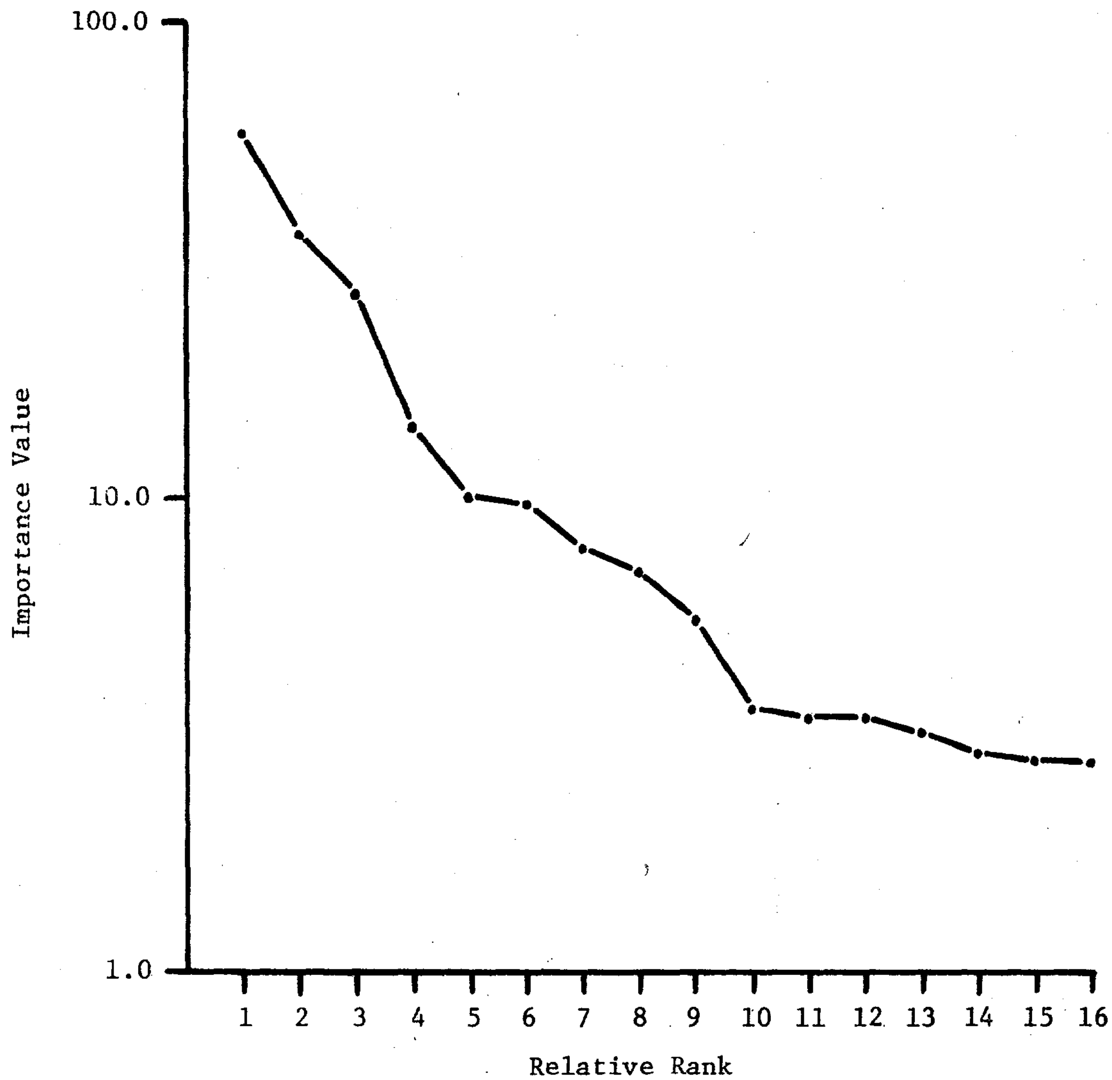


Figure 87. Dominance-diversity curve for plants on the LC 39-B beach site (comparable to beach grid zone 1). Importance values are based on the sum of relative coverage and relative frequency, summer, 1978.

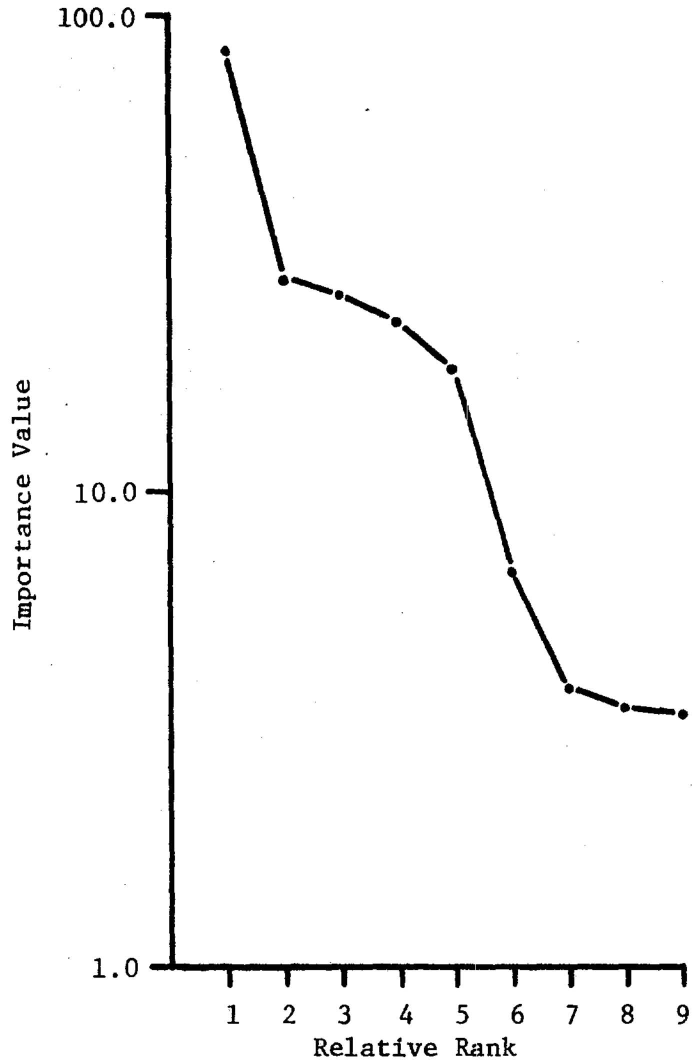


Figure 88. Dominance-diversity curve for plants on the beach grid (zone 3). Importance values are based on the sum of relative coverage and relative frequency, summer, 1976.

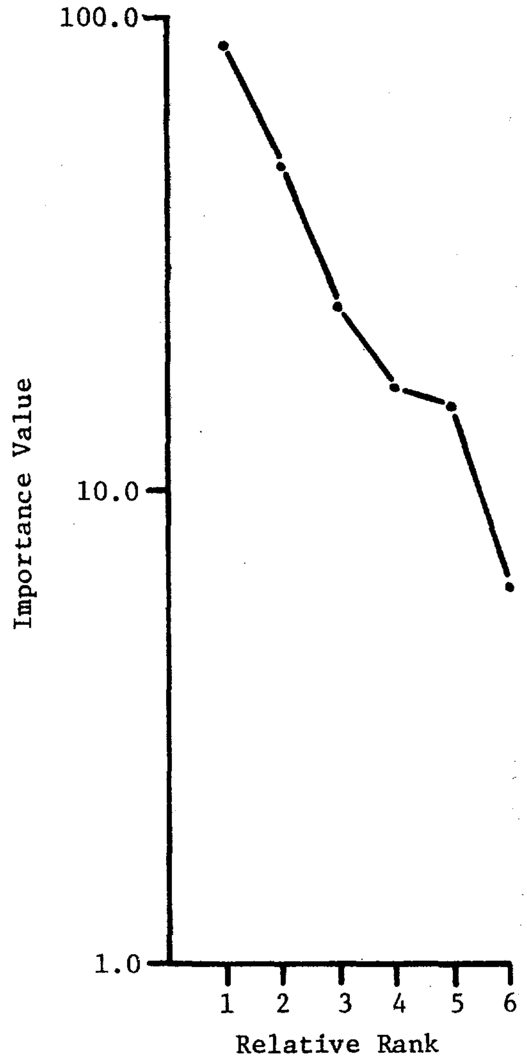


Figure 89. Dominance-diversity curve for plants from the Coastal strand, Cape Canaveral, 1977. This stand is a counterpart to the Beach grid, zone 3. Importance values are based on the sum of relative coverage and relative frequency.

APPENDIX FIGURES

SMALL MAMMAL POPULATIONS

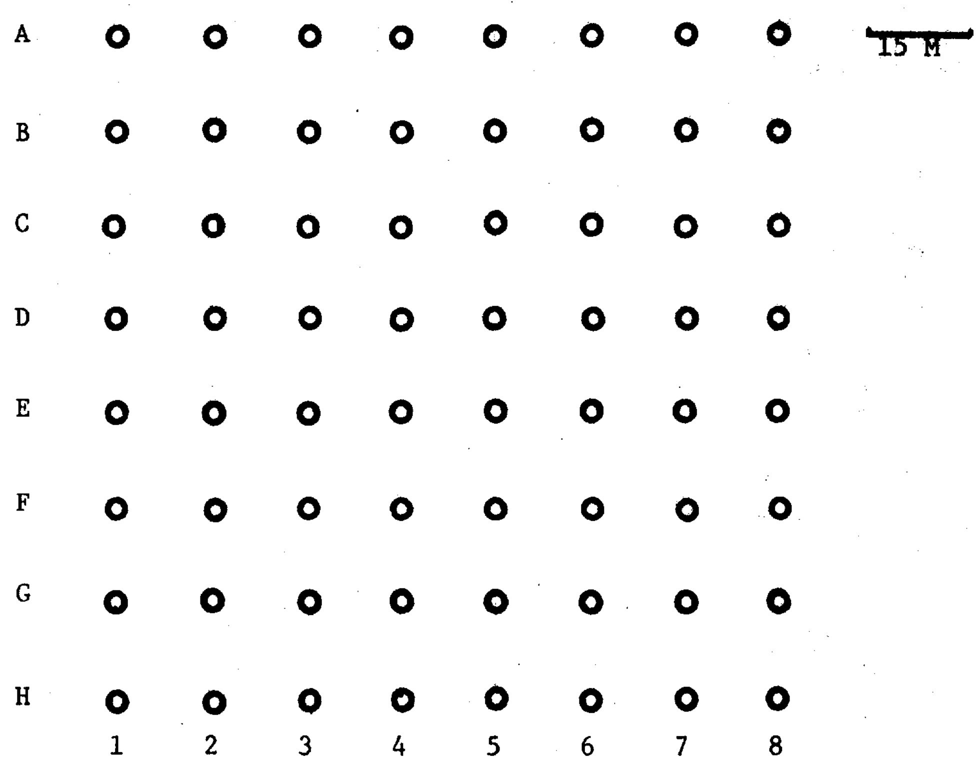


Figure 90.

The standard 8 x 8 grid with 64 trap stations. Grid area is 1.44 hectares.

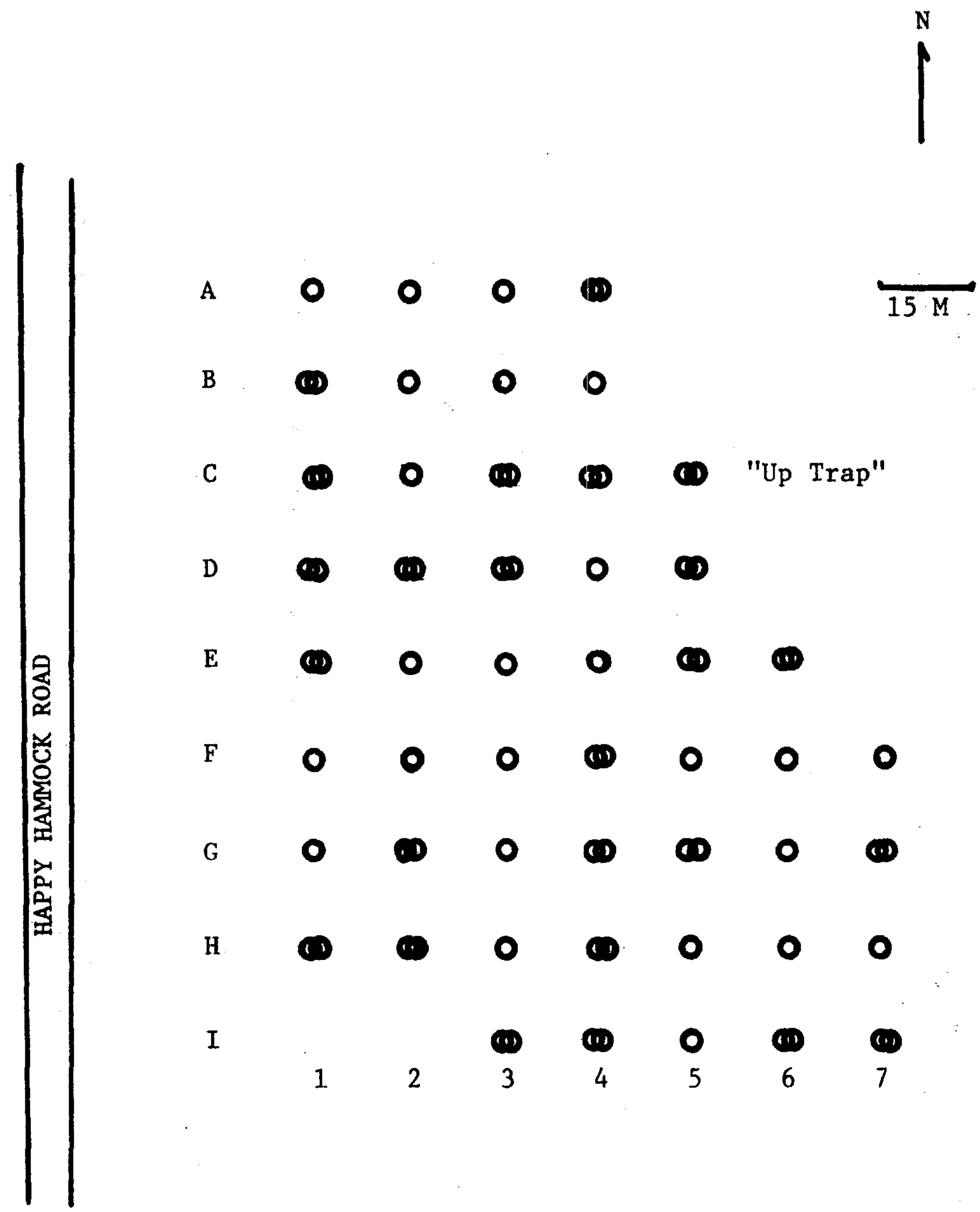


Figure 91.

The arrangement of traps on the Happy Hammock Grid. Fifty traps are located on the ground and an additional 25 traps are positioned on trees at a height of 5 feet. Grid area is 1.12 hectares.

Figure 9?.

Format statement and field data form for the small mammal monitoring program.

Field Data Sheet - SMALL MAMMALS

Data Type / Site / Investig. / Day / Month / Year / Plot Size / Column / Row / Genus / Species / Tag No. / Status / Male / Female / Vulva / Mammary / S P / Pads / Foot Length / Body Weight / Pelage / Ticks / Fleas / Mites / Chiggers / Bot Flies / Condition

1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1	2	3	4	5	6	7	8	9	40	1	2	3	4	5	6	7	8	9	50	1	2	3	4	5	6	7	8	9	60	1	2	3

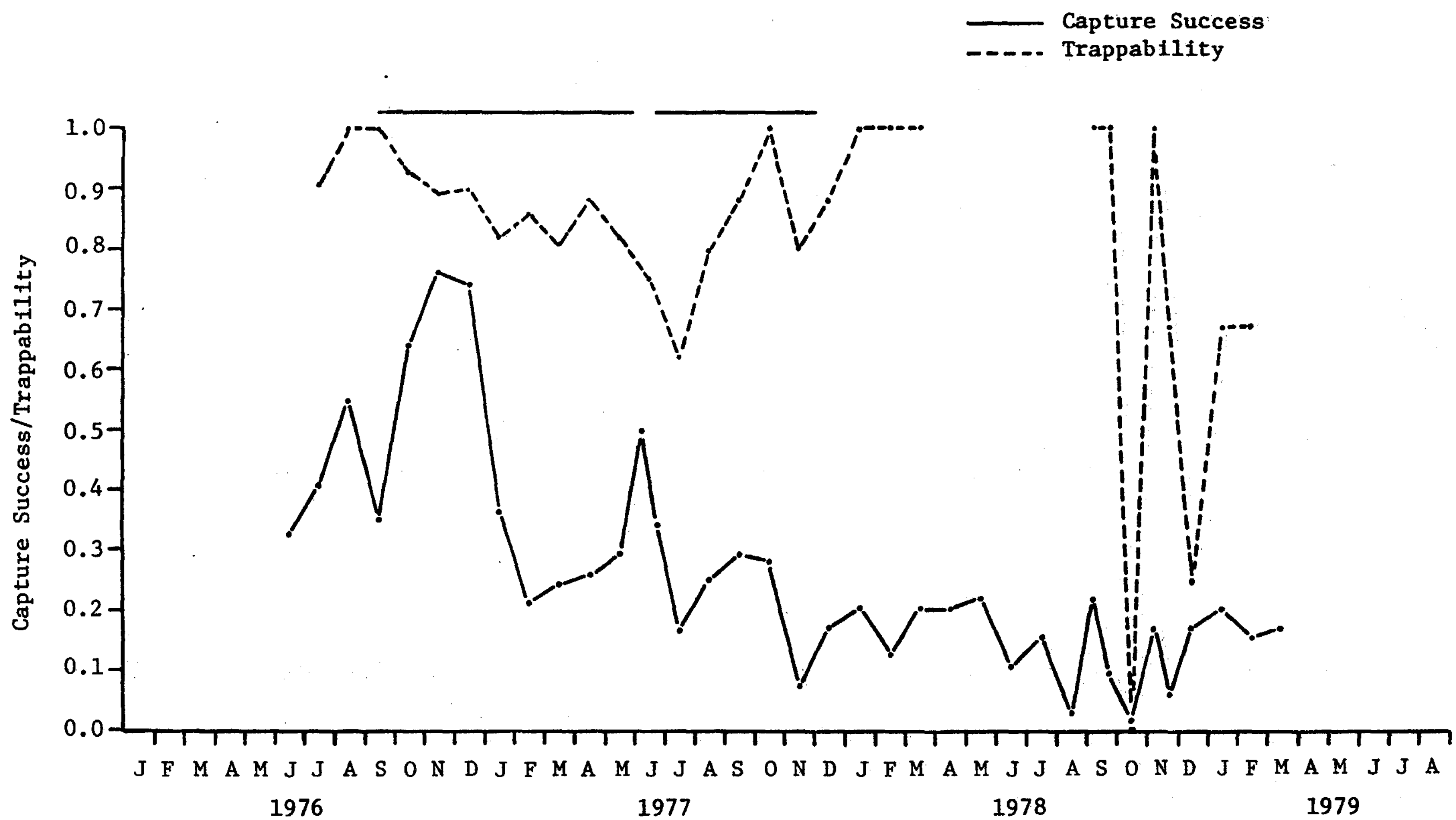


Figure 93. Capture success (total captures of all species/traps on grid) and trappability of cotton rats (number caught/number known to be alive) on the Wisconsin Village Grid. The solid line indicates months when traps were doubled.

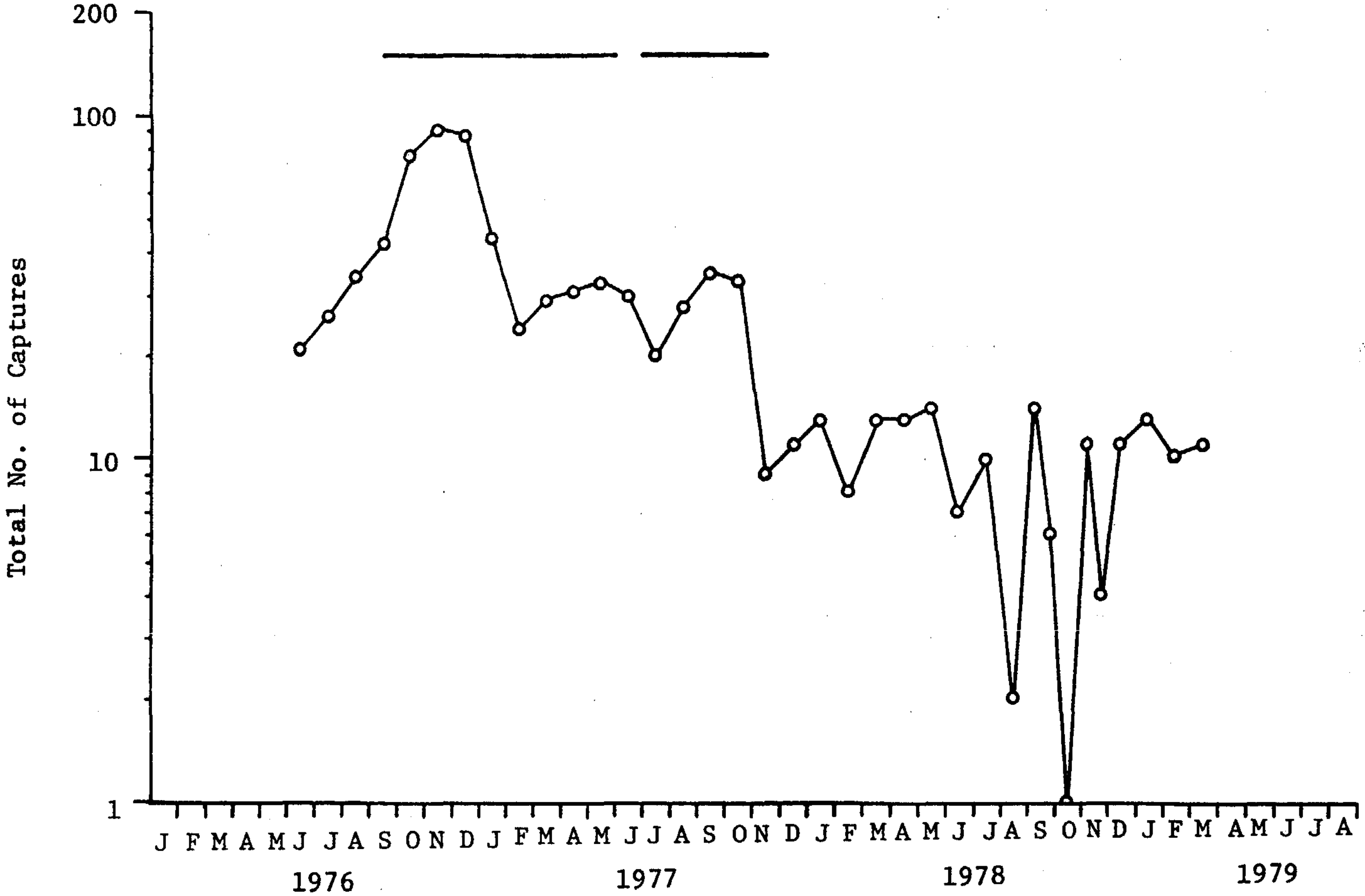


Figure 94. Number of captures of small mammals per month on the Wisconsin Village Grid. Solid line indicates periods when traps were doubled.

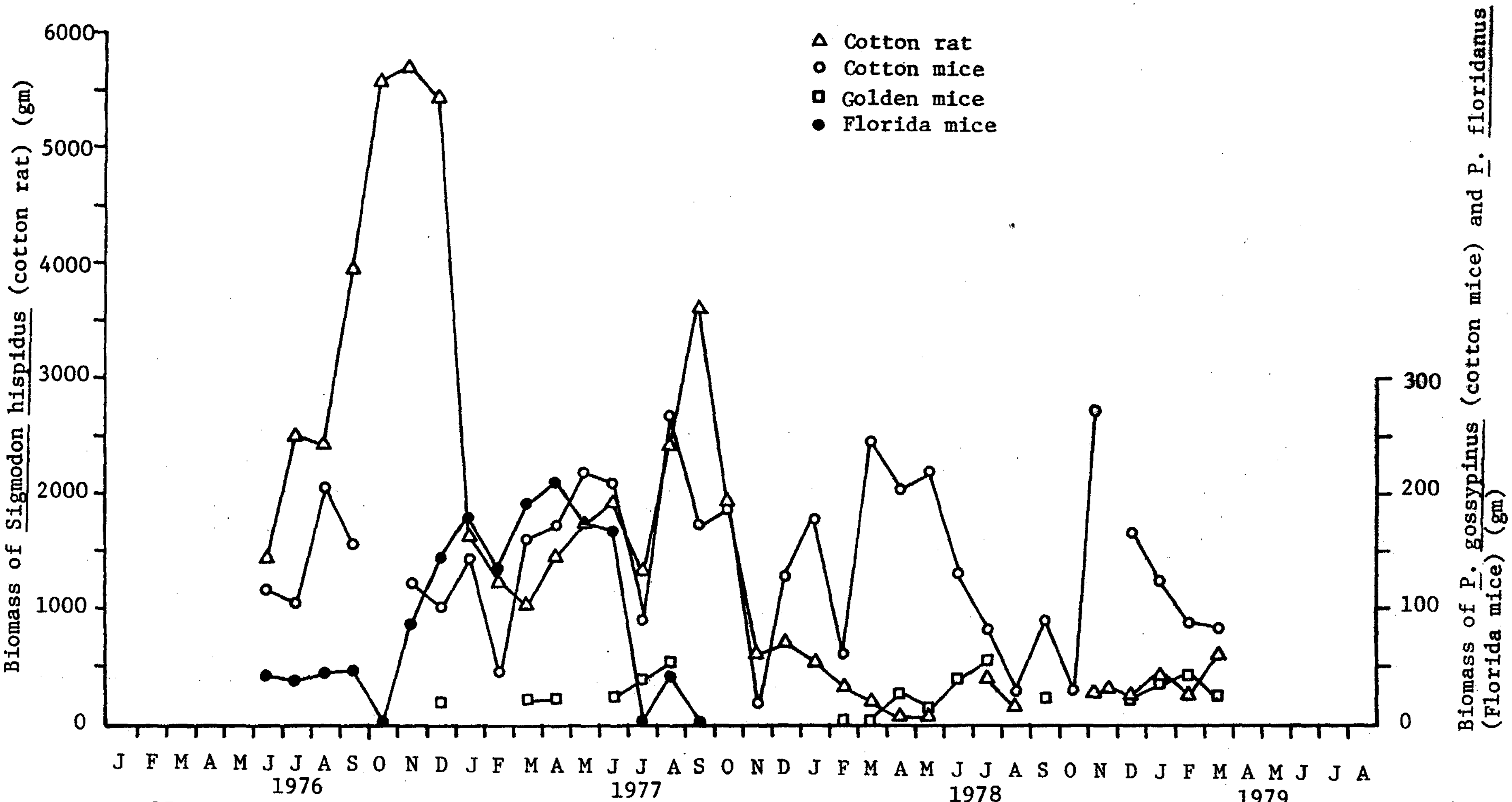


Figure 95. Biomass (live weight) of small mammals on the Wisconsin Village Grid.

Figure 96. Mean body weight of male cotton rats on the Wisconsin Village grid, 1976. Brackets enclose a 95% confidence interval.

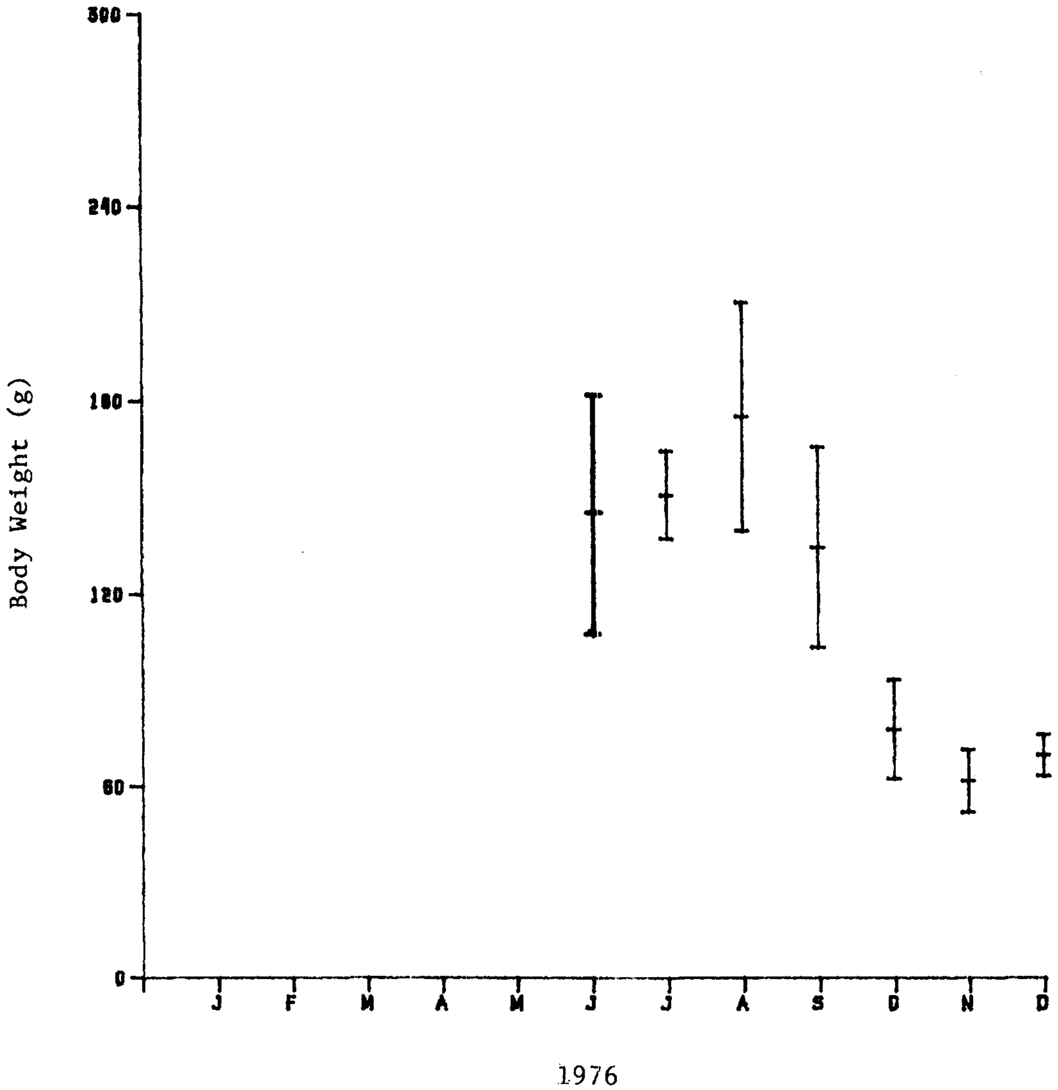


Figure 97. Mean body weight of male cotton rats on the Wisconsin Village grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

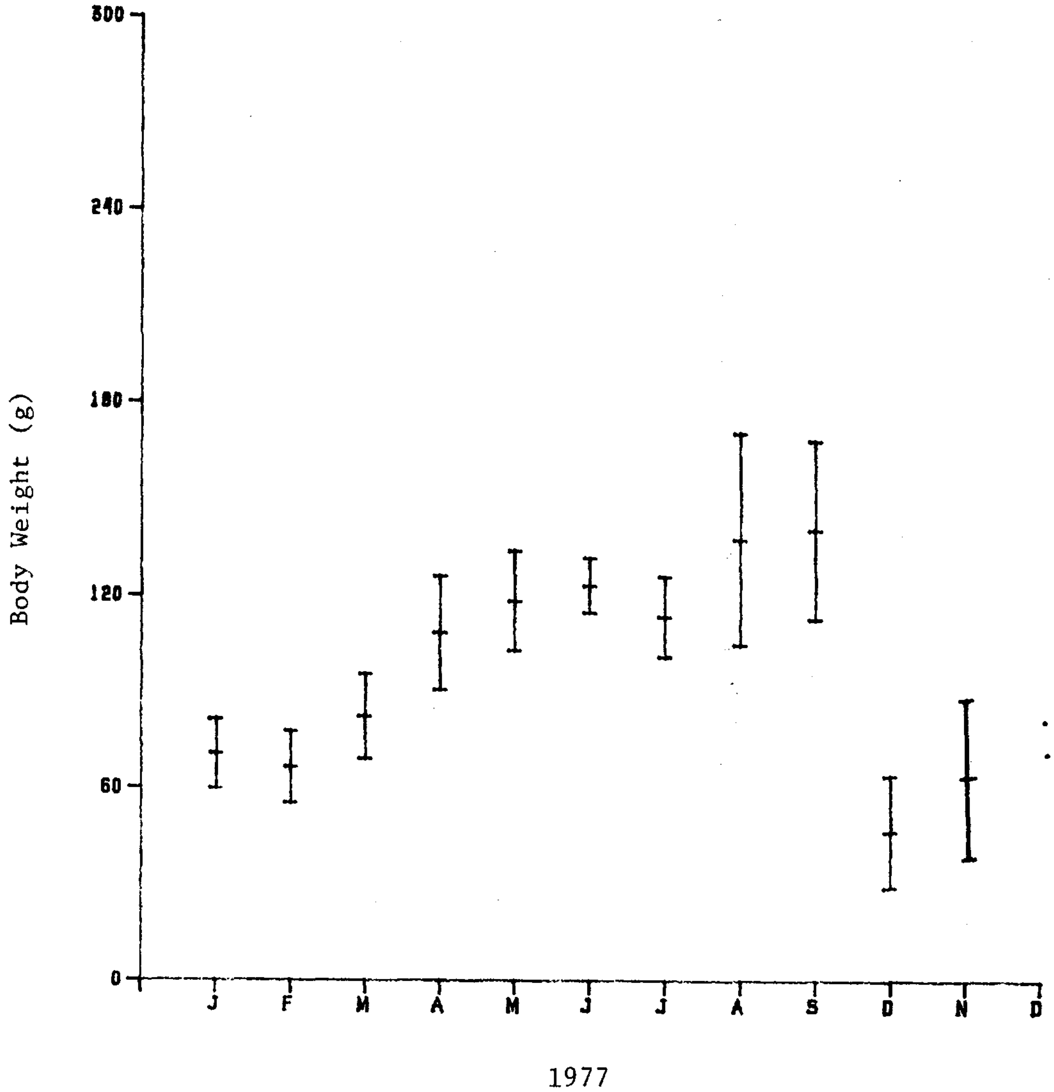


Figure 98. Mean body weight of female cotton rats on the Wisconsin Village grid, 1976. Brackets enclose a 95% confidence interval.

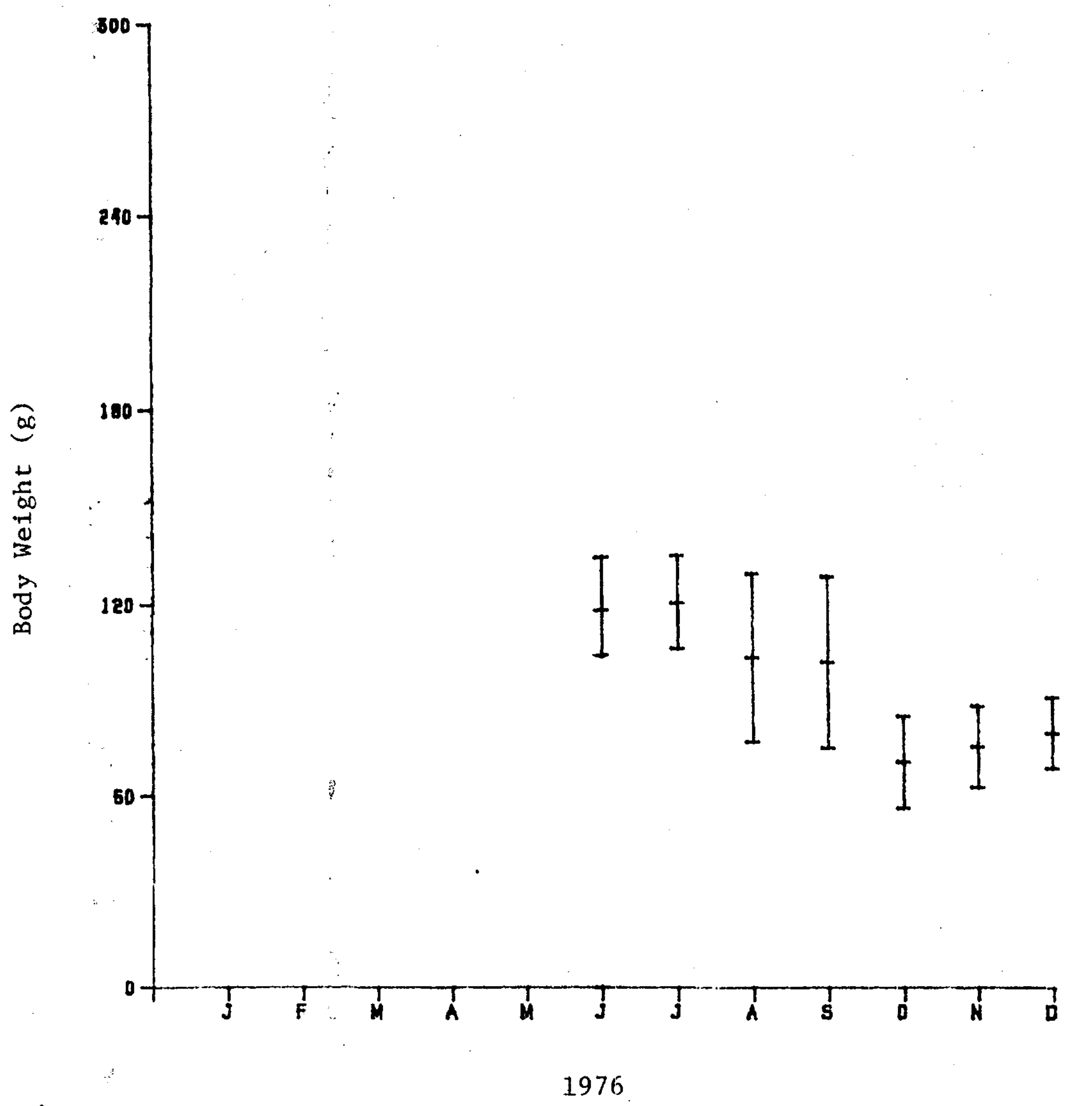


Figure 99. Mean body weight of female cotton rats on the Wisconsin Village grid, 1977. Brackets enclose a 95% confidence interval.

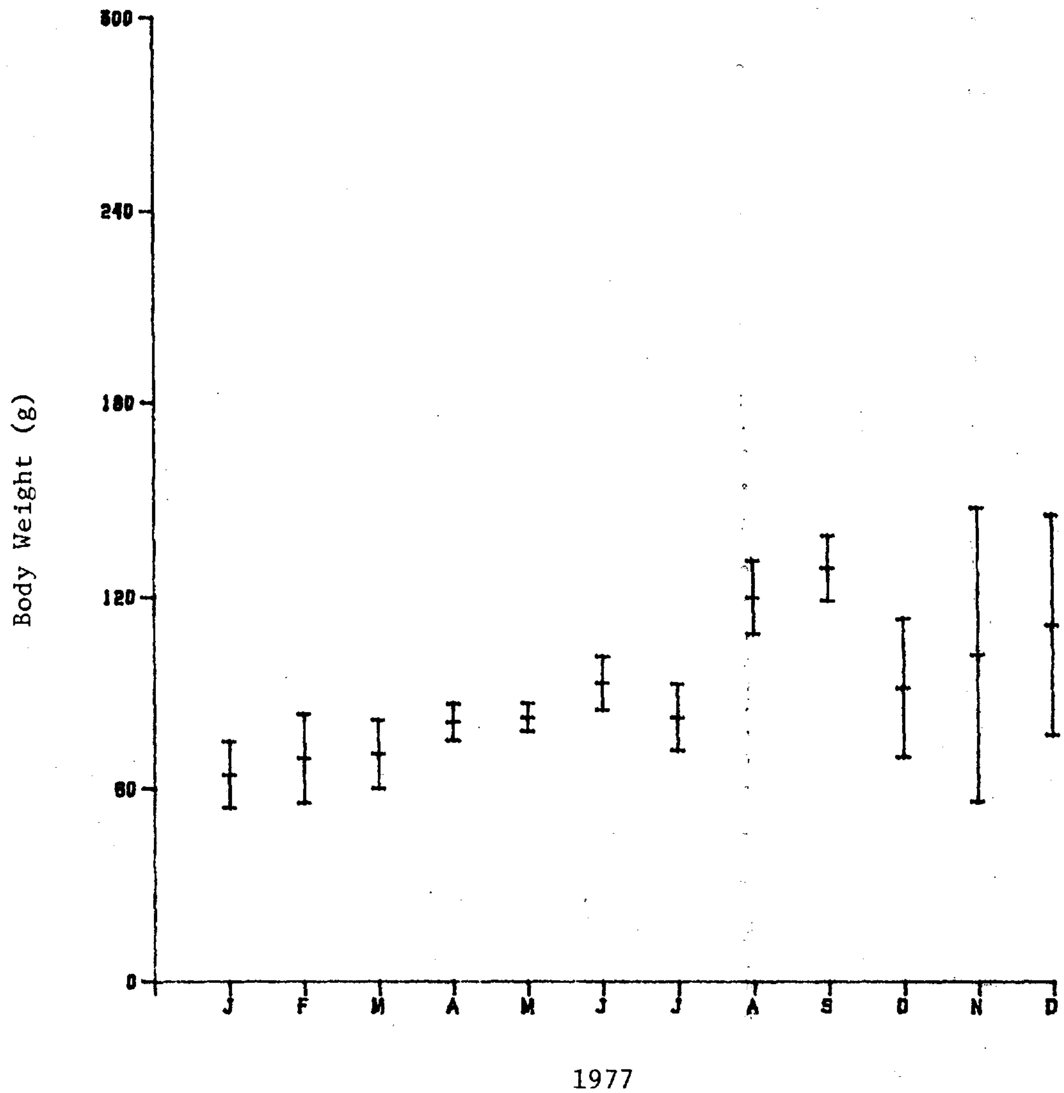


Figure 100. Mean body weight of male cotton mice on the Wisconsin Village grid, 1976. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

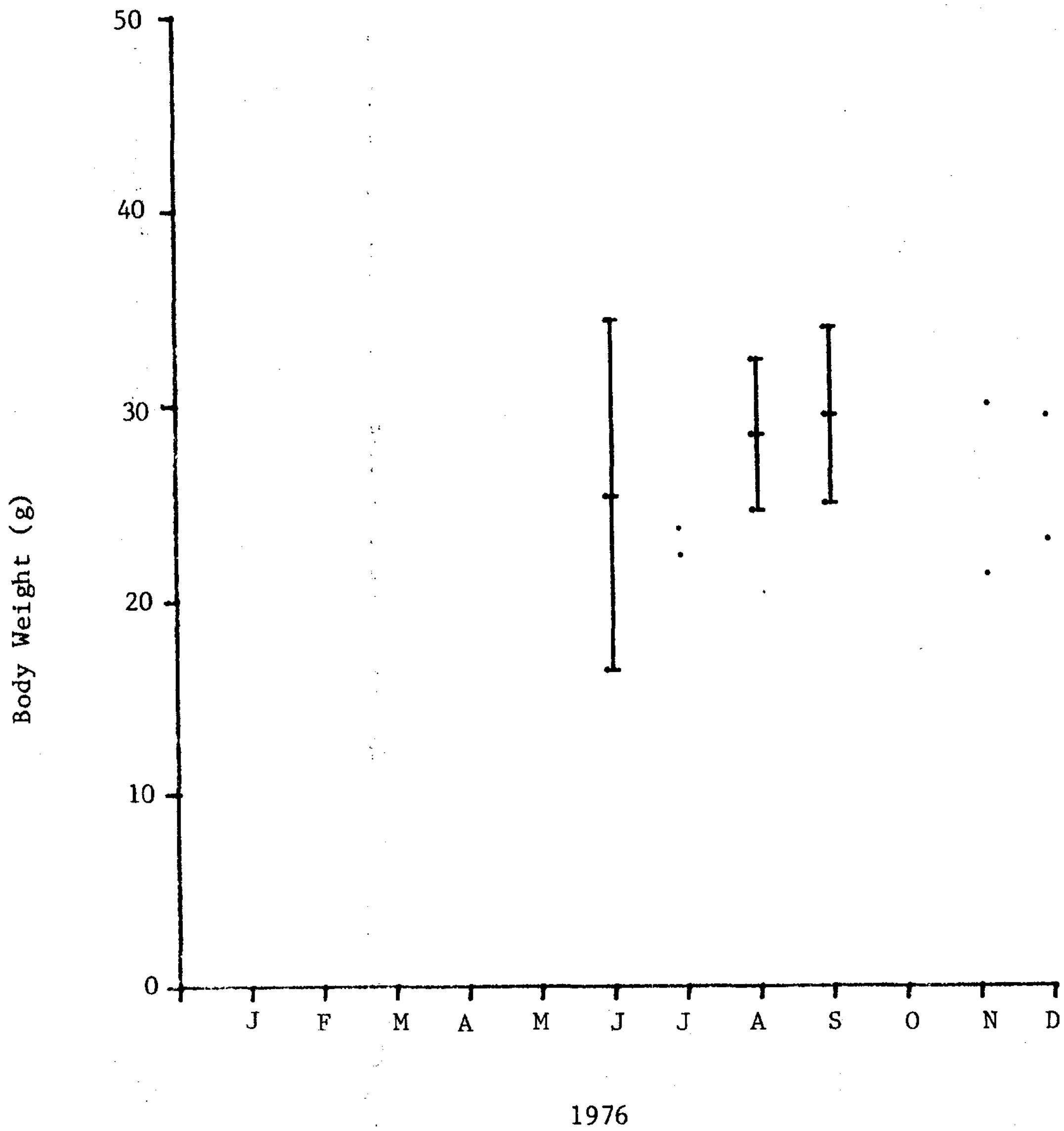


Figure 101. Mean body weight of male cotton mice on the Wisconsin Village grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

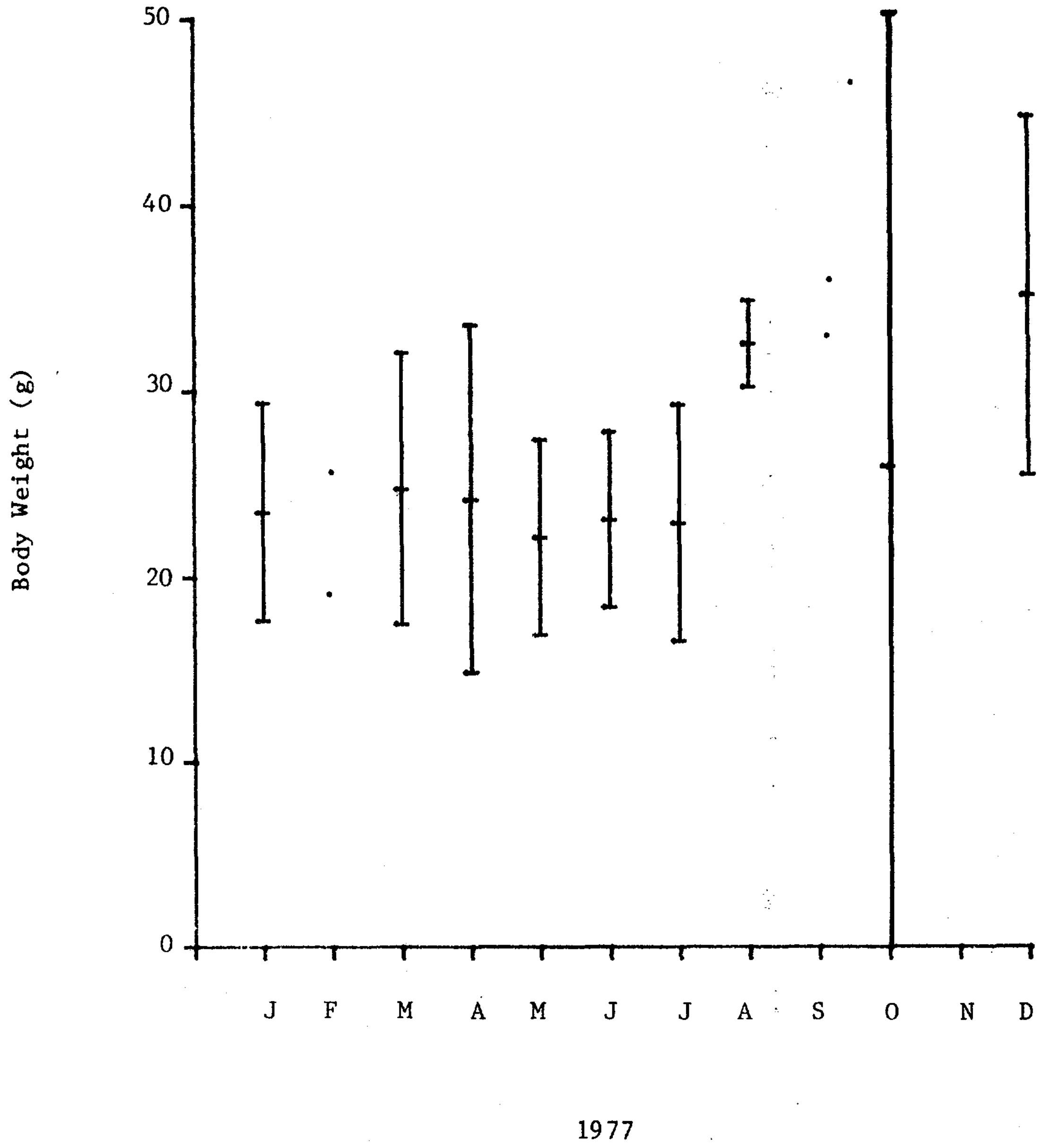


Figure 102. Mean body weight of male cotton mice on the Wisconsin Village grid, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

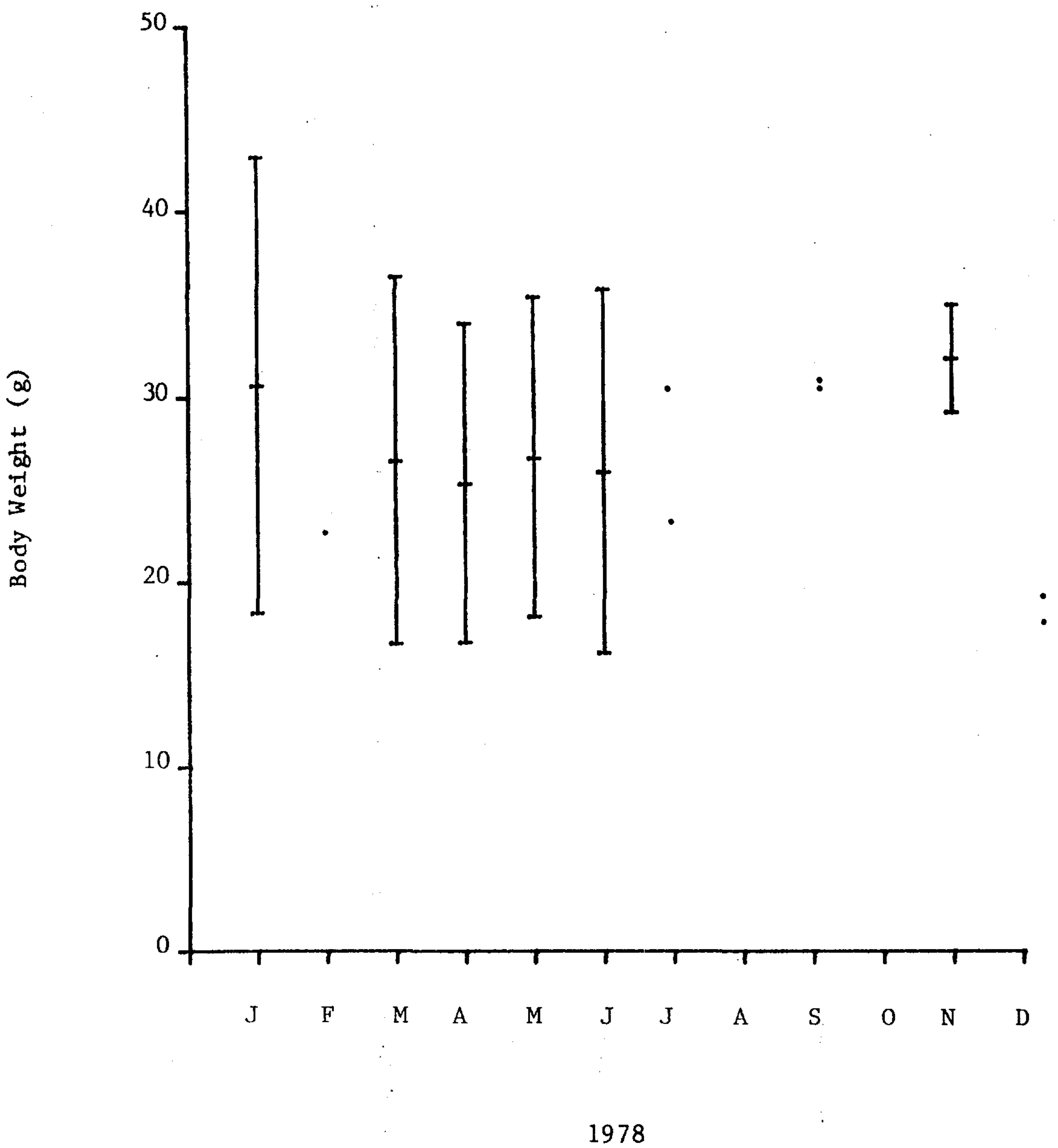


Figure 103. Mean body weight of male cotton mice on the Wisconsin Village Grid, 1979. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

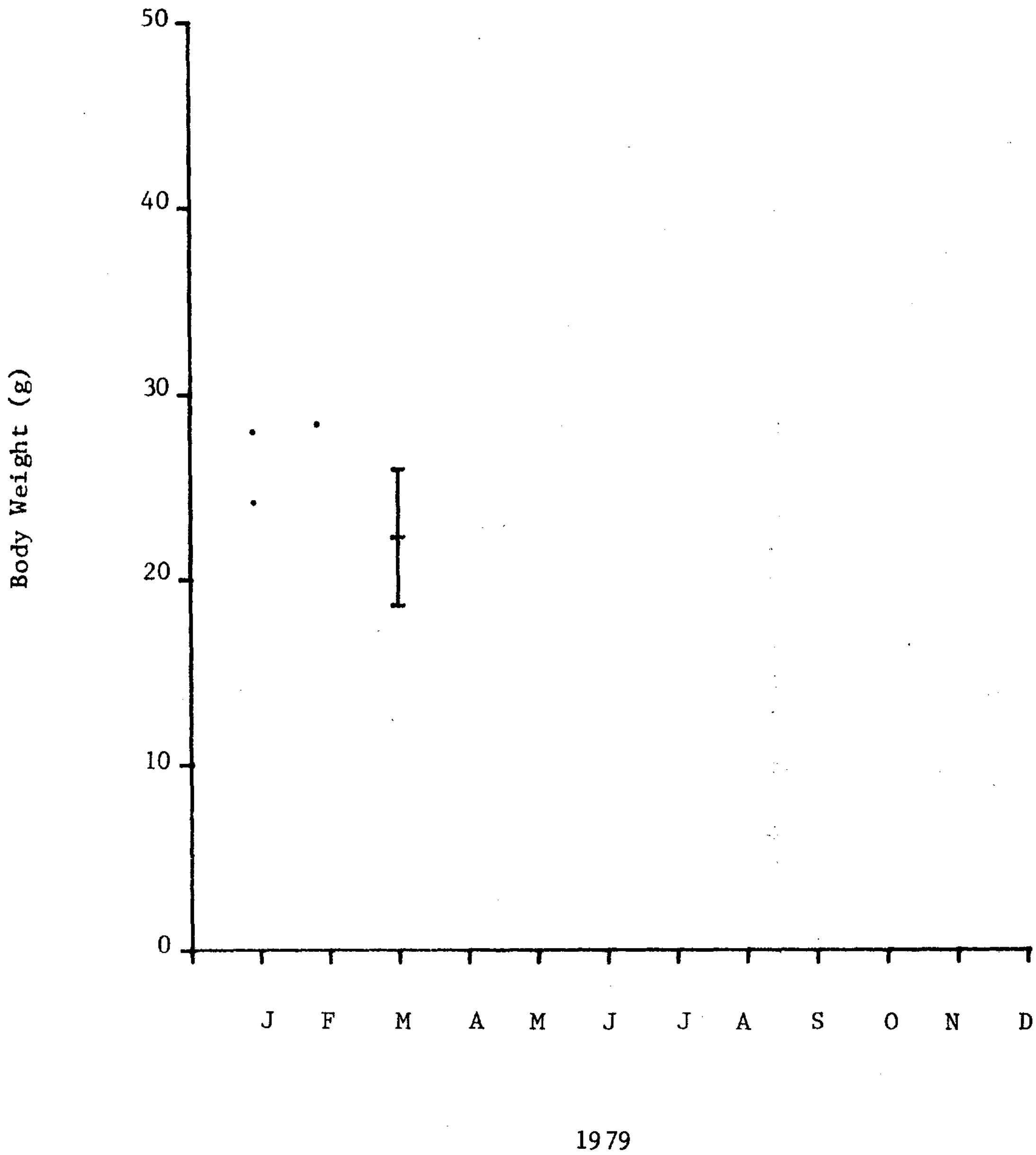


Figure 104. Mean body weight of female cotton mice on the Wisconsin Village grid, 1976. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

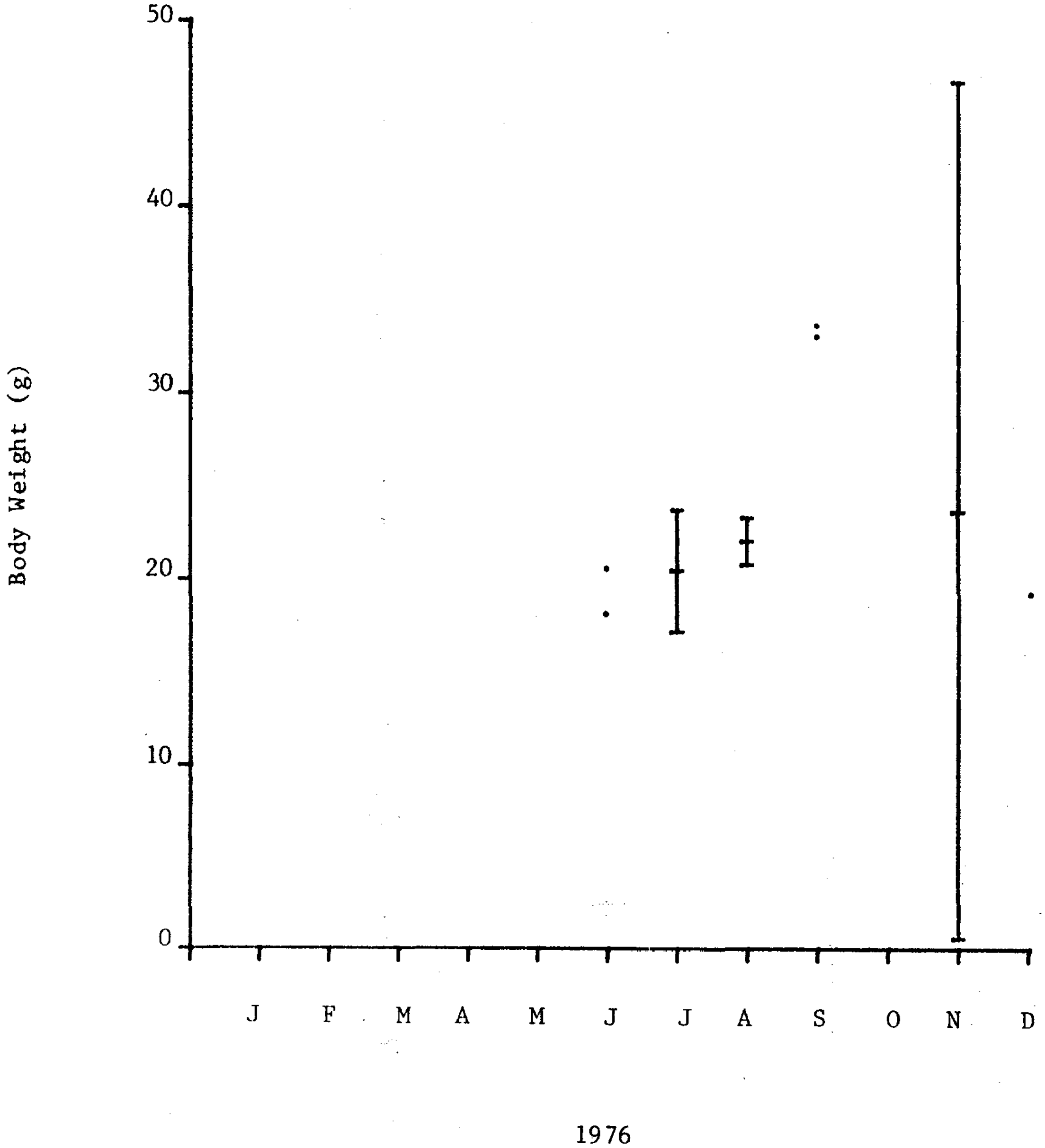


Figure 105. Mean body weight of female cotton mice on the Wisconsin Village grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

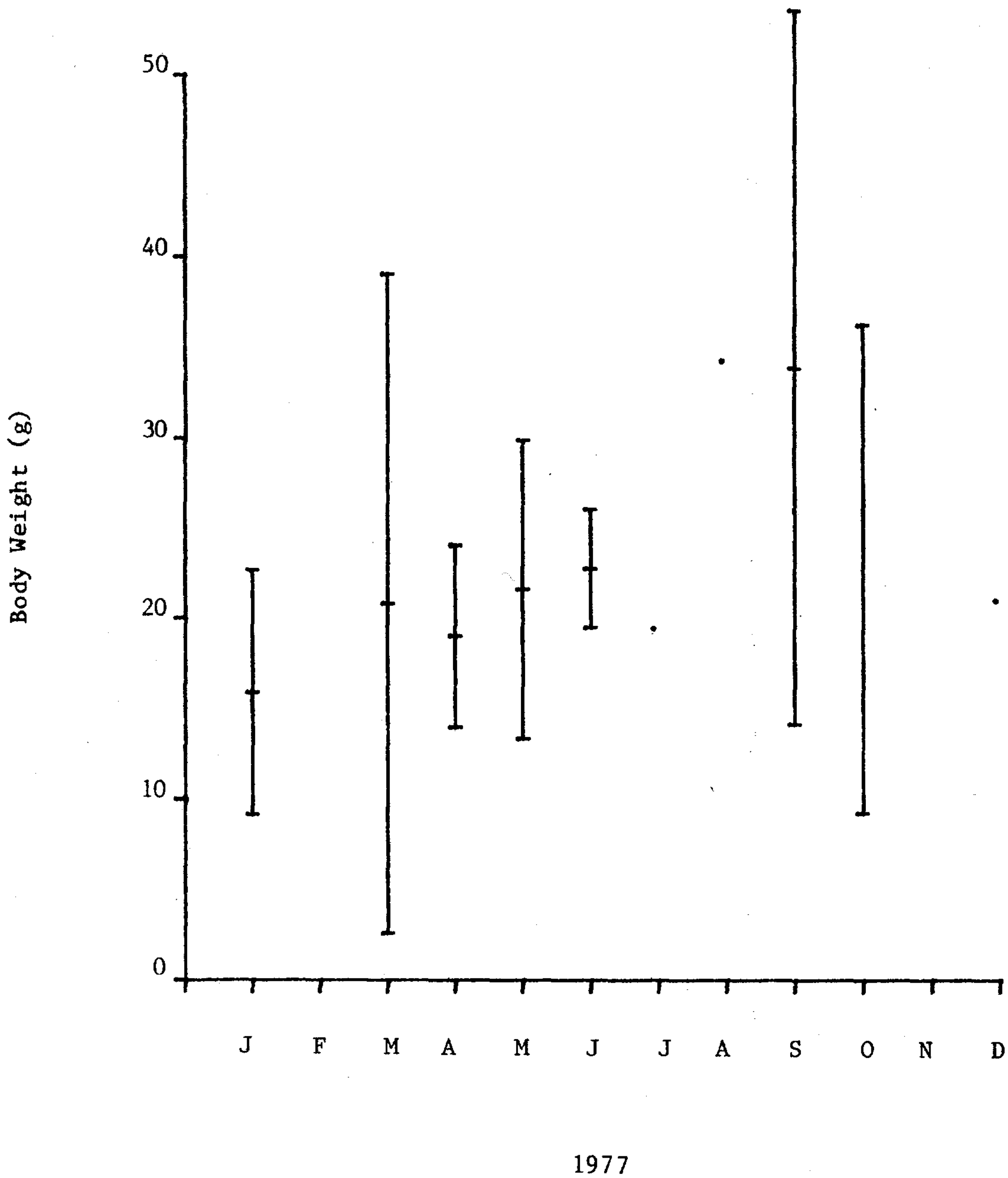


Figure 106. Mean body weight of female cotton mice on the Wisconsin Village grid, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

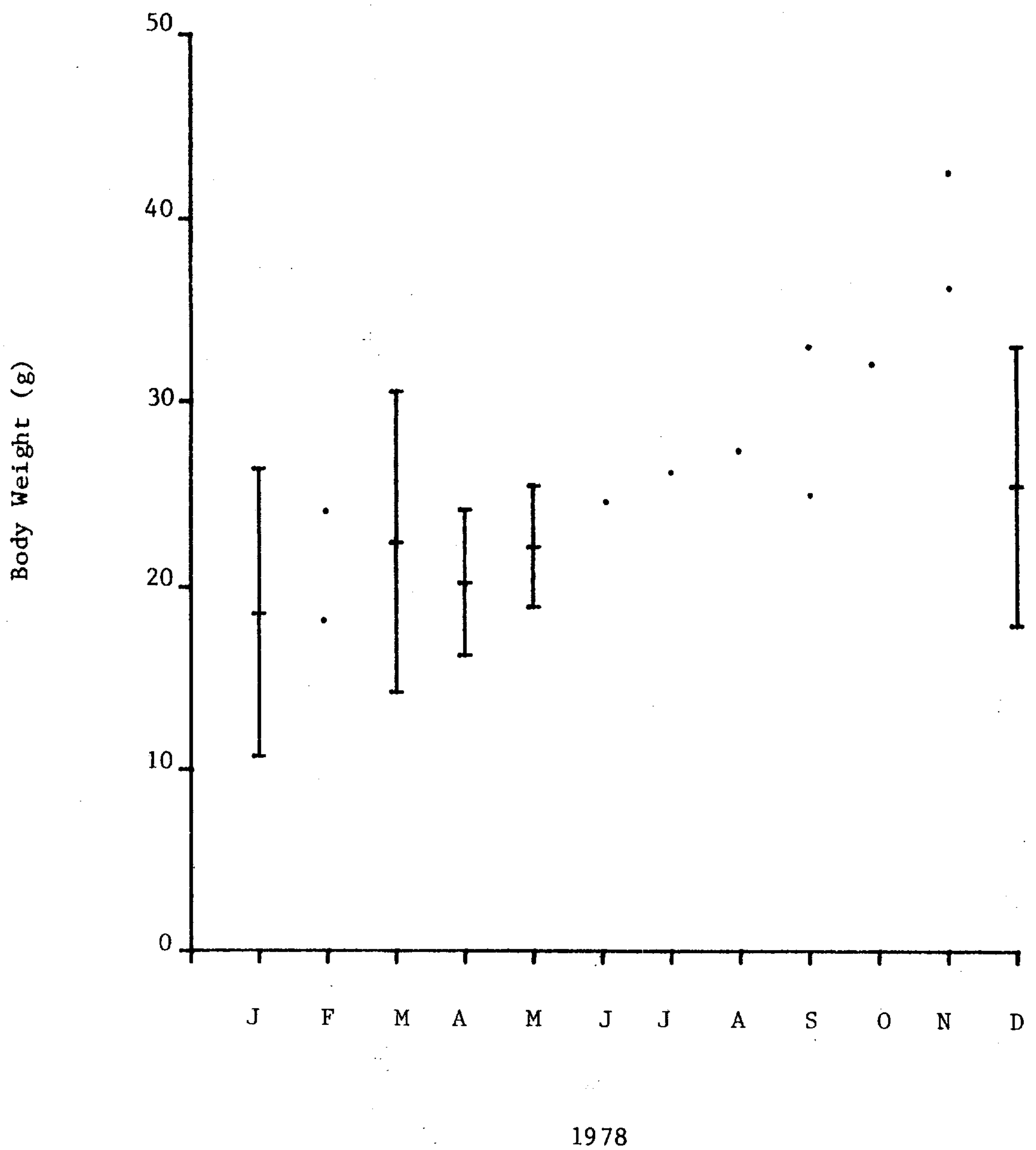
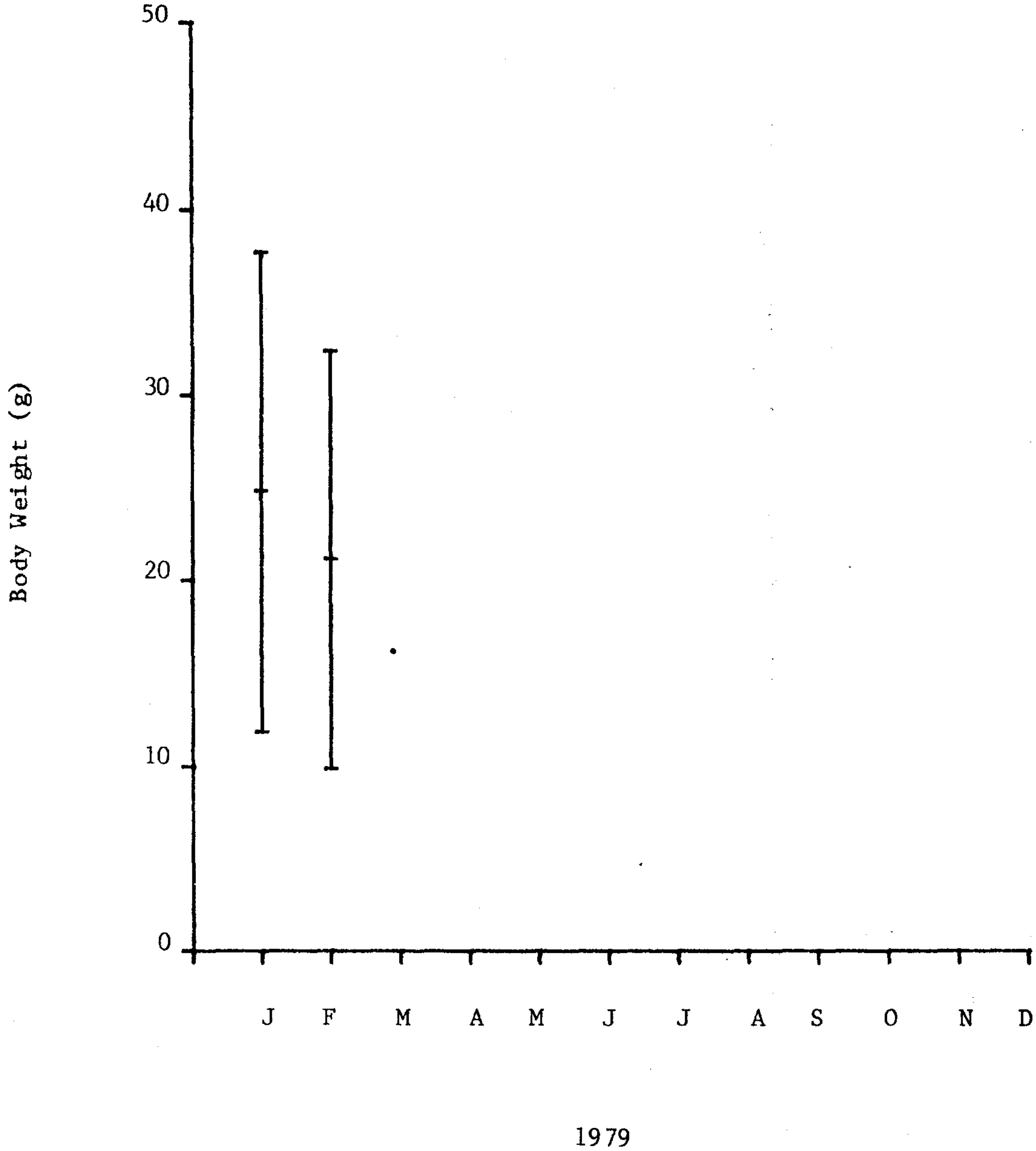


Figure 107. Mean body weight of female cotton mice on the Wisconsin Village grid, 1979. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.



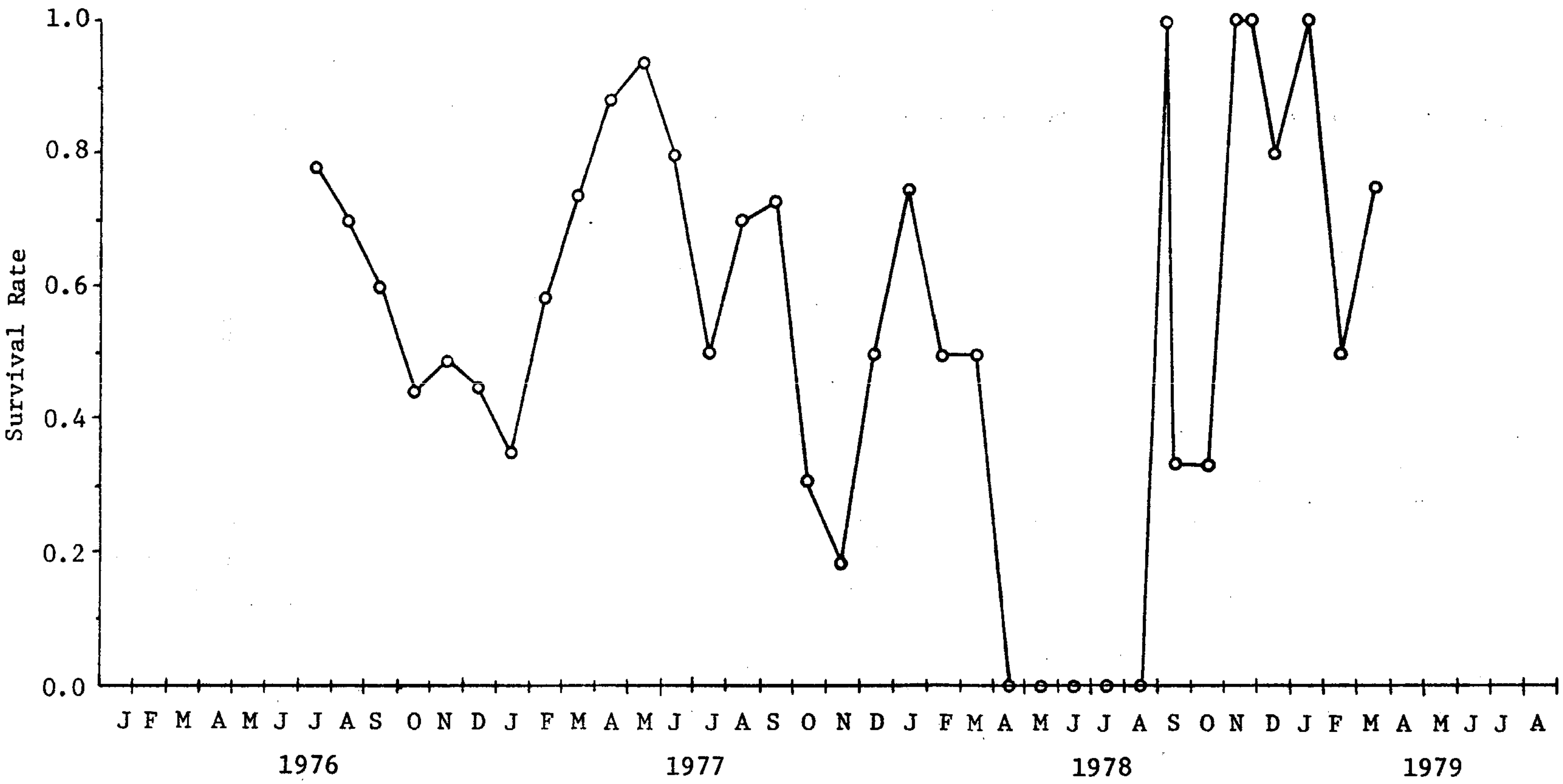


Figure 108. Four week survival rate of cotton rats on the Wisconsin Village Grid.

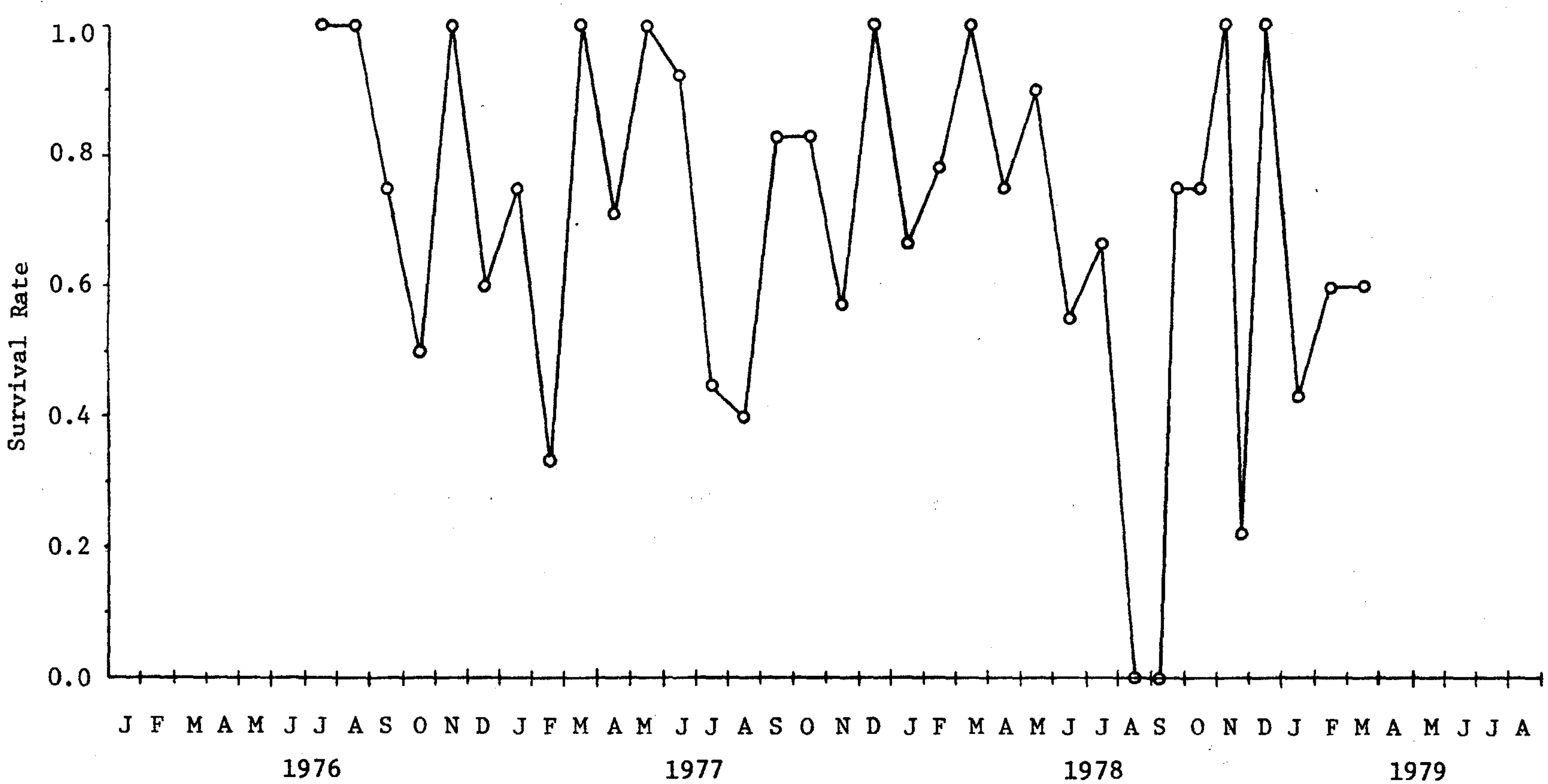


Figure 109. Four week survival rate of cotton mice on the Wisconsin Village Grid.

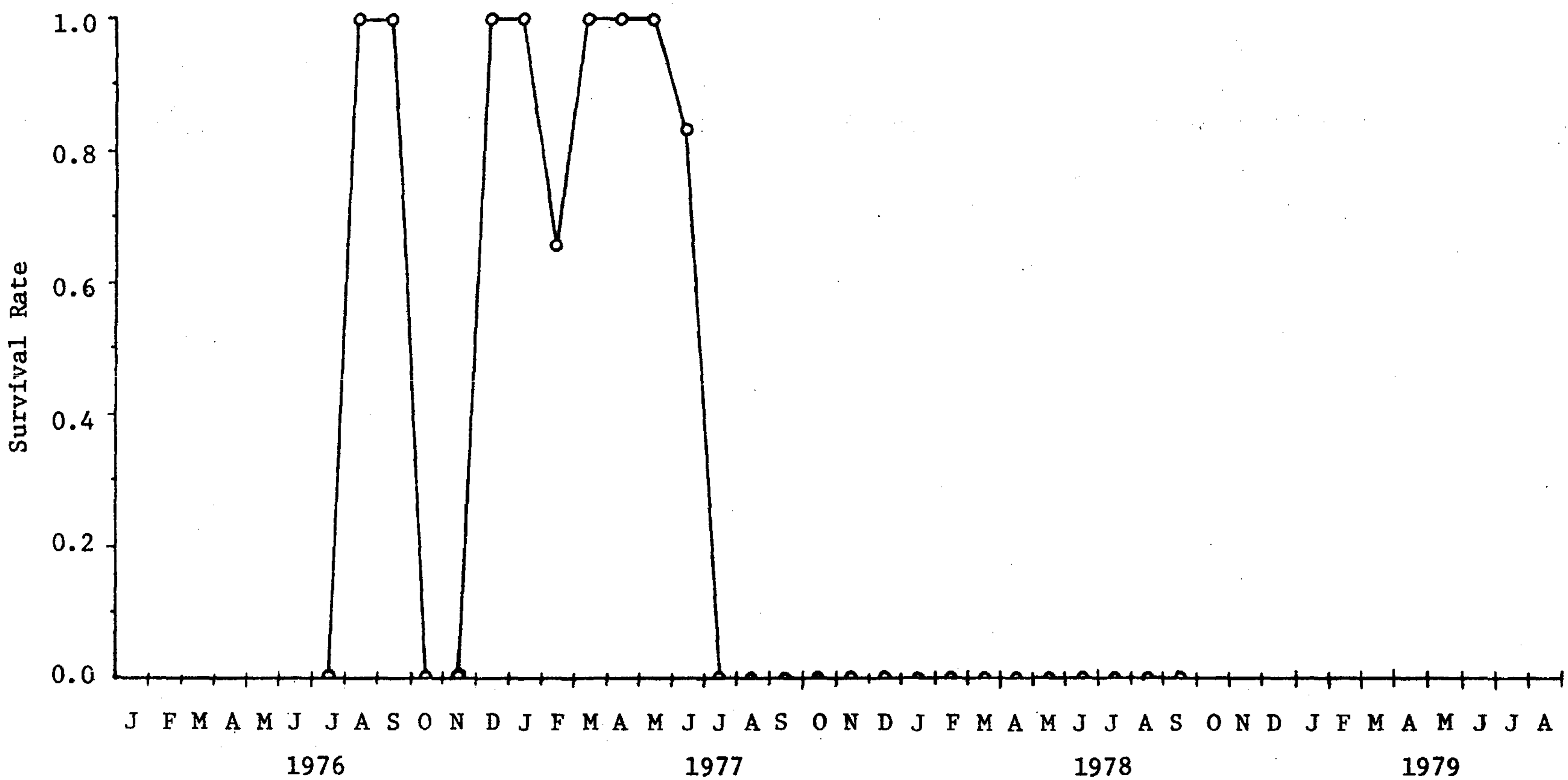


Figure 110. Four week survival rate of Florida mice on the Wisconsin Village Grid.

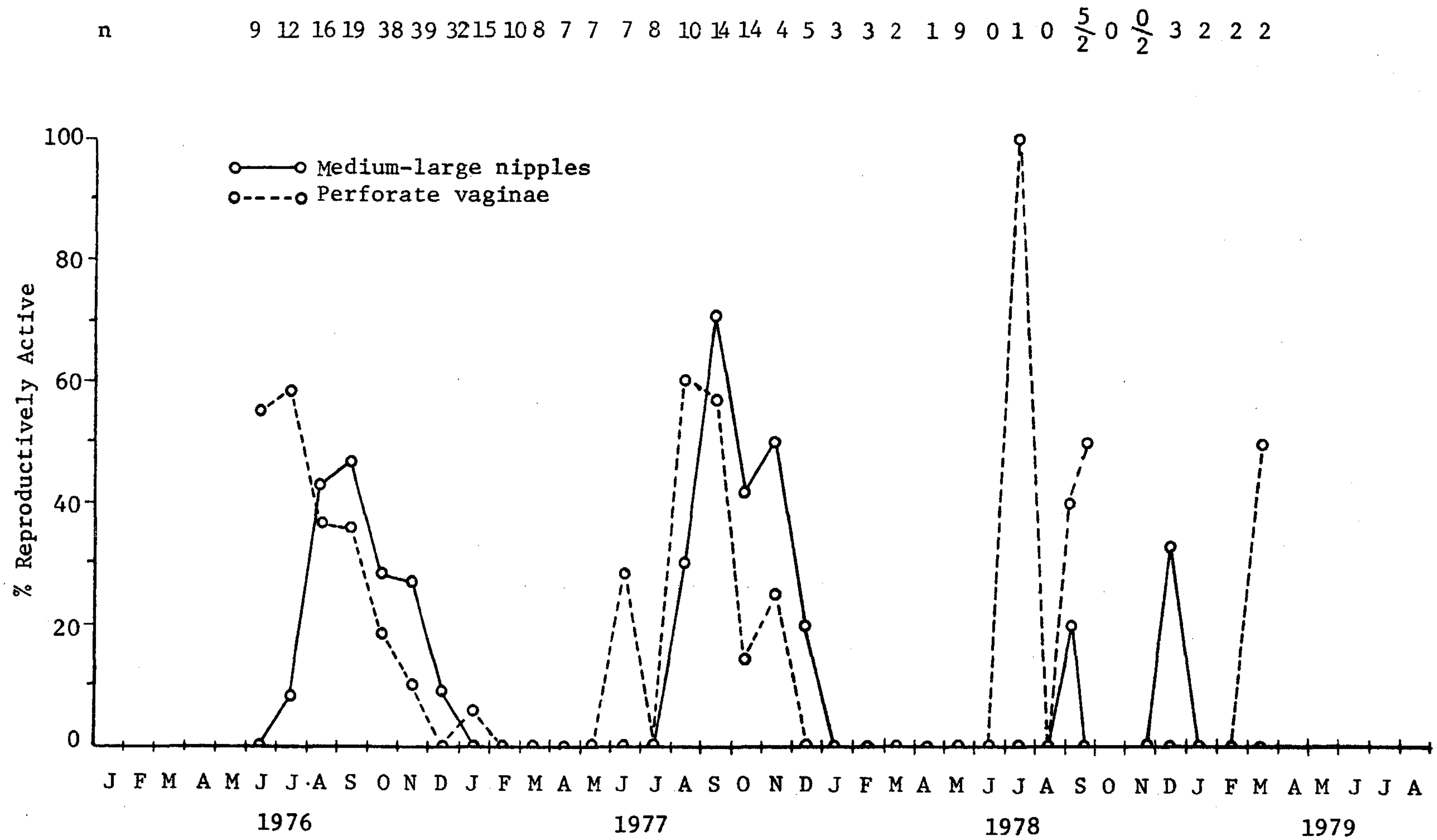


Figure 111. Monthly percentages of adult female cotton rats in reproductive condition on the Wisconsin Village Grid.

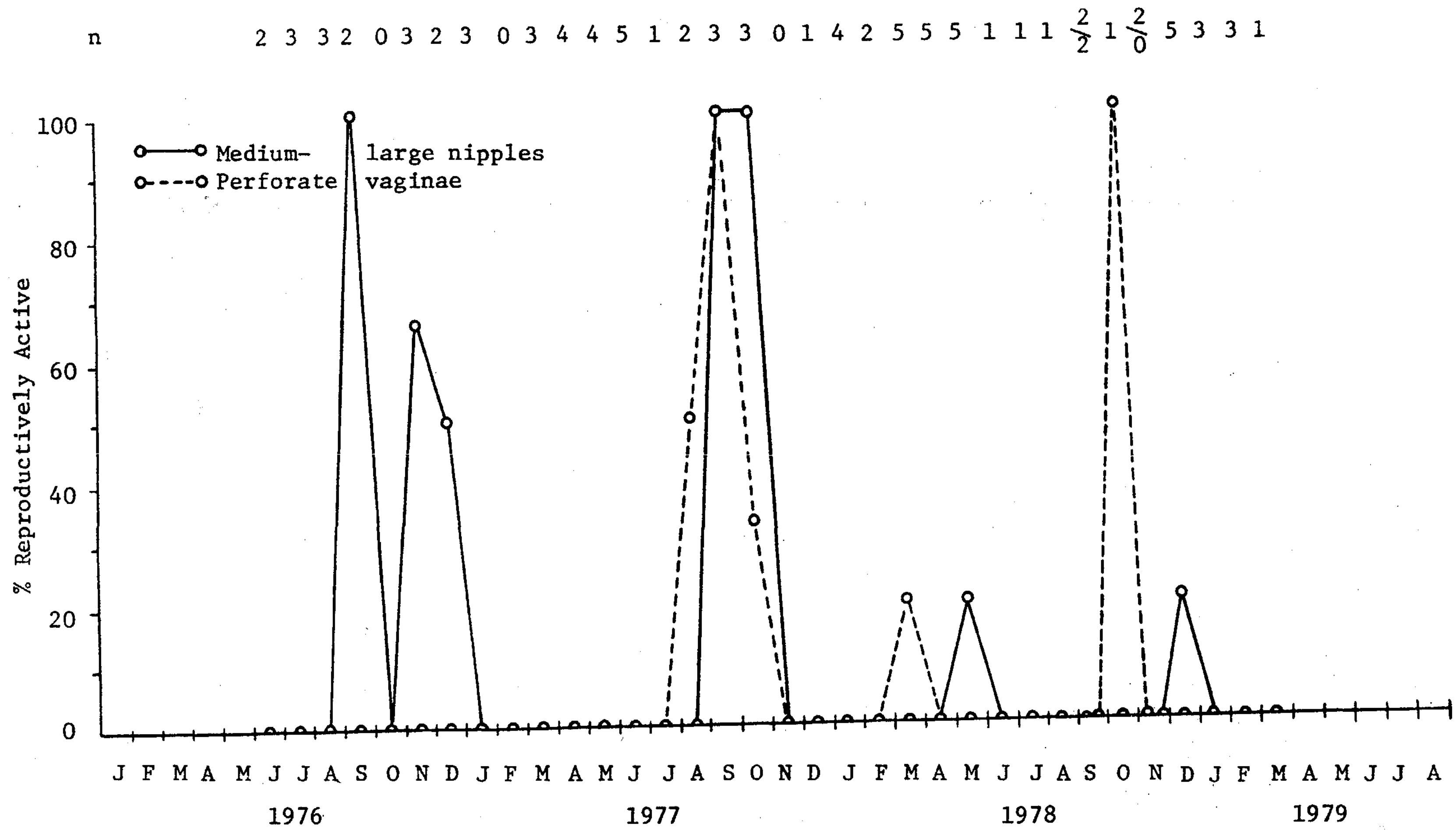


Figure 112. Monthly percentage of adult female cotton mice in reproductive condition on the Wisconsin Village Grid.

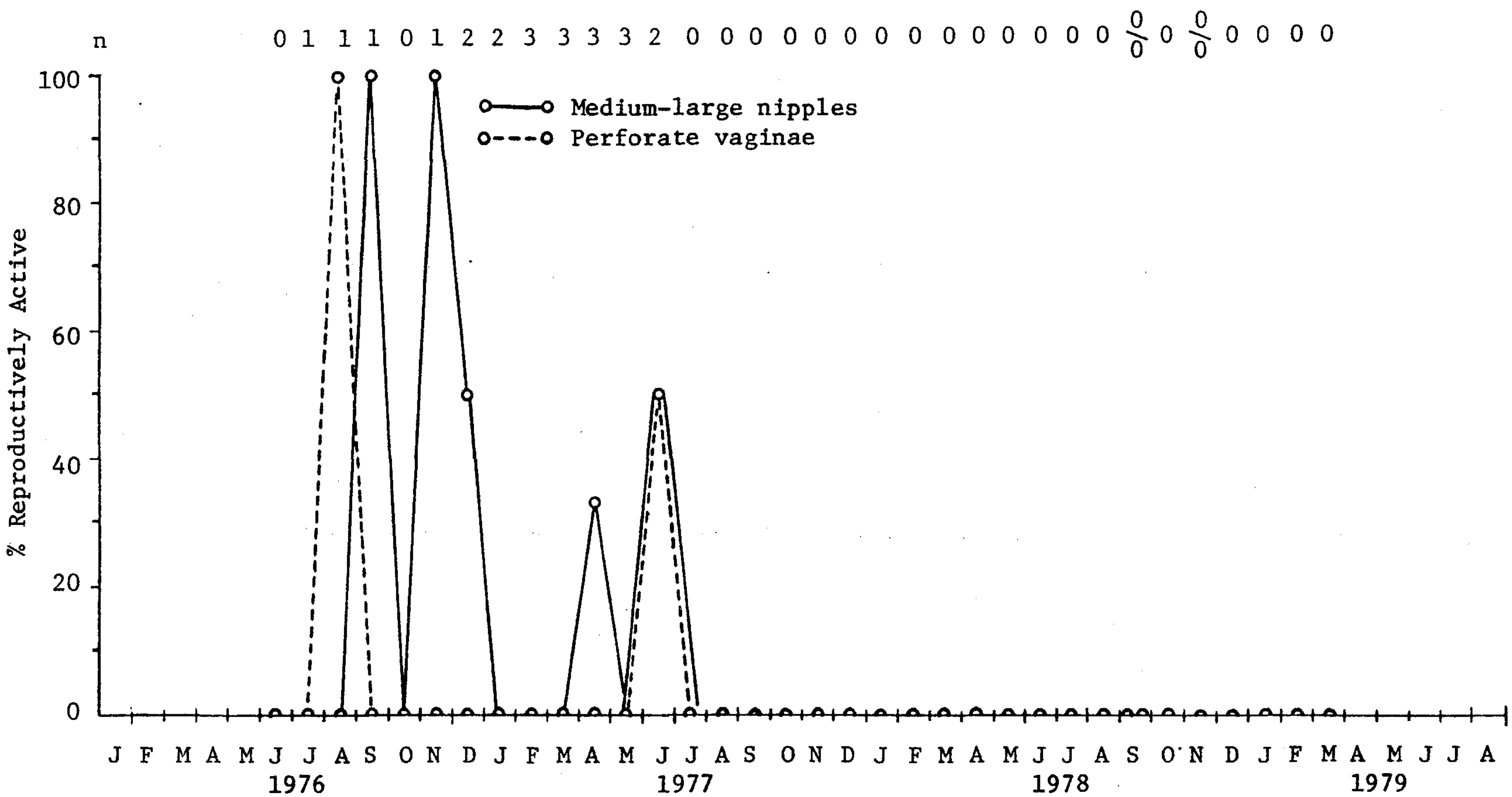


Figure 113. Monthly percentage of adult female Florida mice in reproductive condition on the Wisconsin Village Grid.

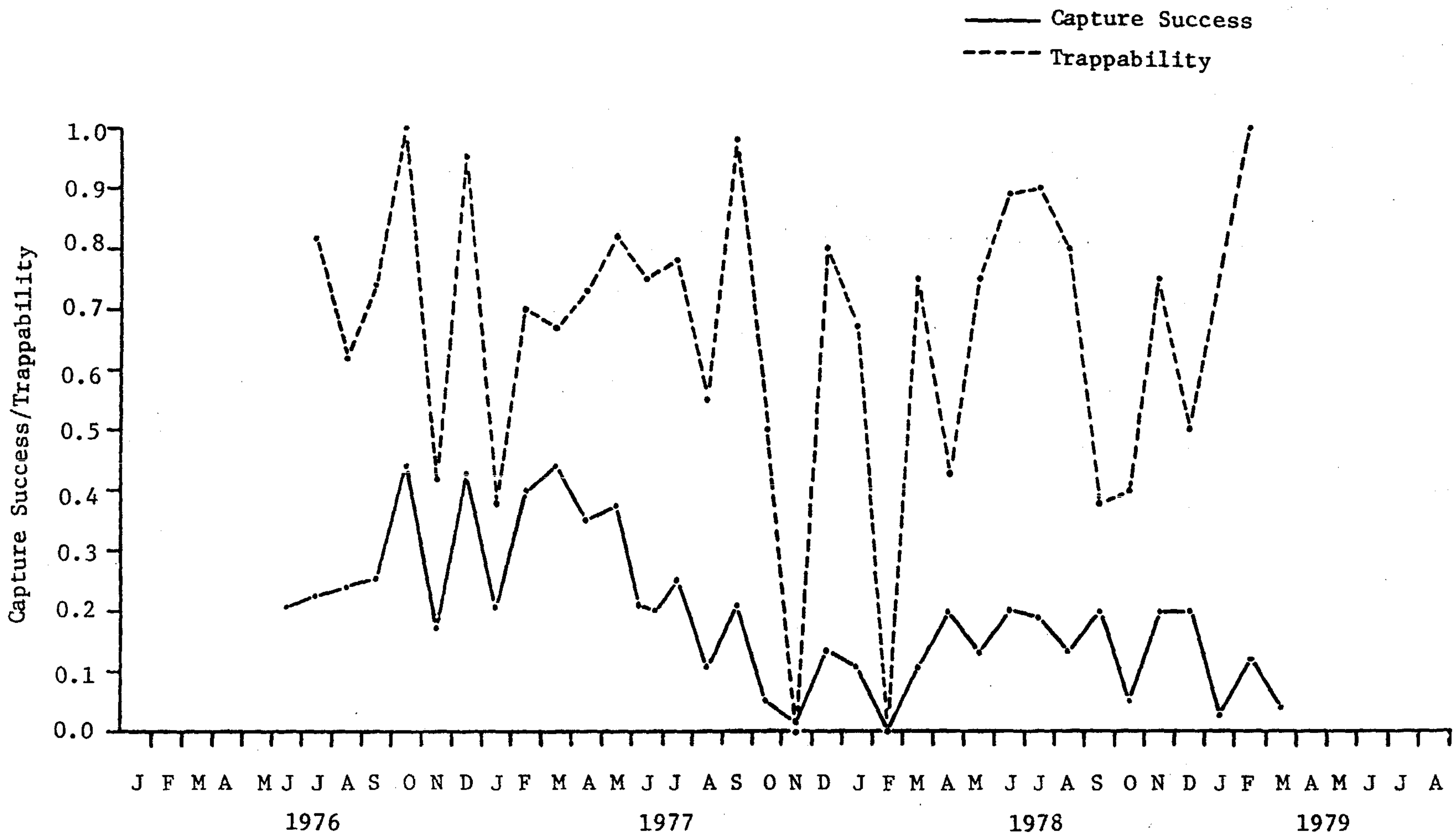


Figure 114. Capture success (total captures of all species/traps on grid) and trappability of cotton mice (number caught/number known to be alive) on the Happy Hammock Grid.

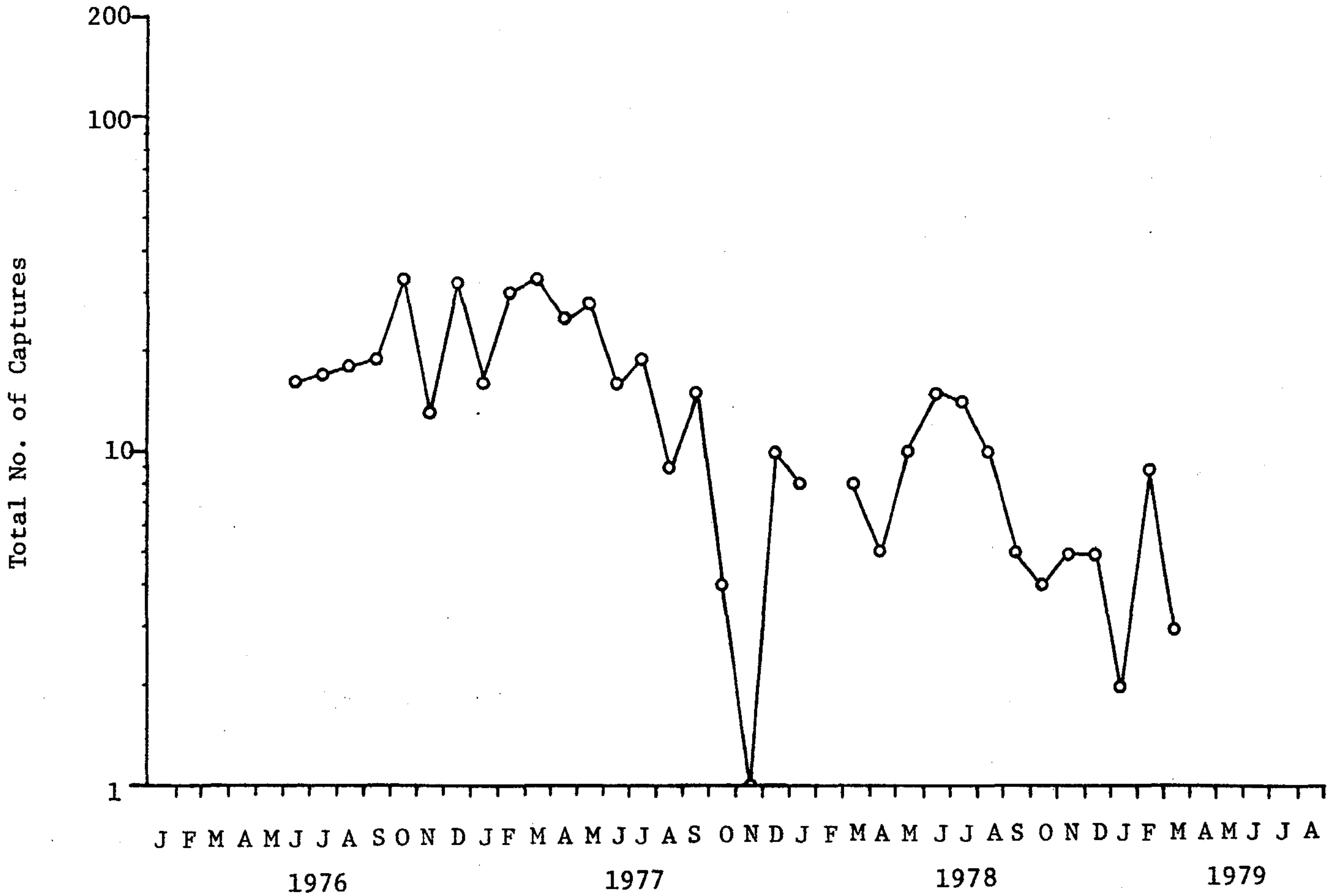


Figure 115. Number of captures of small mammals per month on the Happy Hammock Grid.

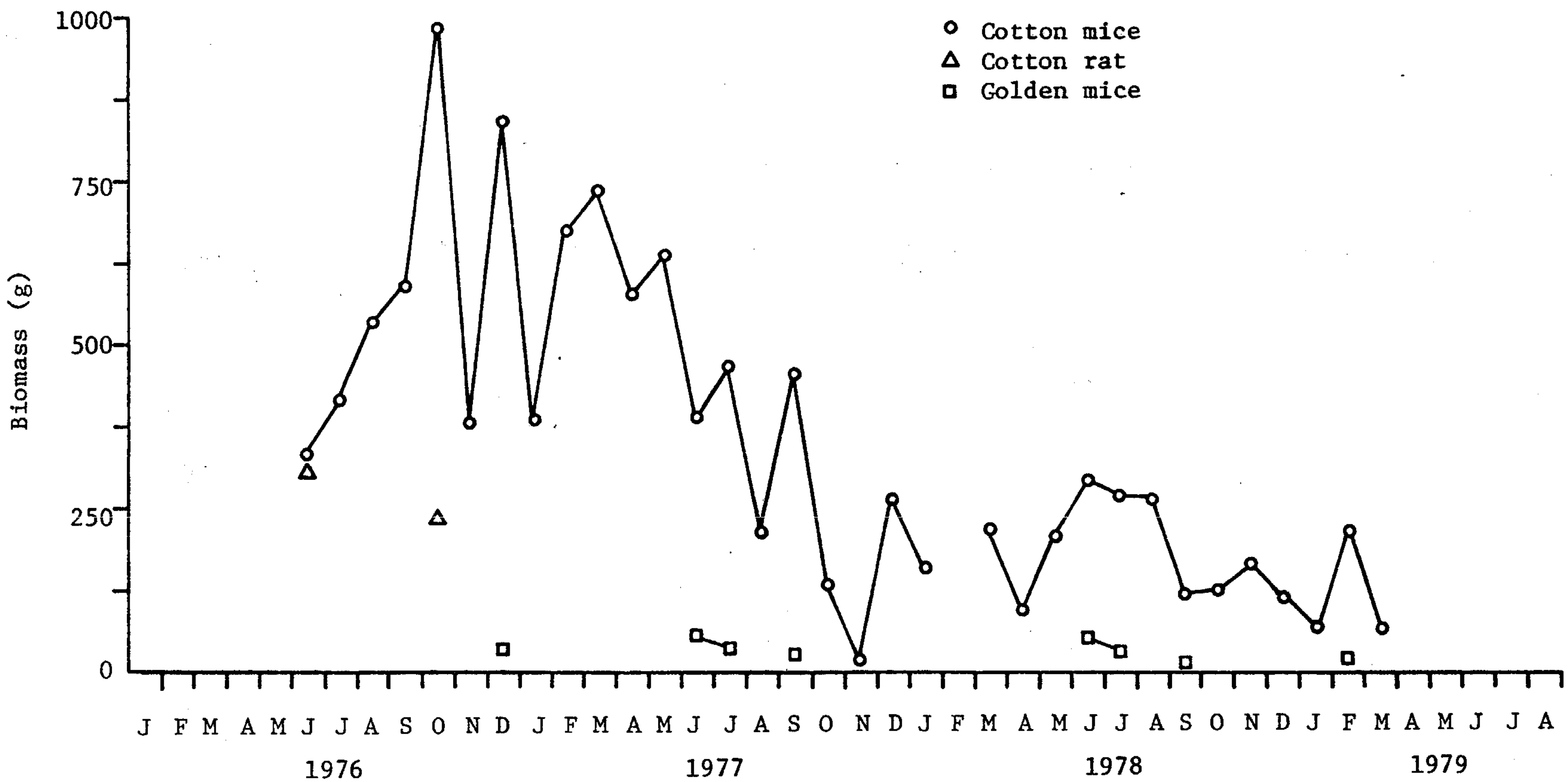


Figure 116. Biomass (live weight) of small mammals on the Happy Hammock Grid.

Figure 117. Mean body weight of male cotton mice on the Happy Hammock grid, 1976. Brackets enclose a 95% confidence interval.

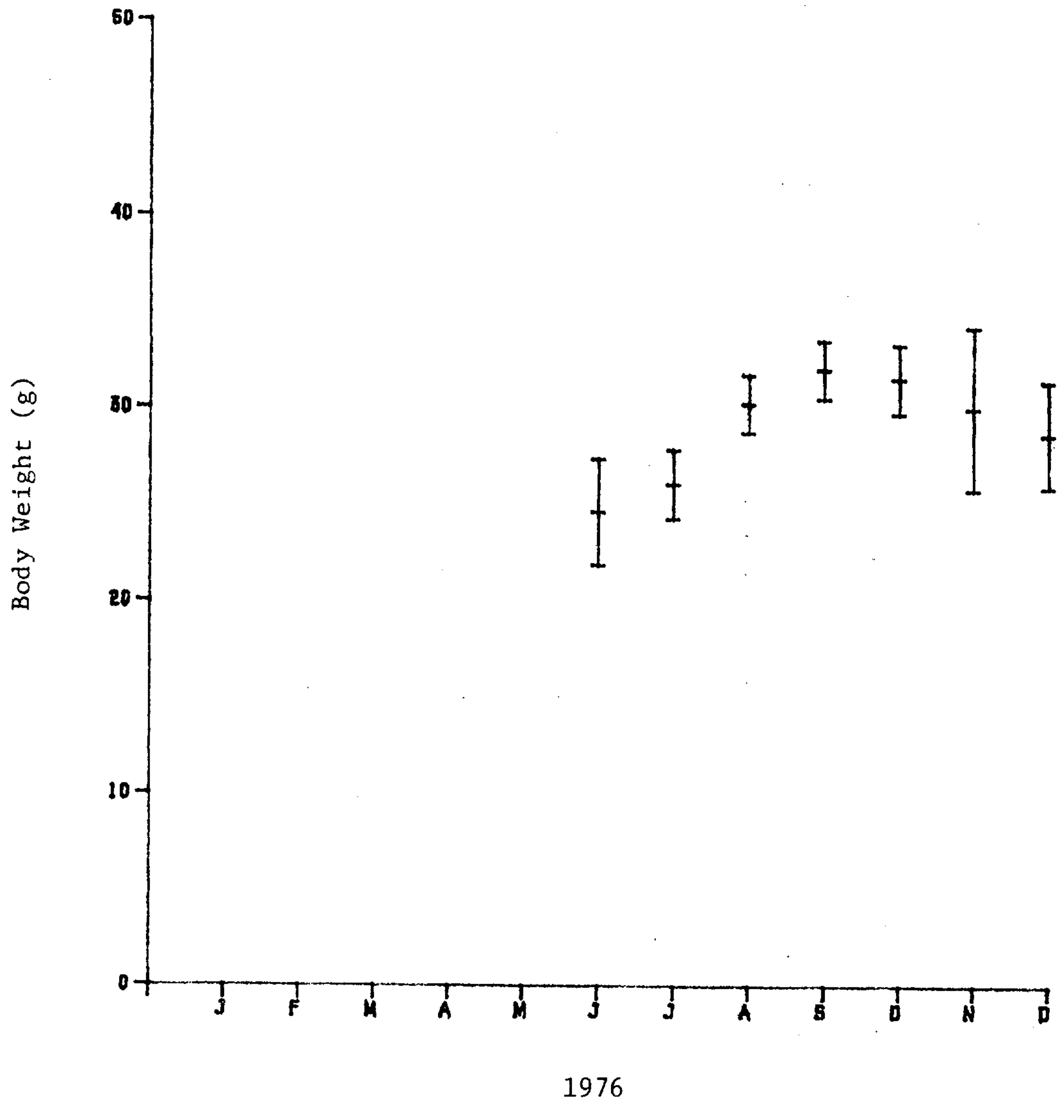


Figure 118. Mean body weight of male cotton mice on the Happy Hammock grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

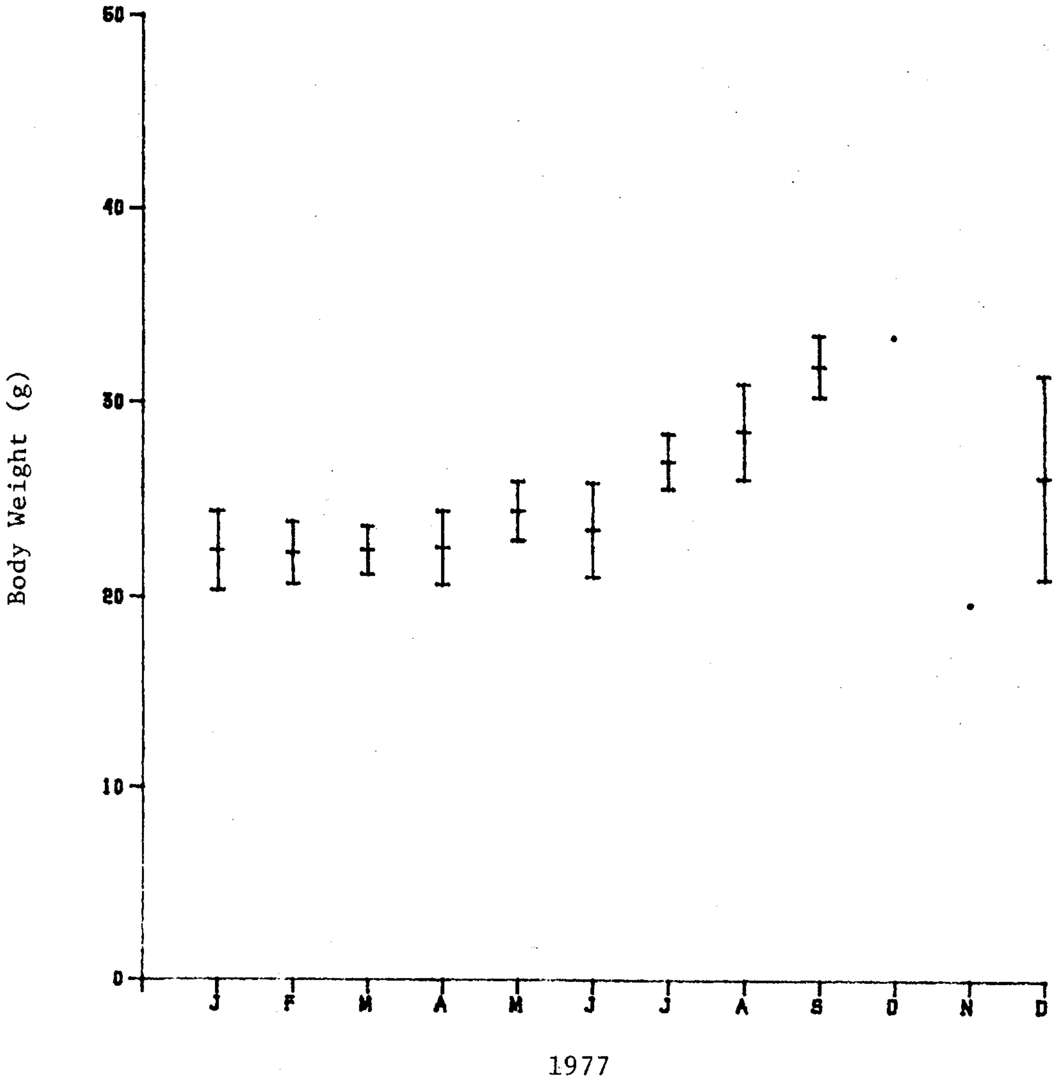


Figure 119. Mean body weight of male cotton mice on the Happy Hammock grid, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

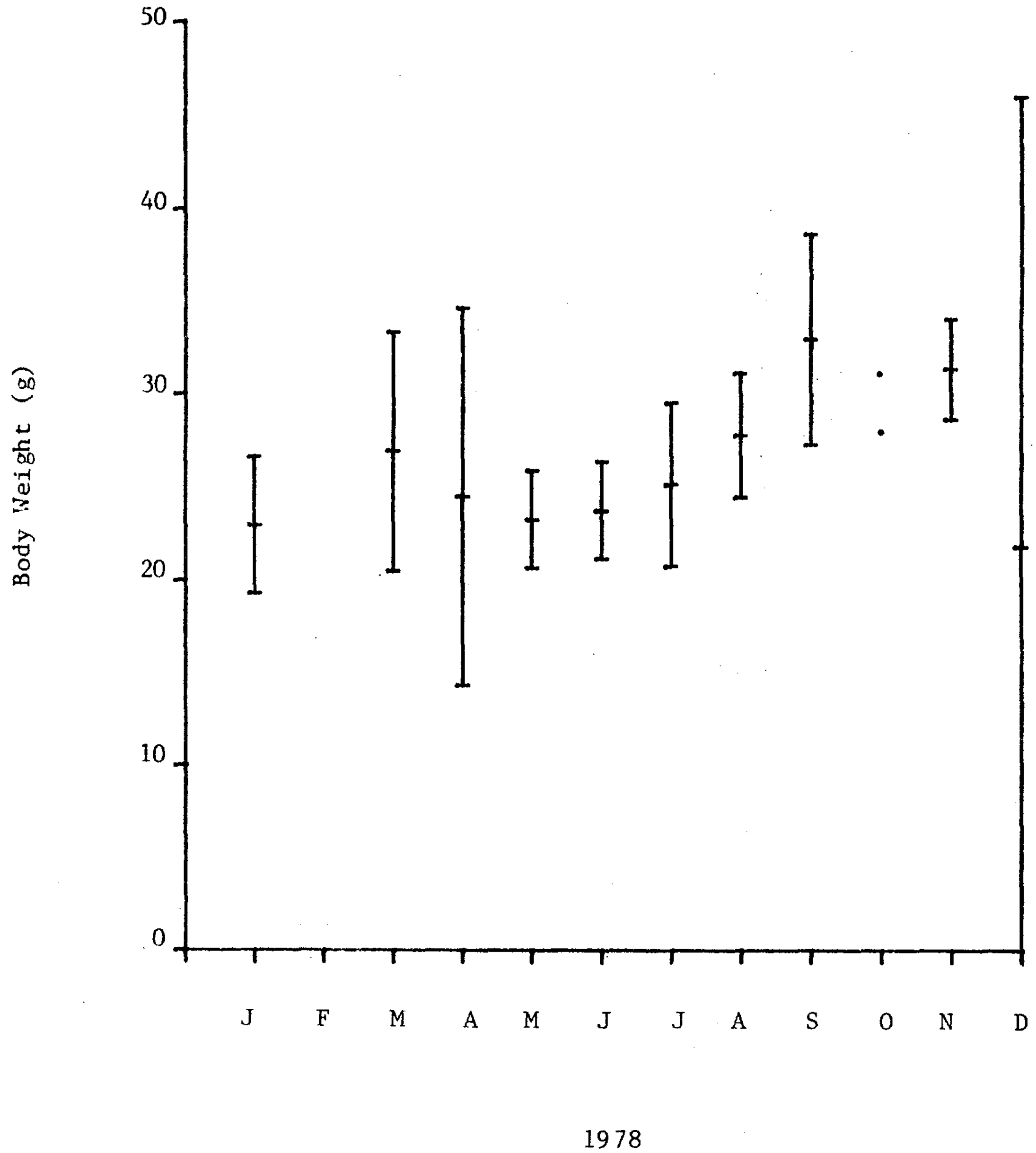


Figure 120. Mean body weight of male cotton mice on the Happy Hammock grid, 1979. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

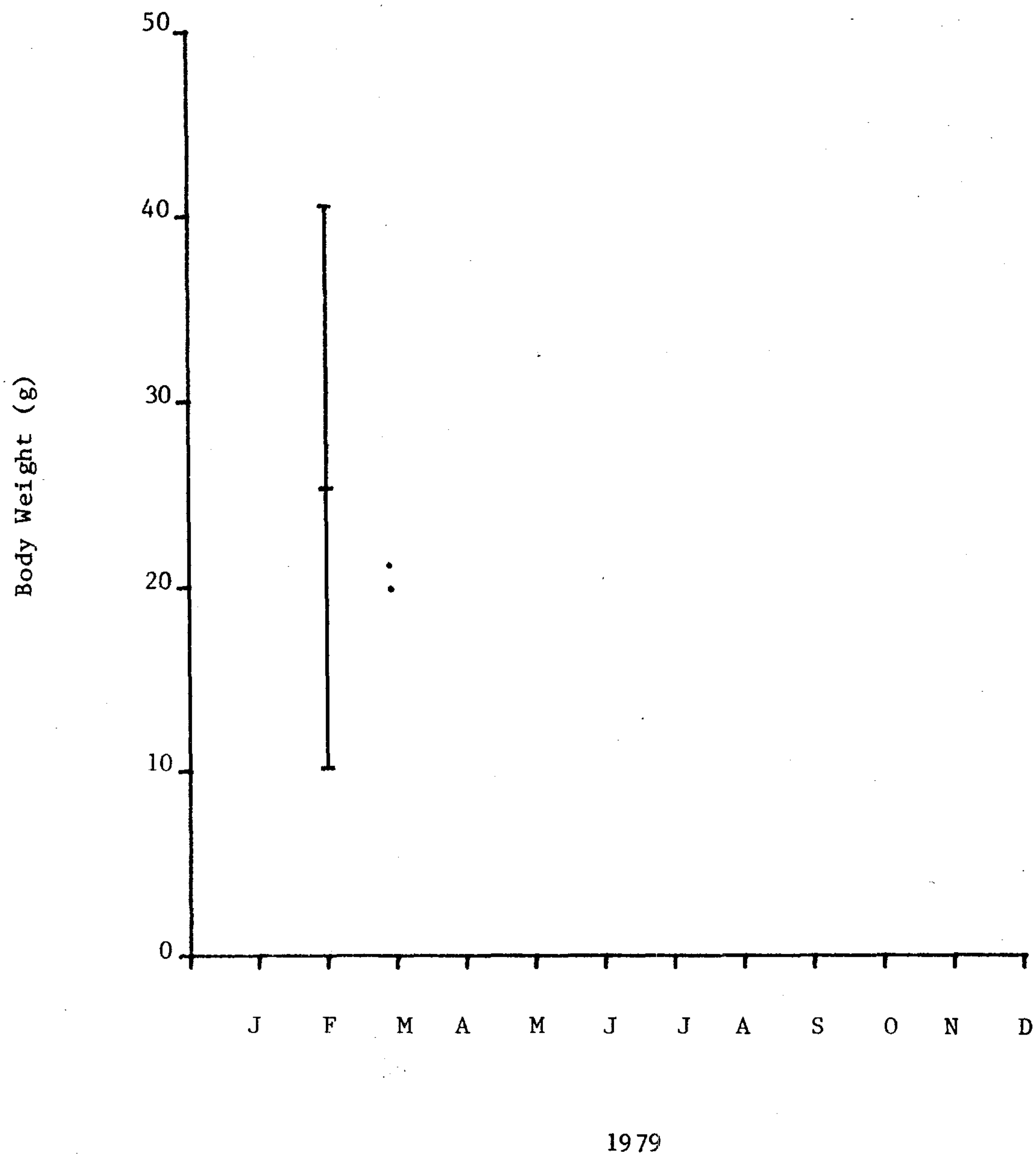


Figure 121. Mean body weight of female cotton mice on the Happy Hammock grid, 1976. Brackets enclose a 95% confidence interval.

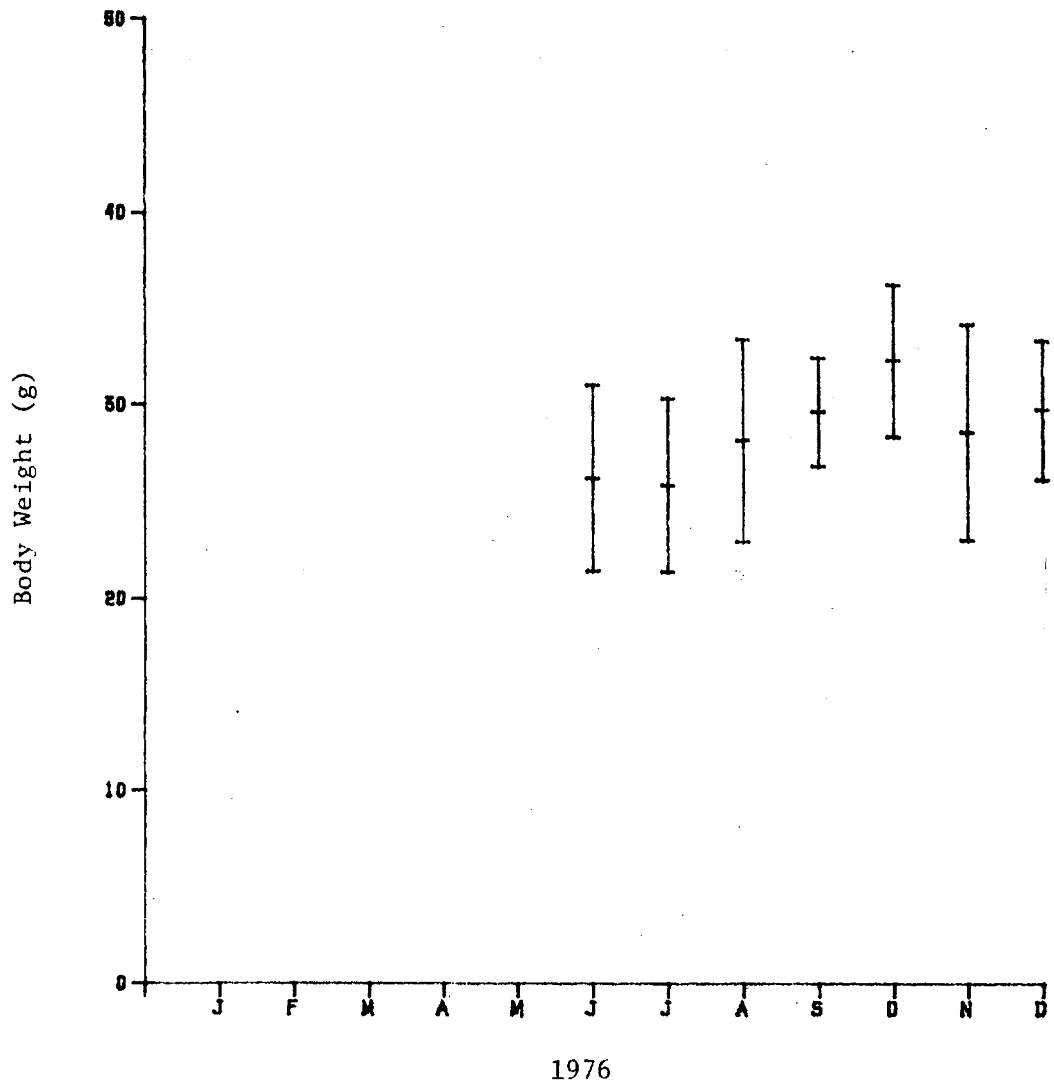


Figure 122. Mean body weight of female cotton mice on the Happy Hammock grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

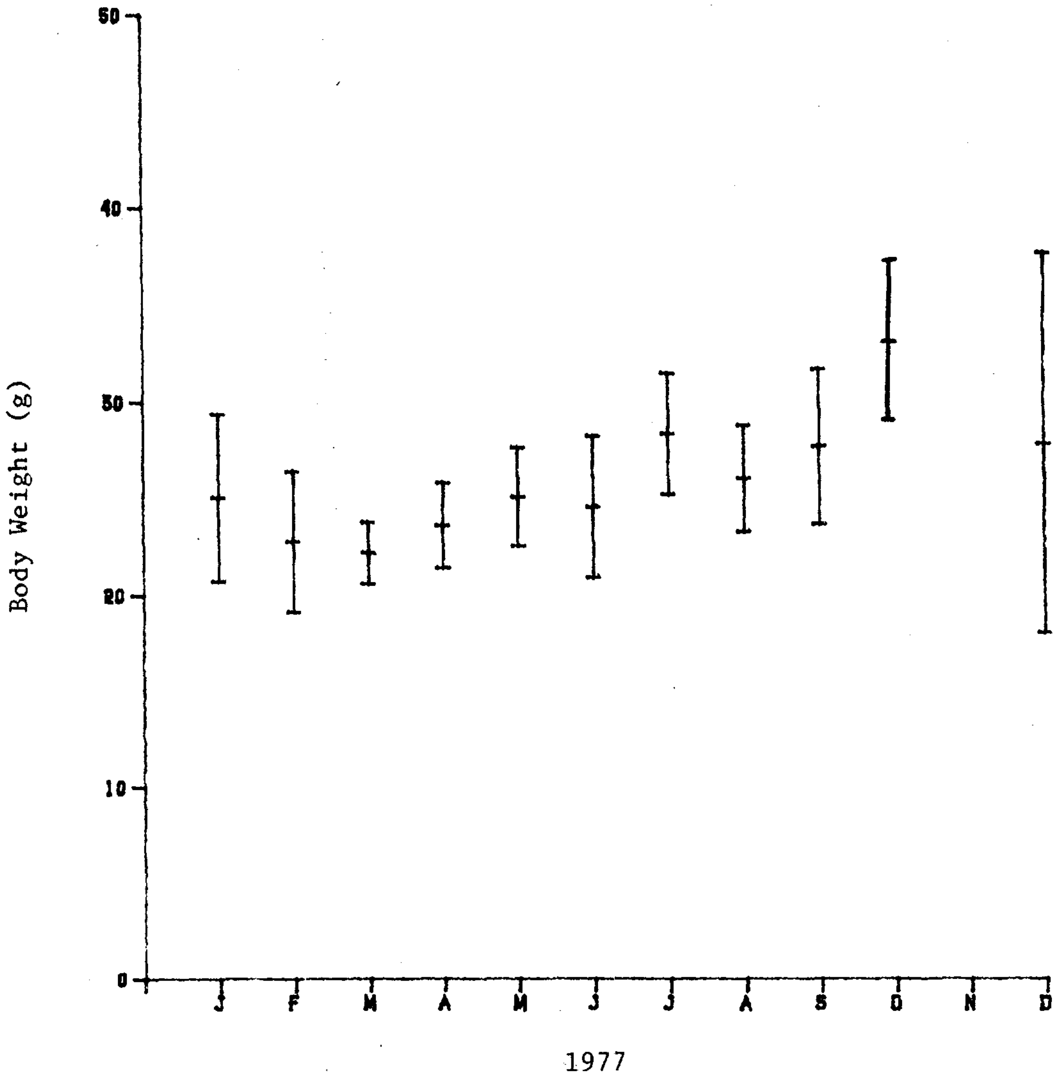


Figure 123. Mean body weight of female cotton mice on the Happy Hammock grid, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

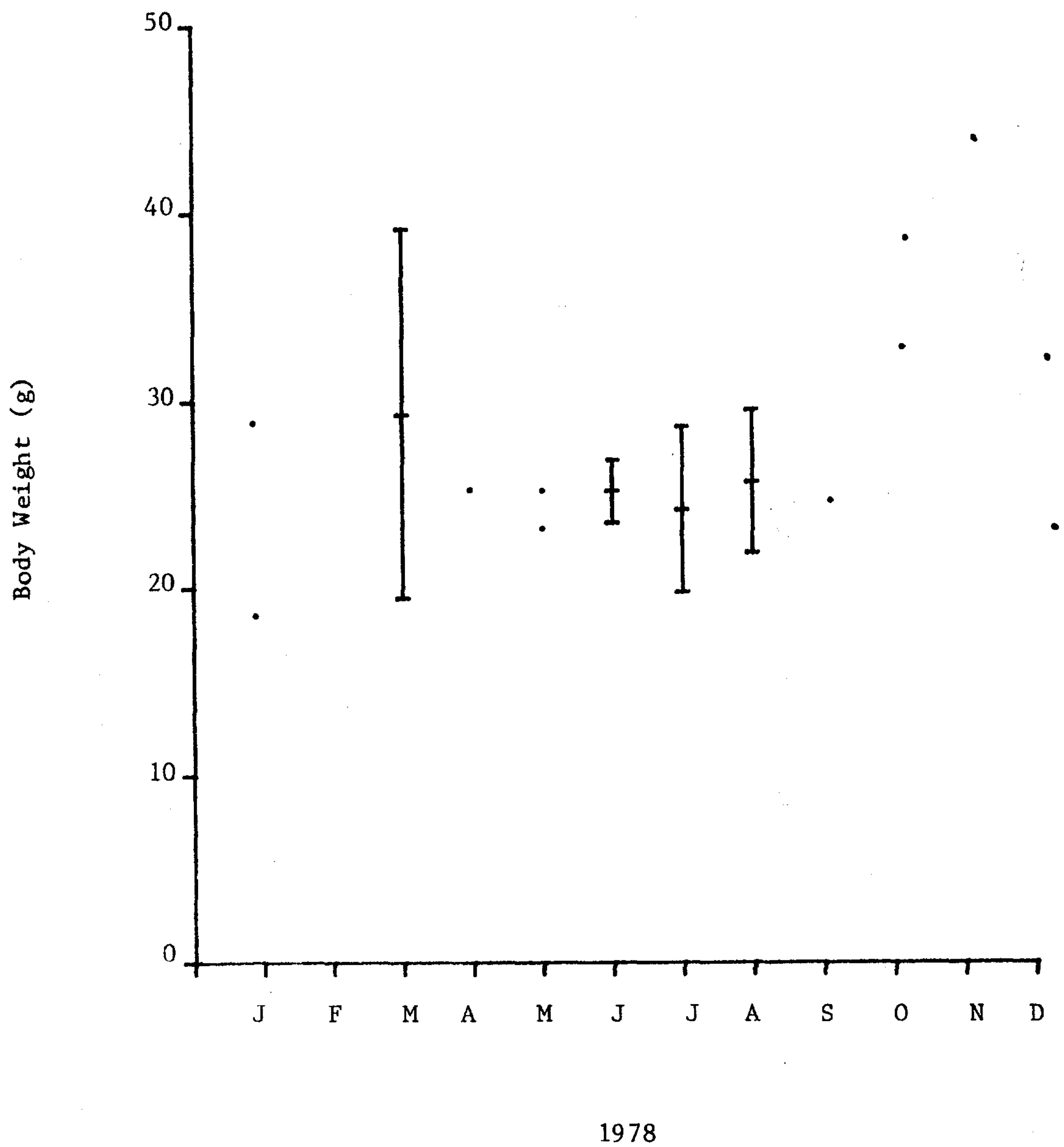
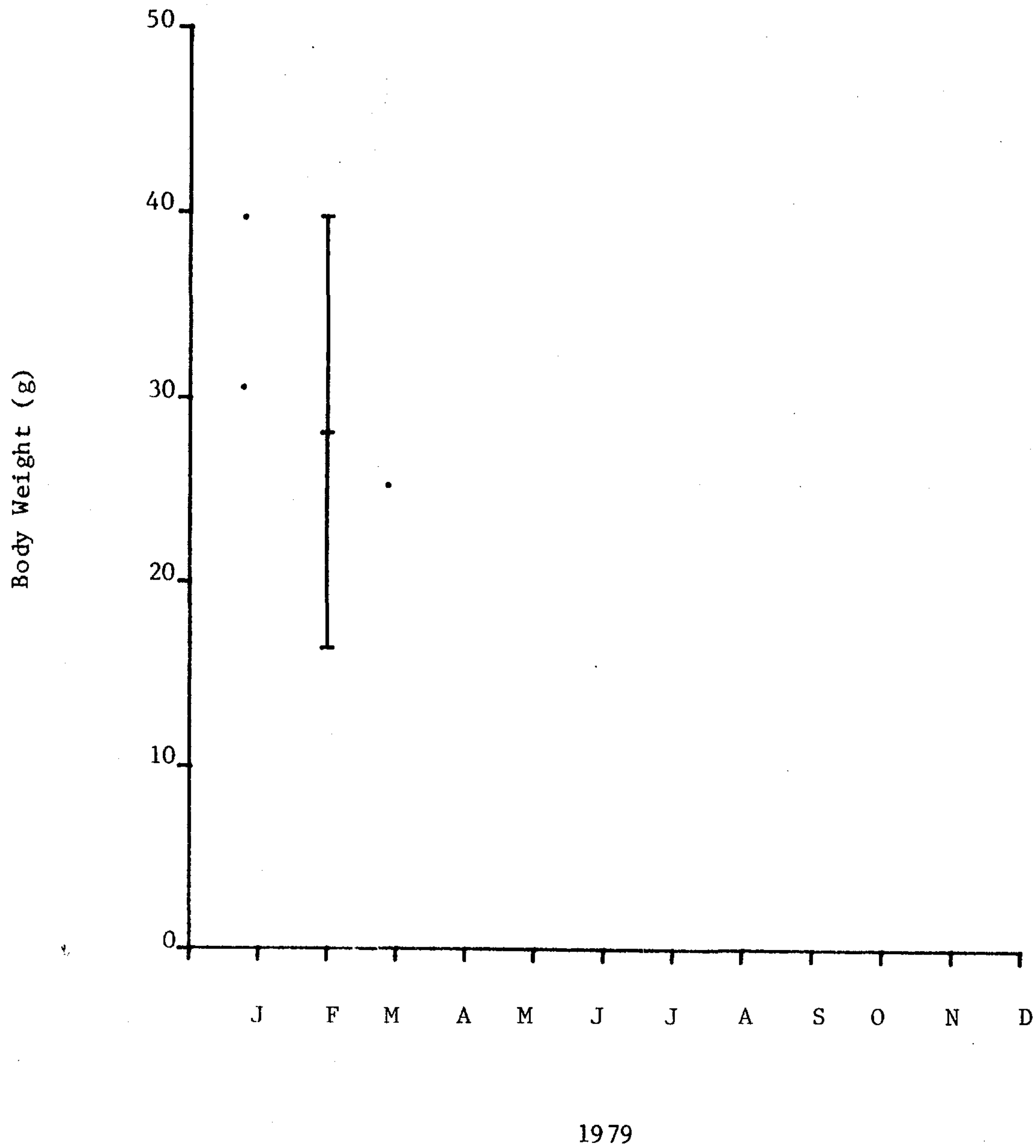


Figure 124. Mean body weight of female cotton mice on the Happy Hammock grid, 1979. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.



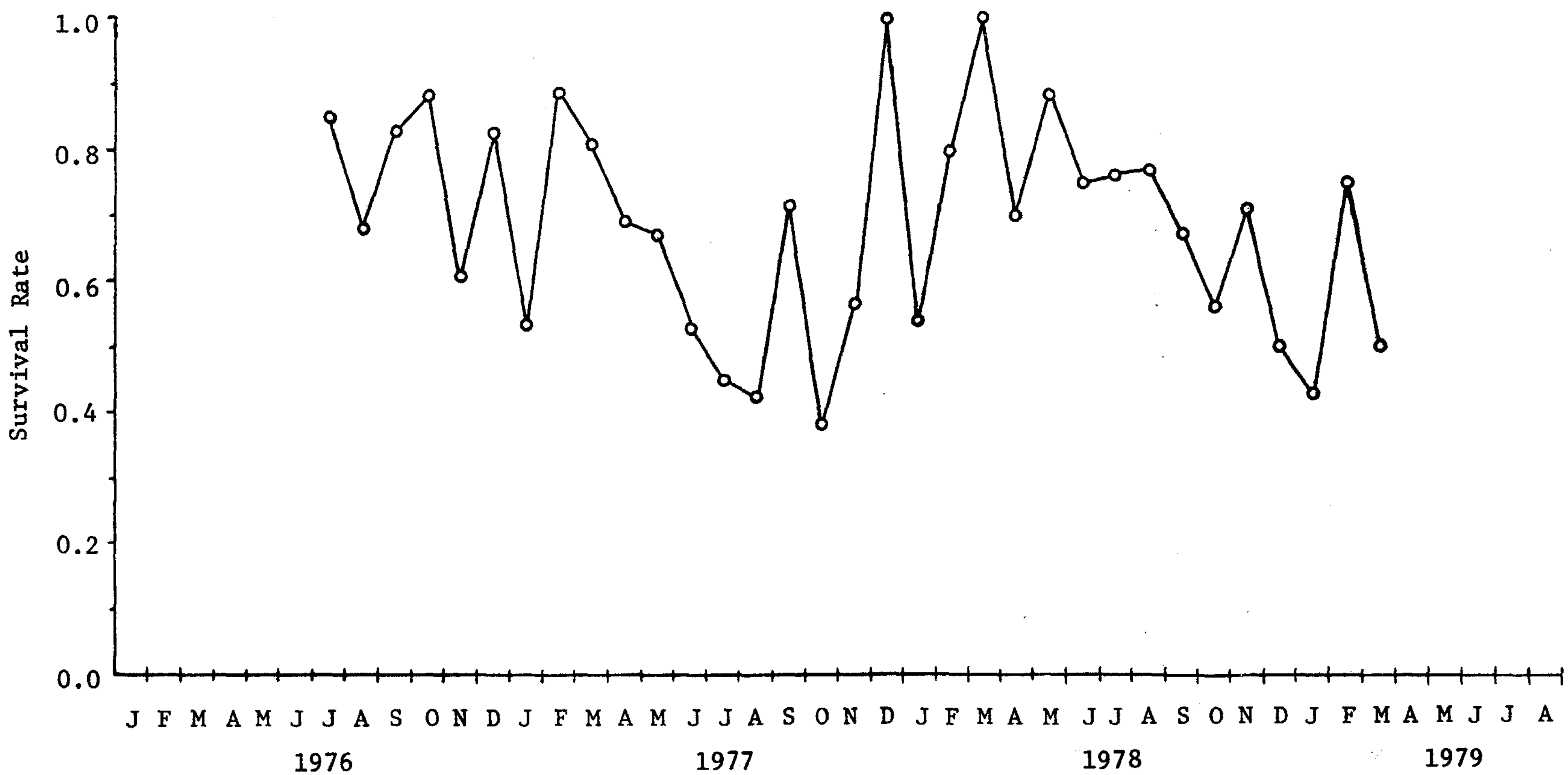


Figure 125. Four week survival rate of cotton mice on the Happy Hammock Grid.

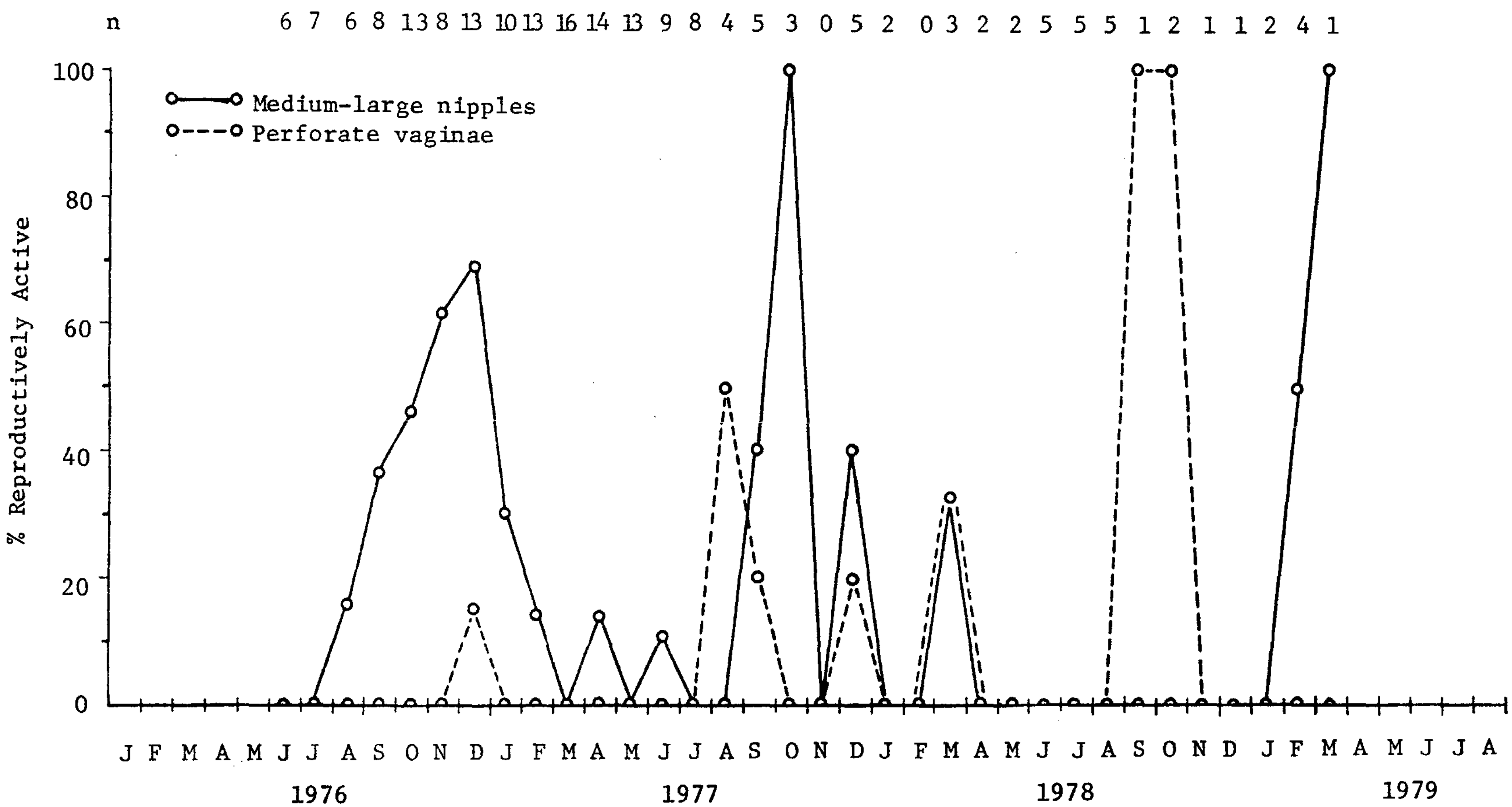


Figure 126. Monthly percentage of adult cotton mice in reproductive condition on the Happy Hammock Grid.

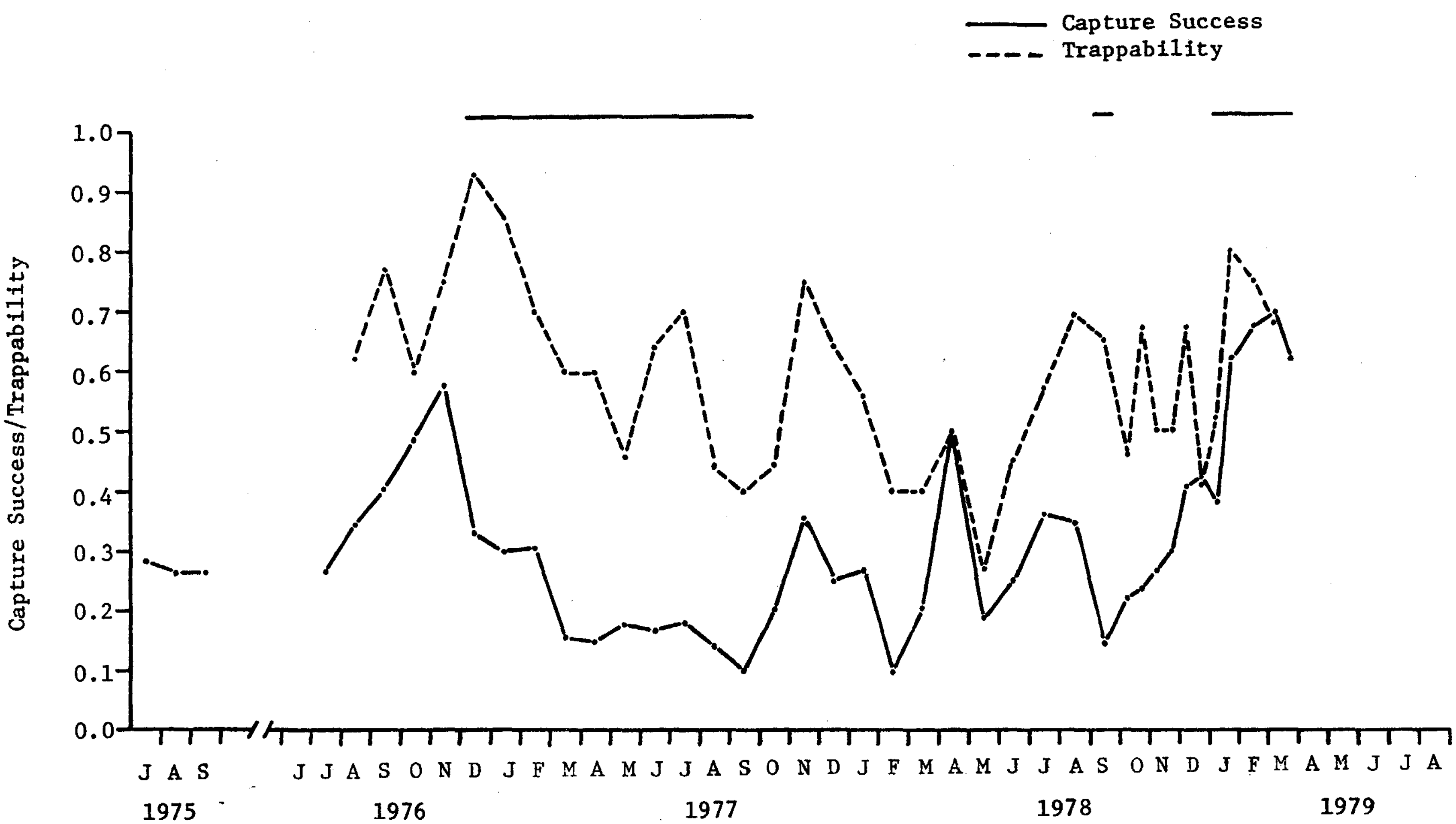


Figure 127. Capture success (total captures of all species/traps on grid) and trappability of beach mice (number caught/number known to be alive) on the beach grid. The solid line indicates months when traps were doubled.

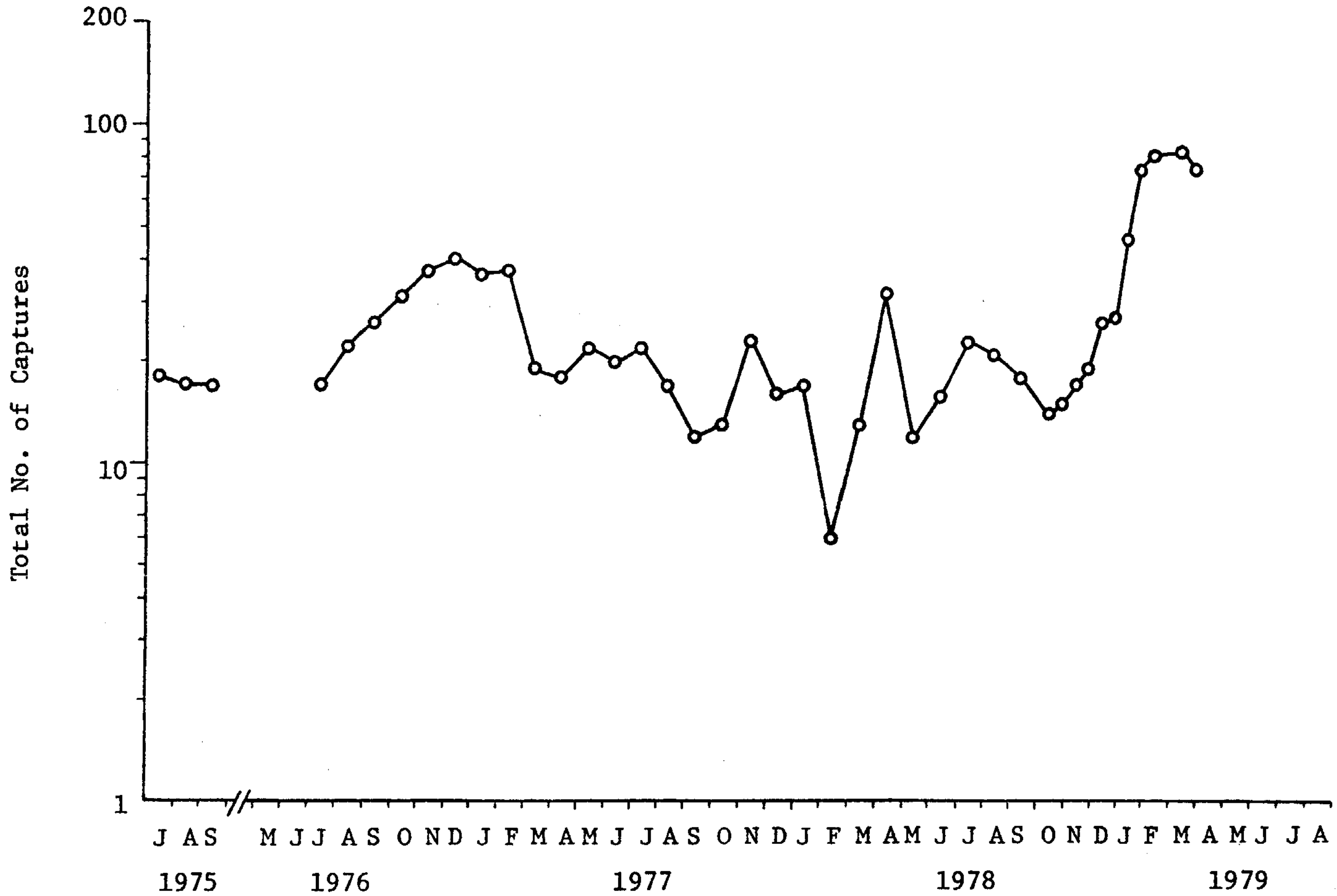


Figure 128. Number of captures of small mammals per month on the Beach Grid.

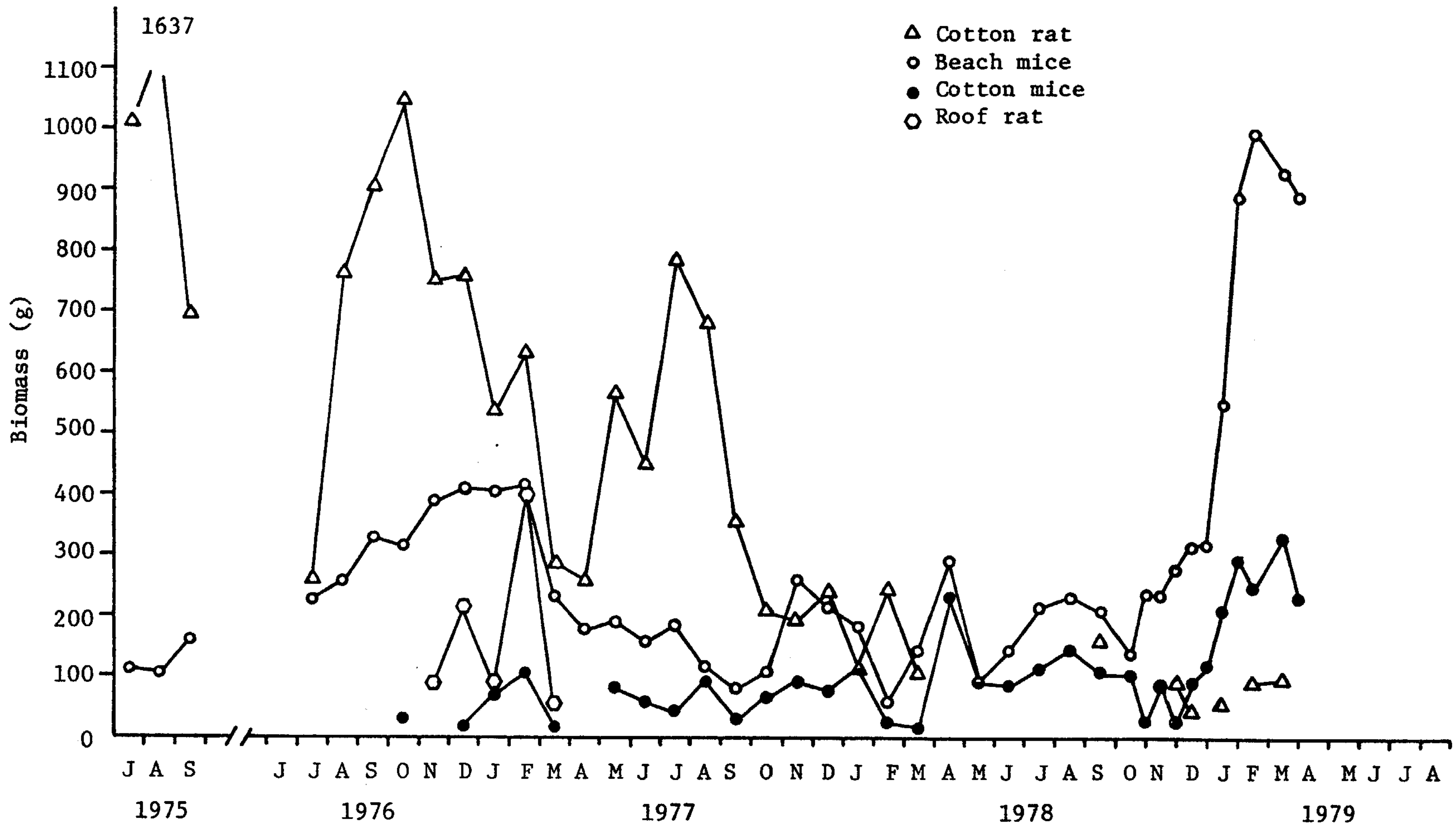


Figure 129. Biomass (live weight) of small mammals on the Beach Grid.

Figure 130. Mean body weight of male cotton rats on the beach grid, 1976. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

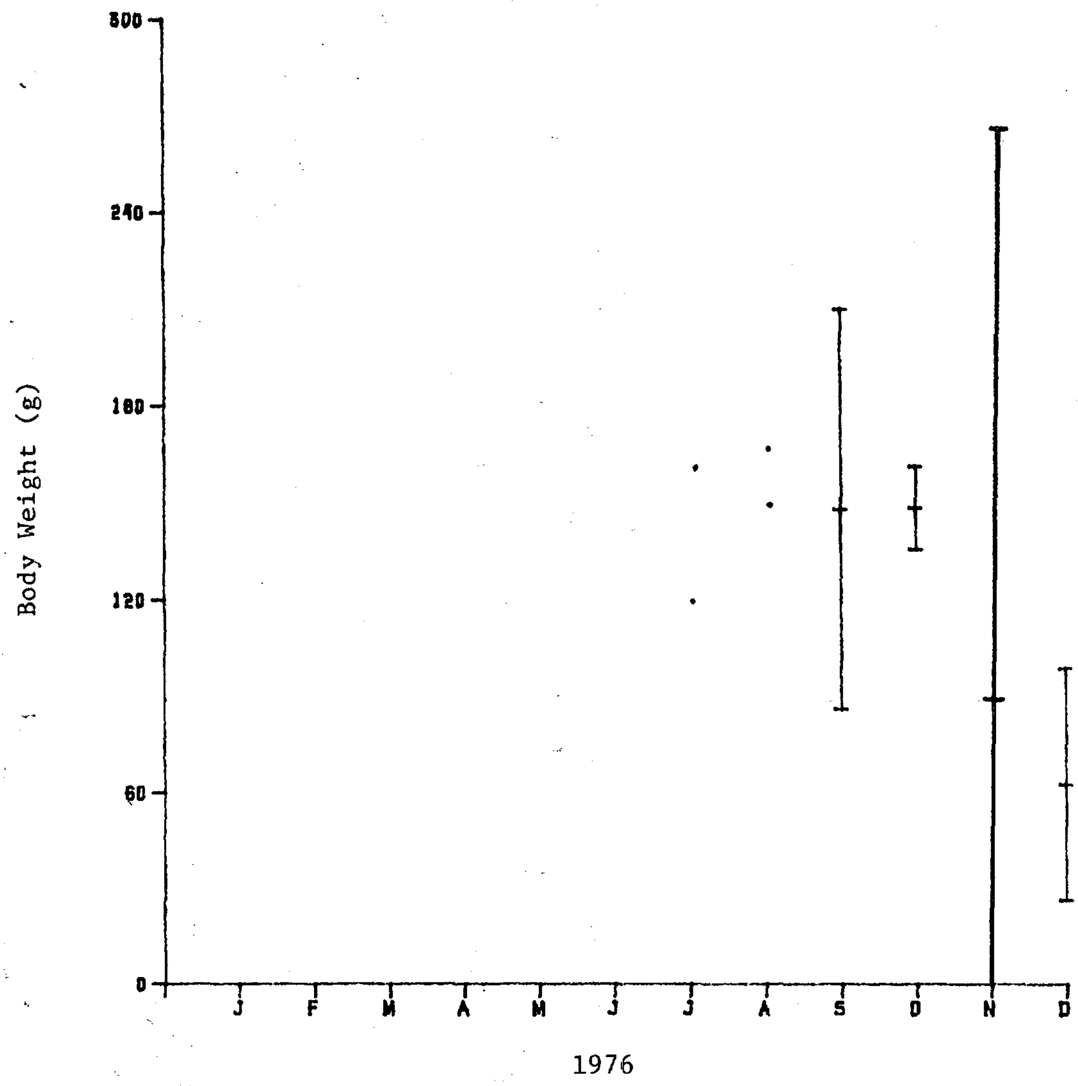


Figure 131. Mean body weight of male cotton rats on the beach grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

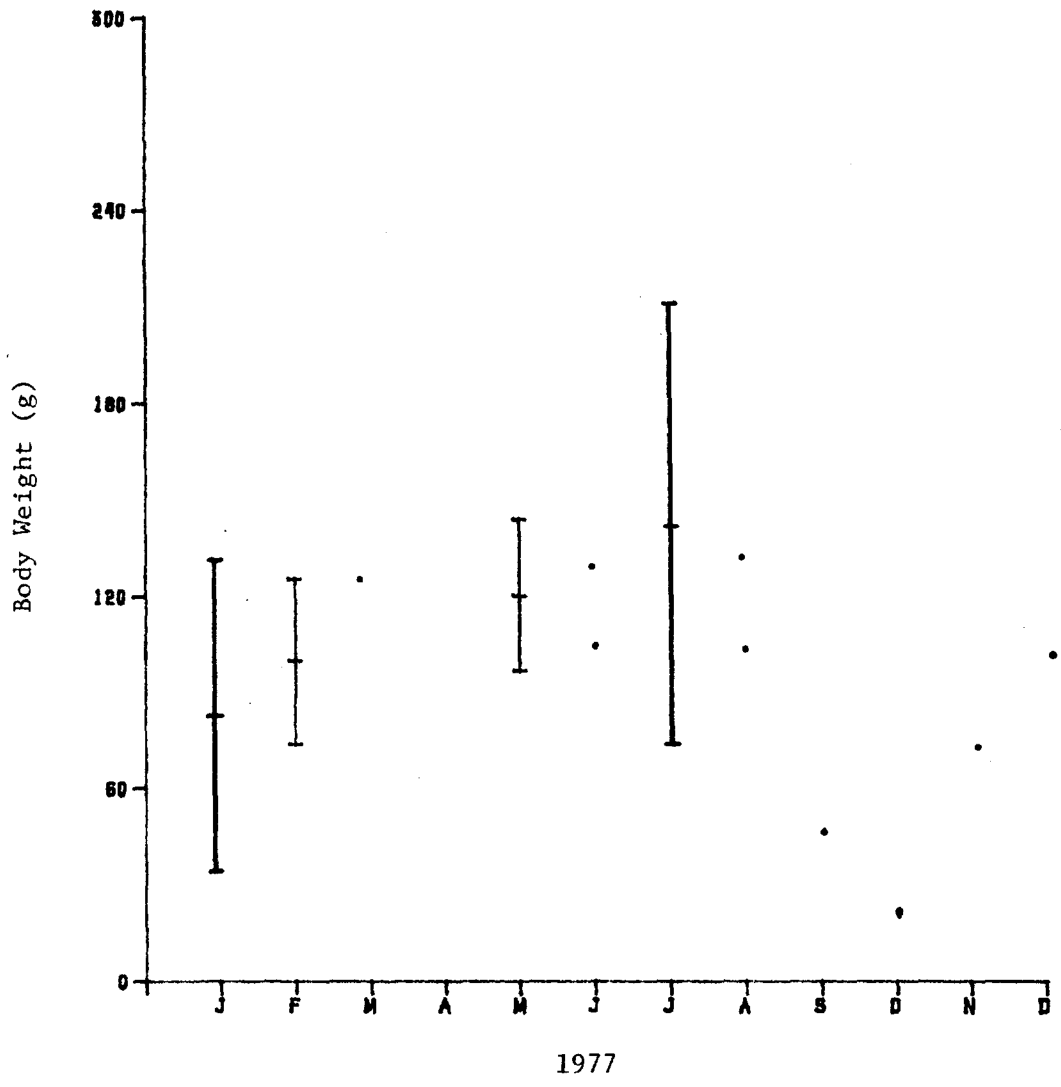


Figure 132. Mean body weight of female cotton rats on the beach grid, 1976. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

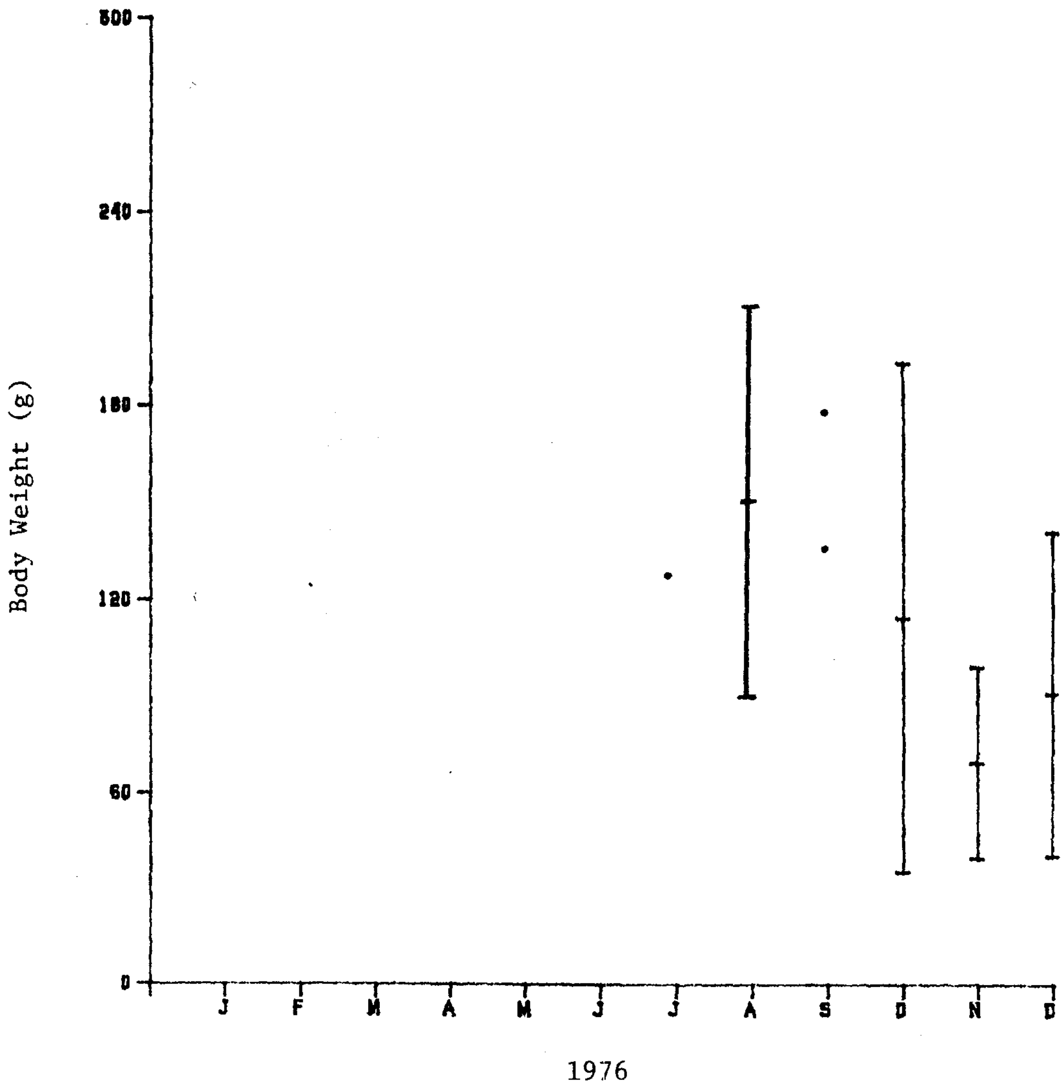


Figure 133. Mean body weight of female cotton rats on the beach grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

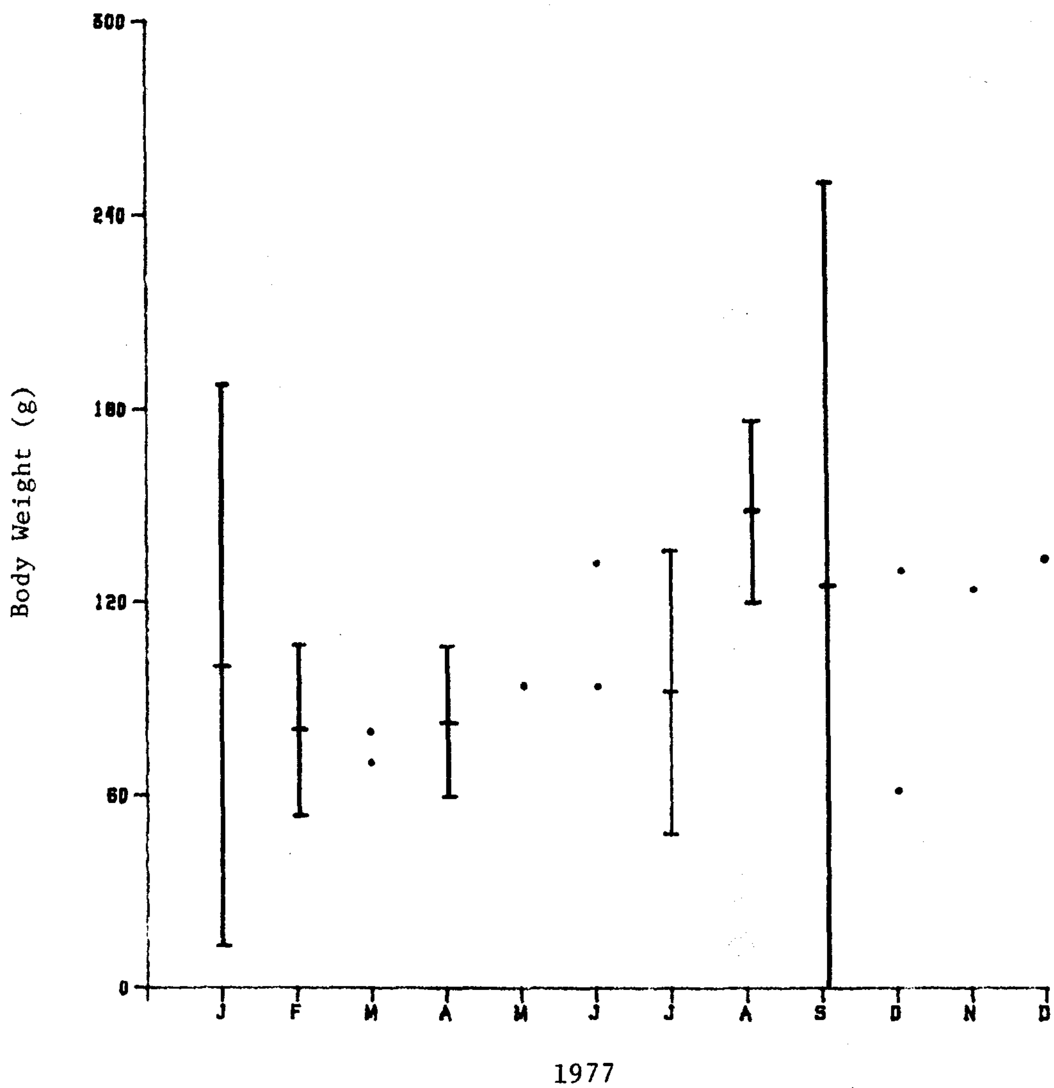


Figure 134. Mean body weight of male beach mice on the beach grid, 1976. Brackets enclose a 95% confidence interval.

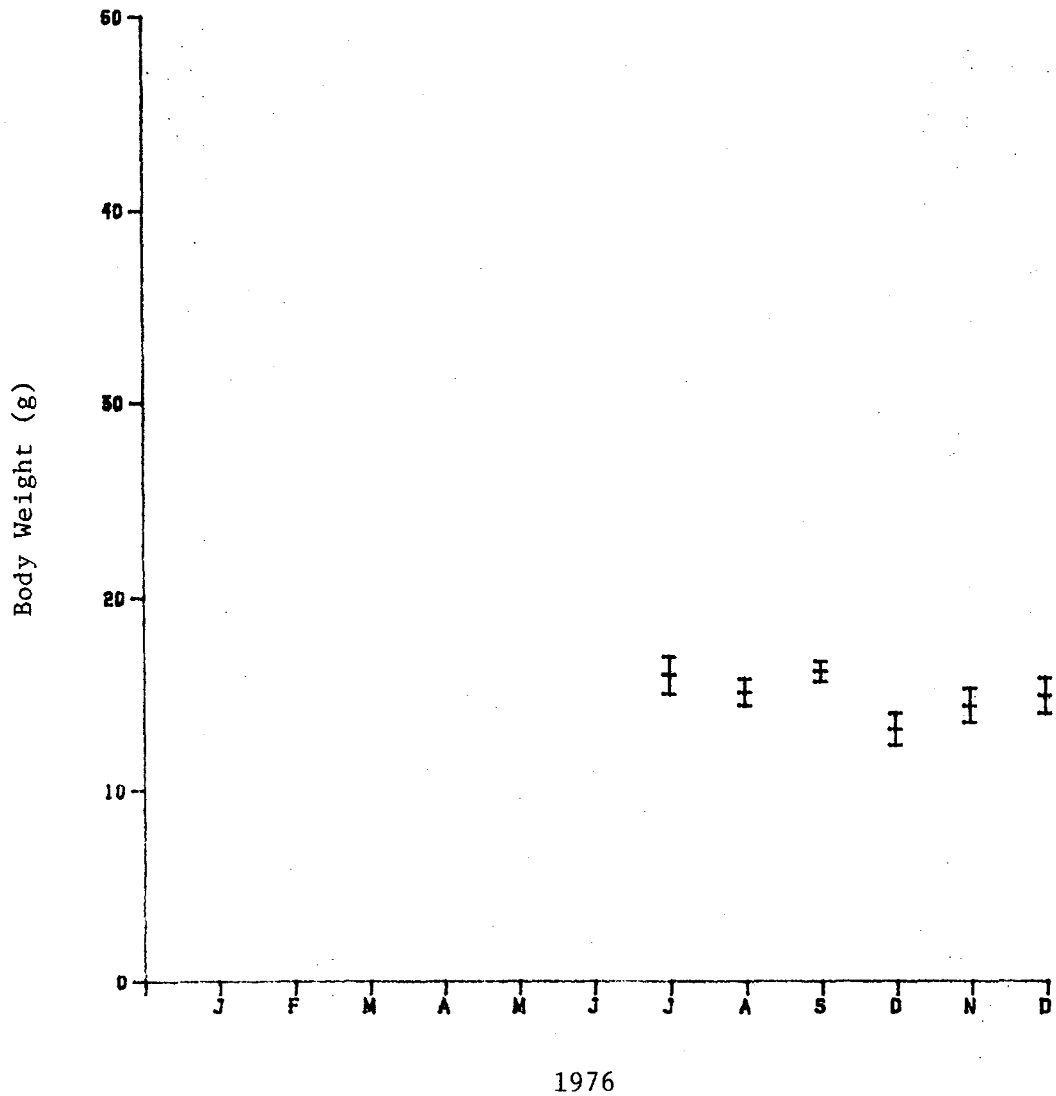


Figure 135. Mean body weight of male beach mice on the beach grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

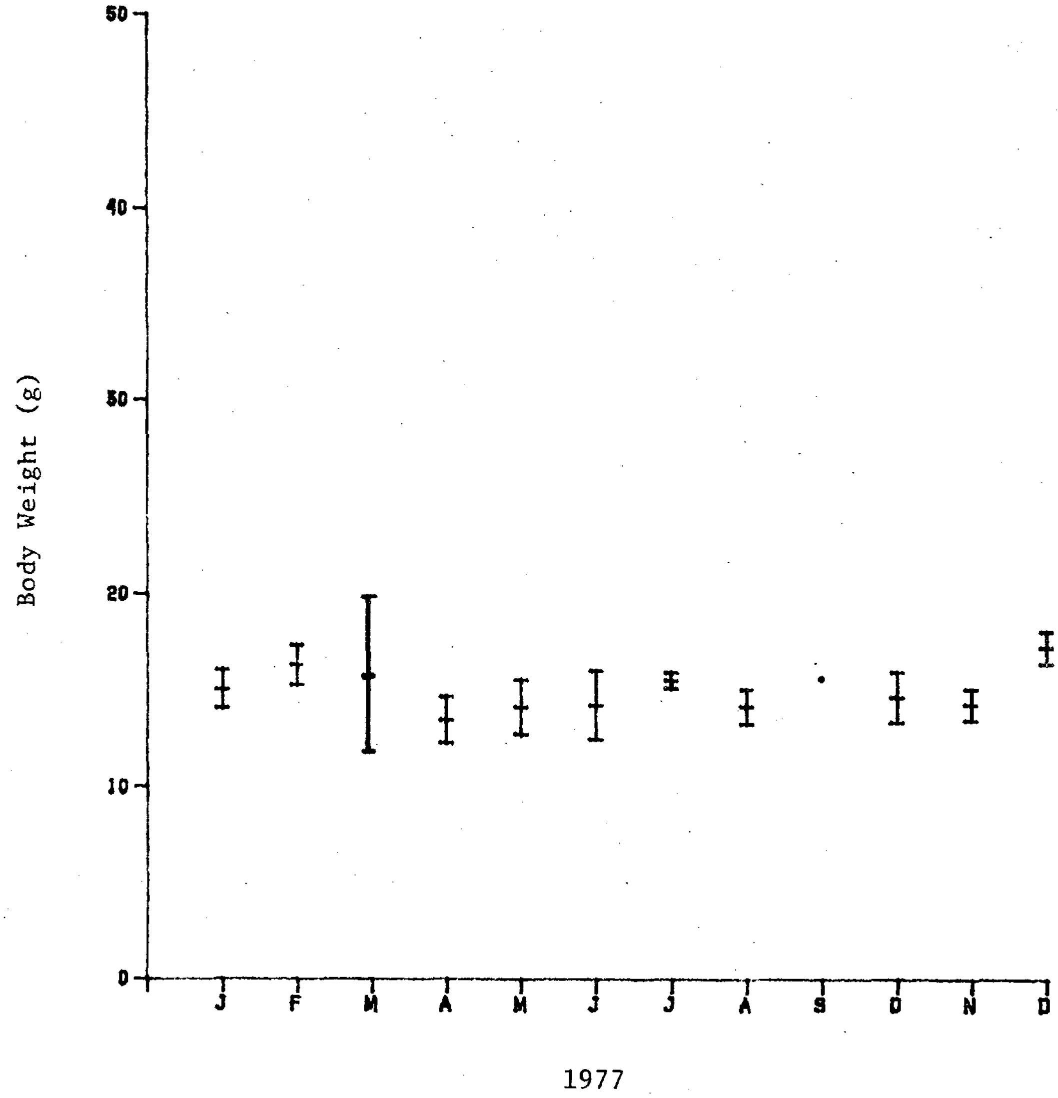


Figure 136. Mean body weight of male beach mice on the beach grid, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

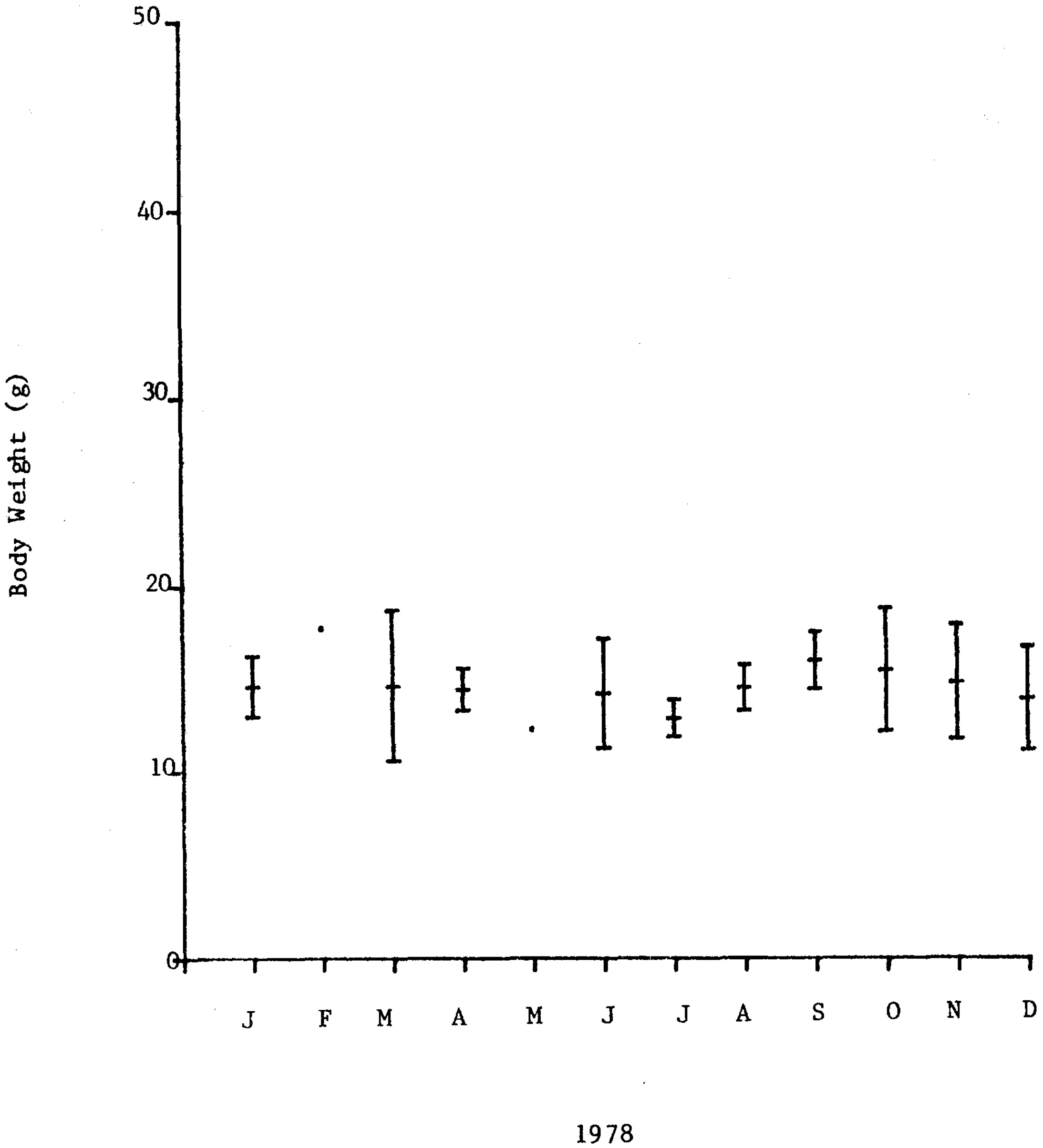


Figure 137. Mean body weight of male beach mice on the beach grid, 1979. Brackets enclose a 95% confidence interval.

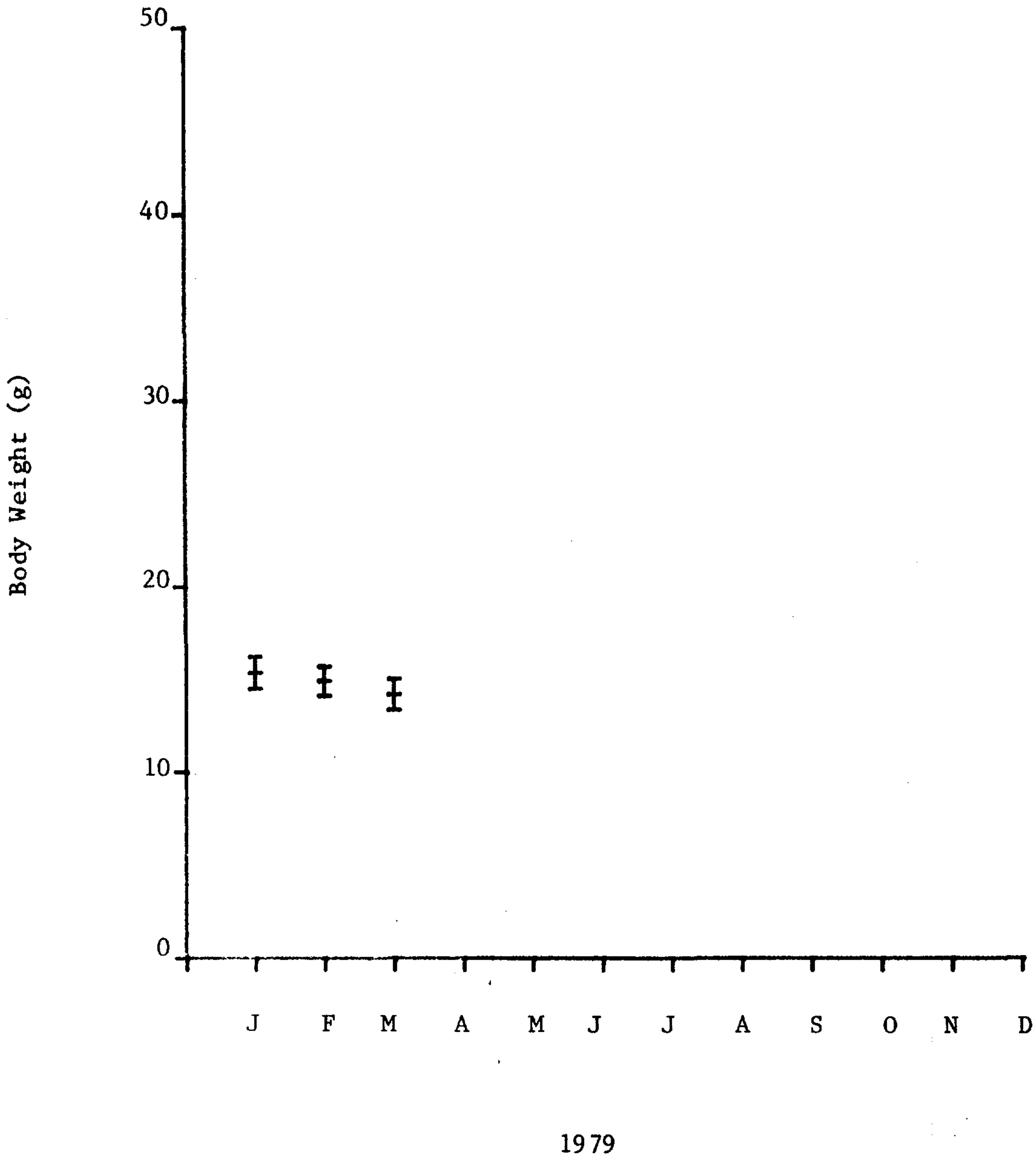


Figure 138. Mean body weight of female beach mice on the beach grid, 1976. Brackets enclose a 95% confidence interval.

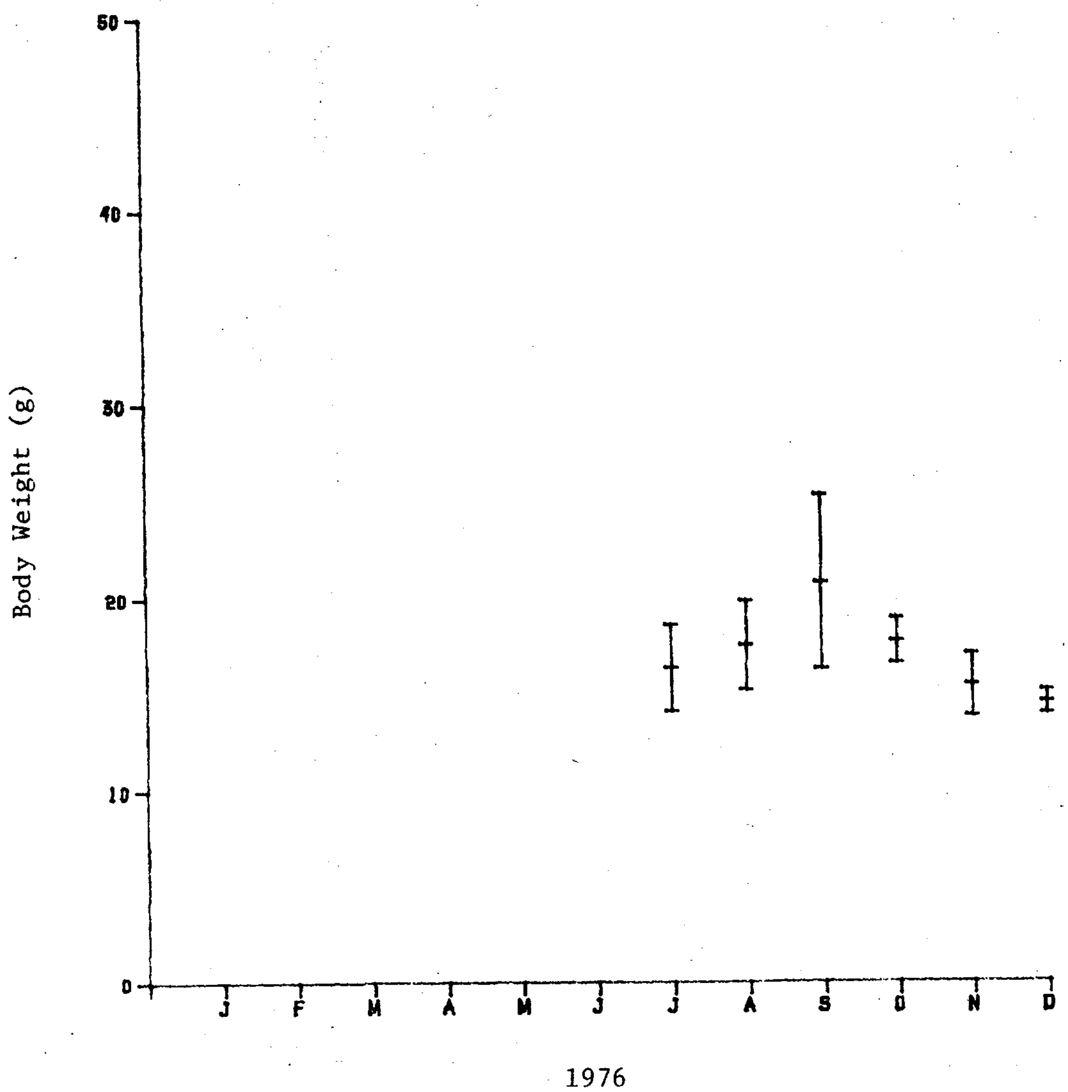


Figure 139. Mean body weight of female beach mice on the beach grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

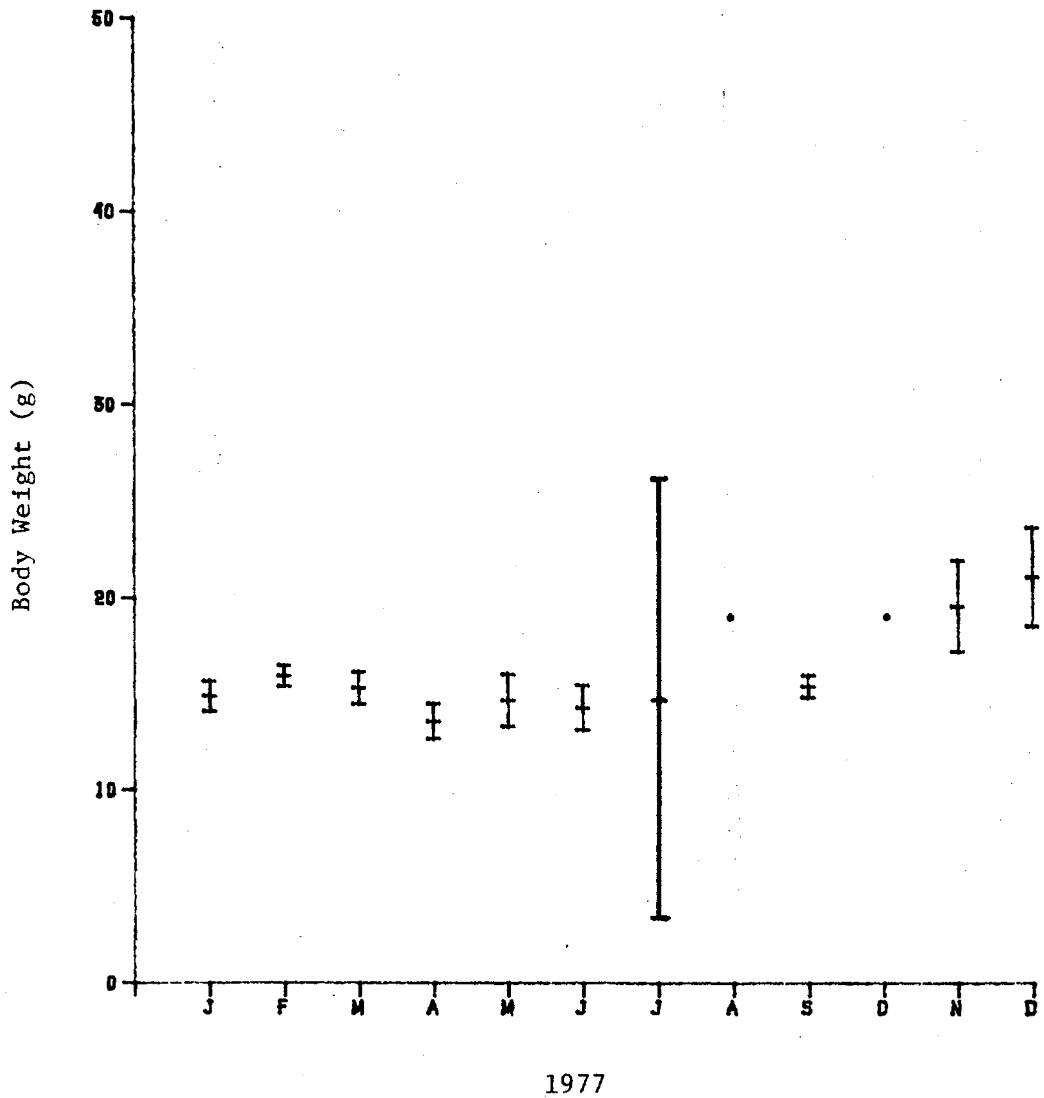


Figure 140. Mean body weight of female beach mice on the beach grid, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

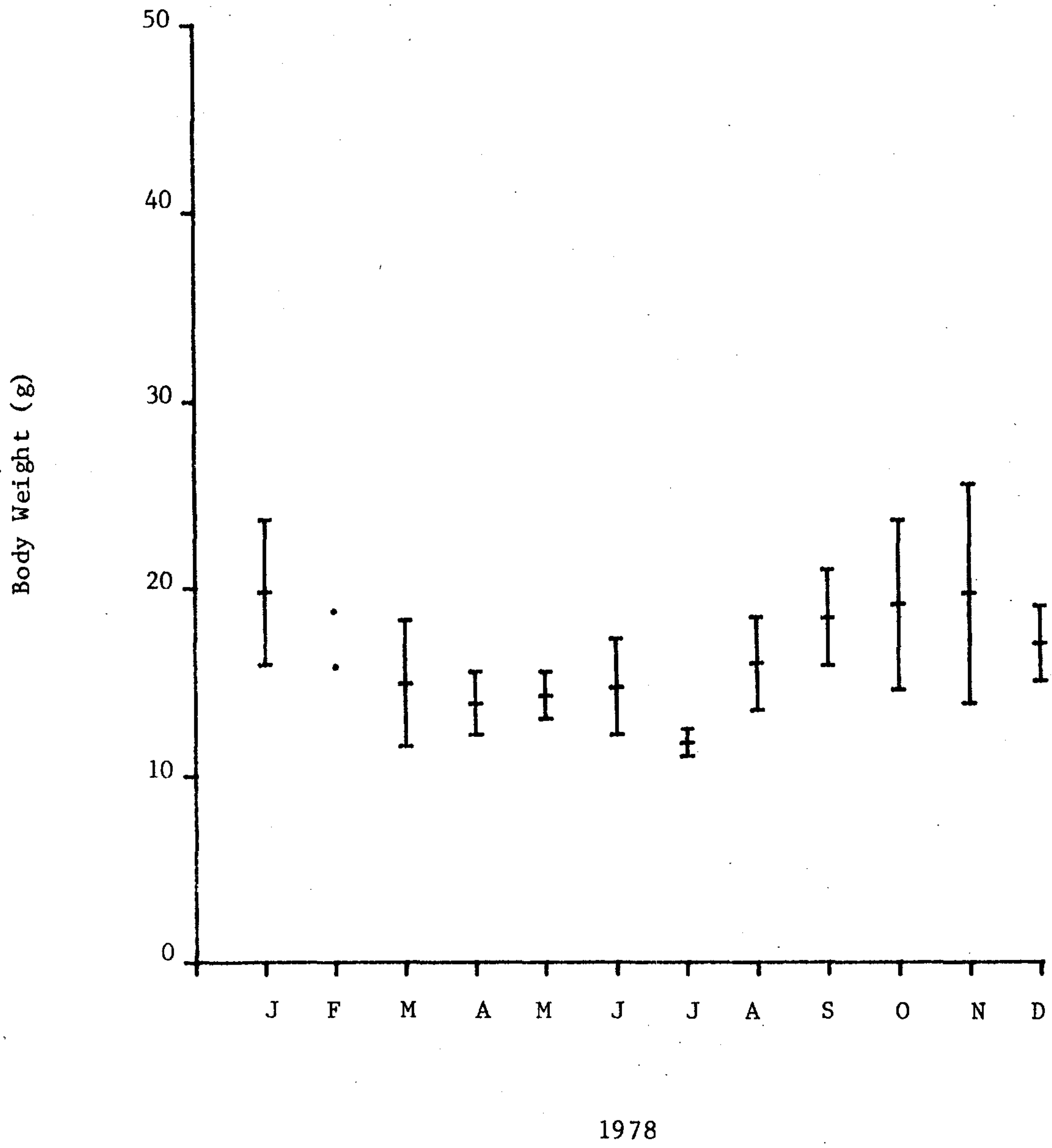


Figure 141. Mean body weight of female beach mice on the beach grid, 1979. Brackets enclose a 95% confidence interval.

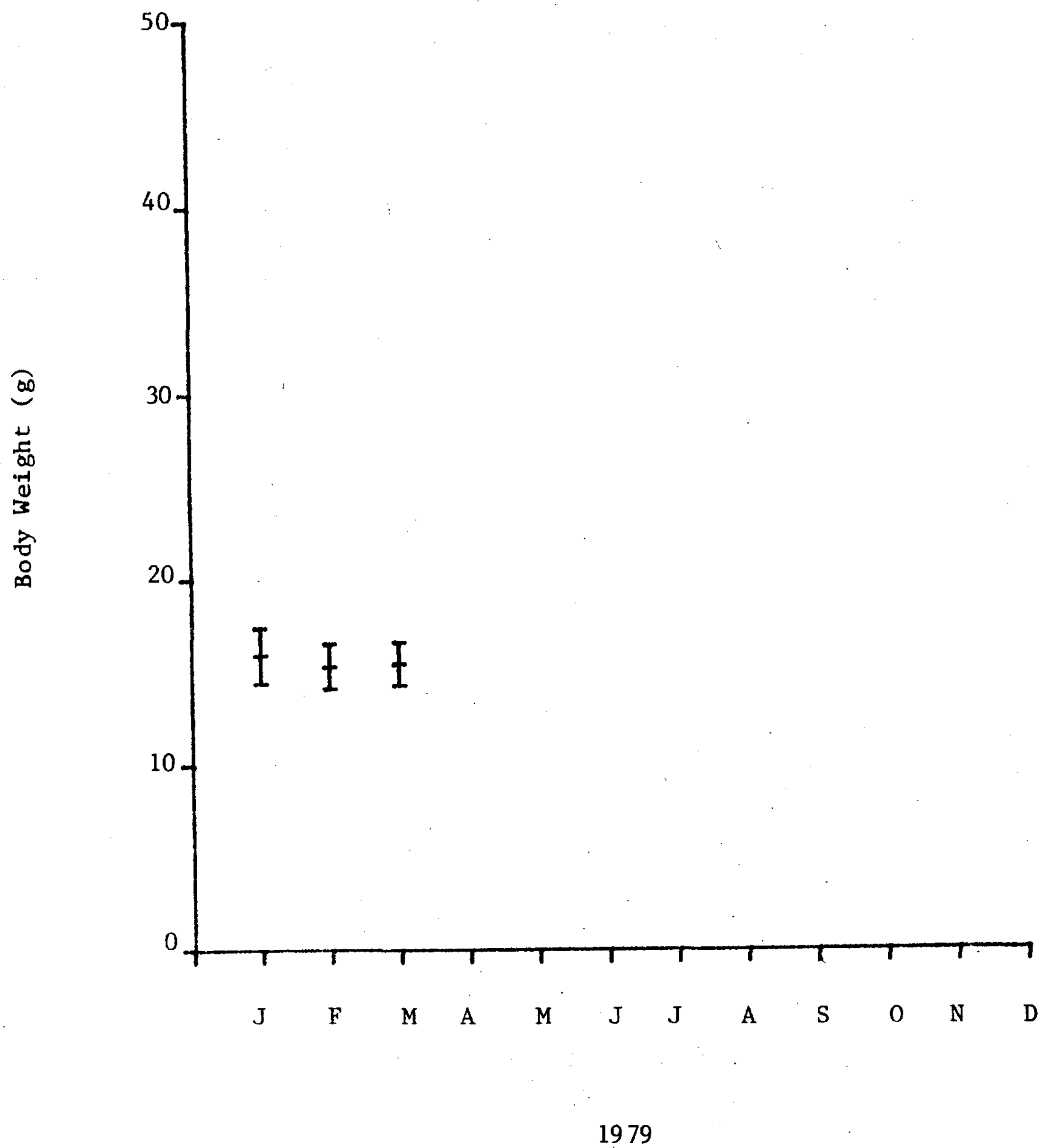


Figure 142. Mean body weight of male cotton mice on the beach grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

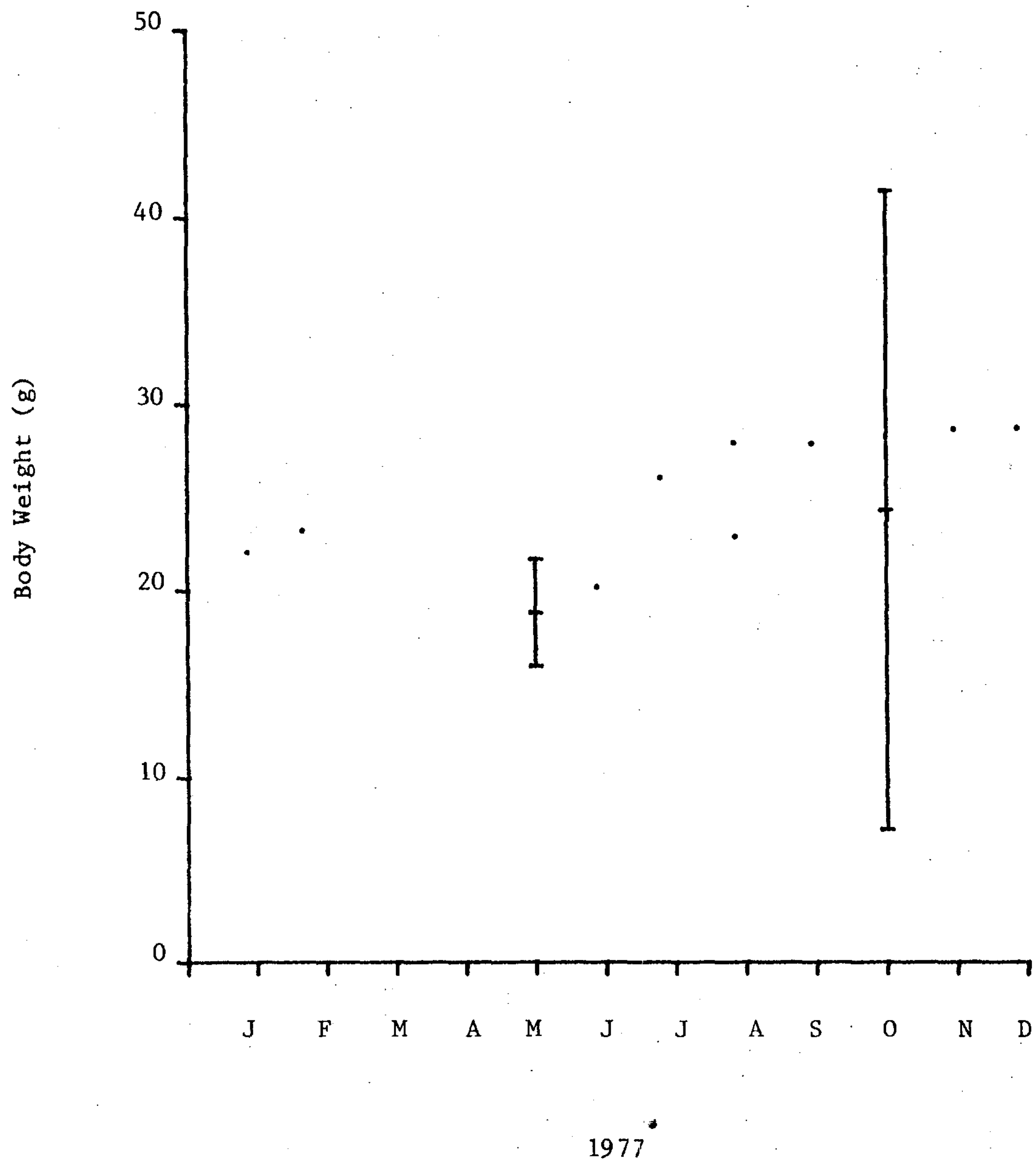


Figure 143. Mean body weight of male cotton mice on the beach grid, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

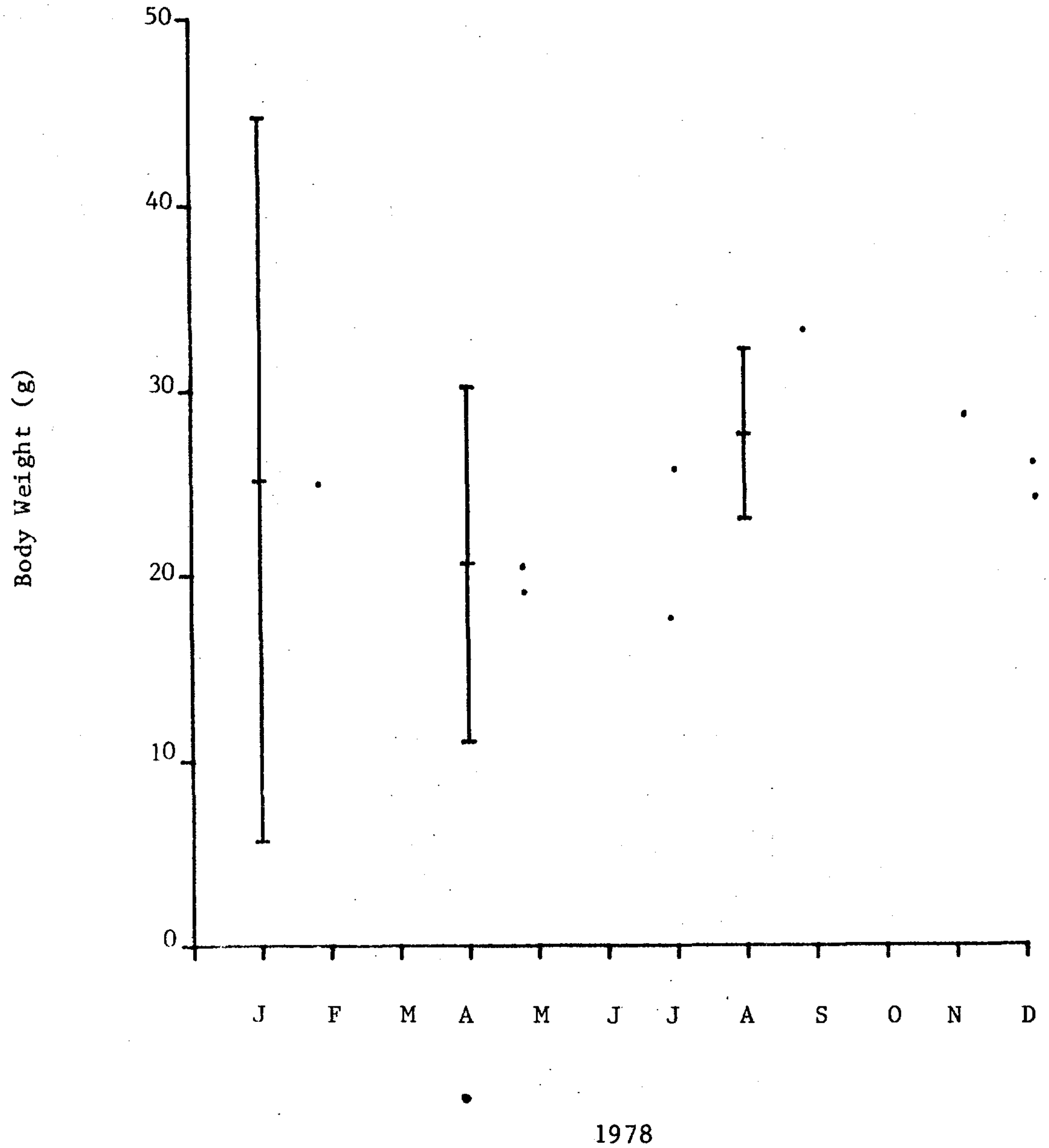


Figure 144. Mean body weight of male cotton mice on the beach grid, 1979. Brackets enclose a 95% confidence interval.

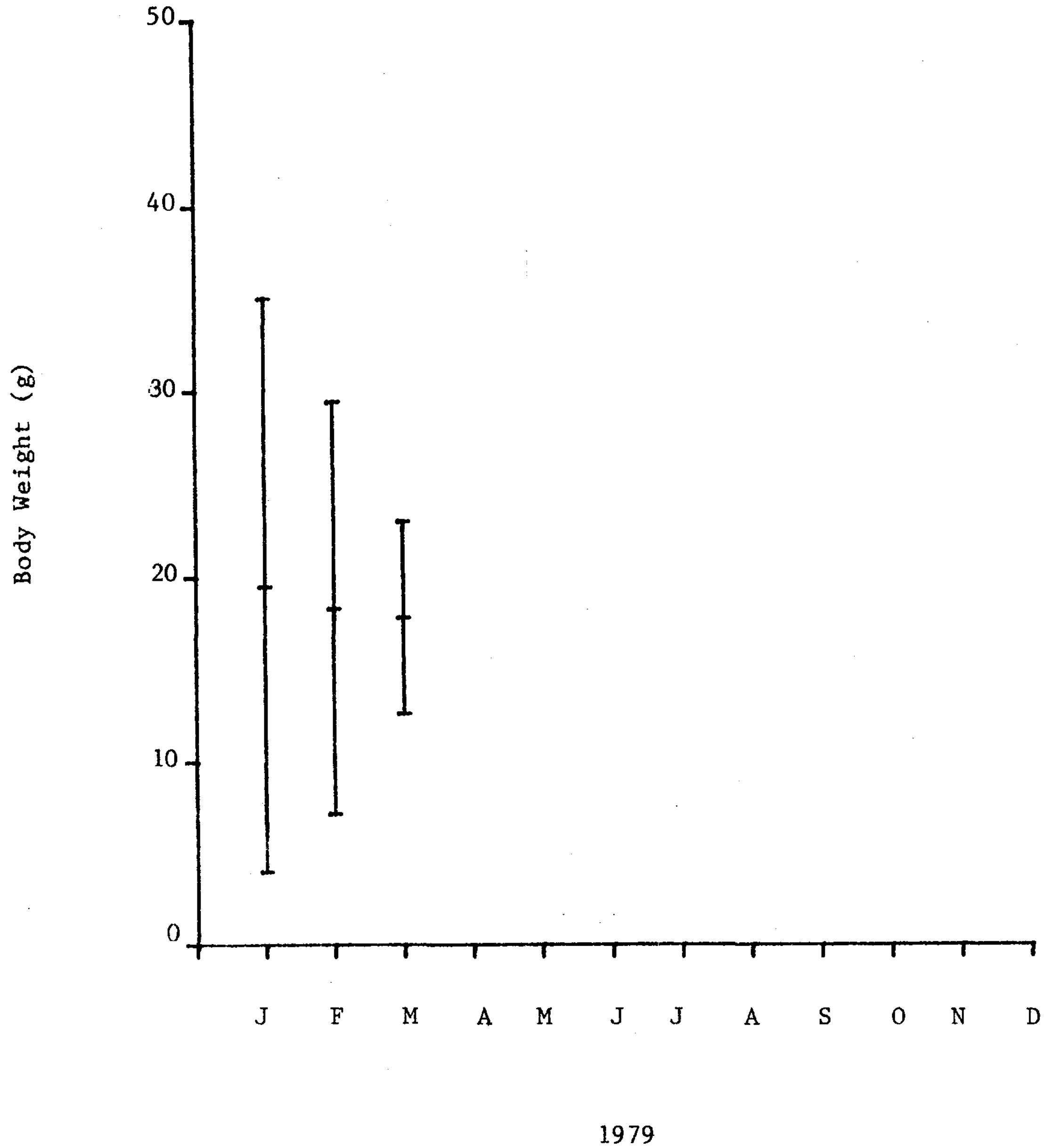


Figure 145. Mean body weight of female cotton mice on the beach grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

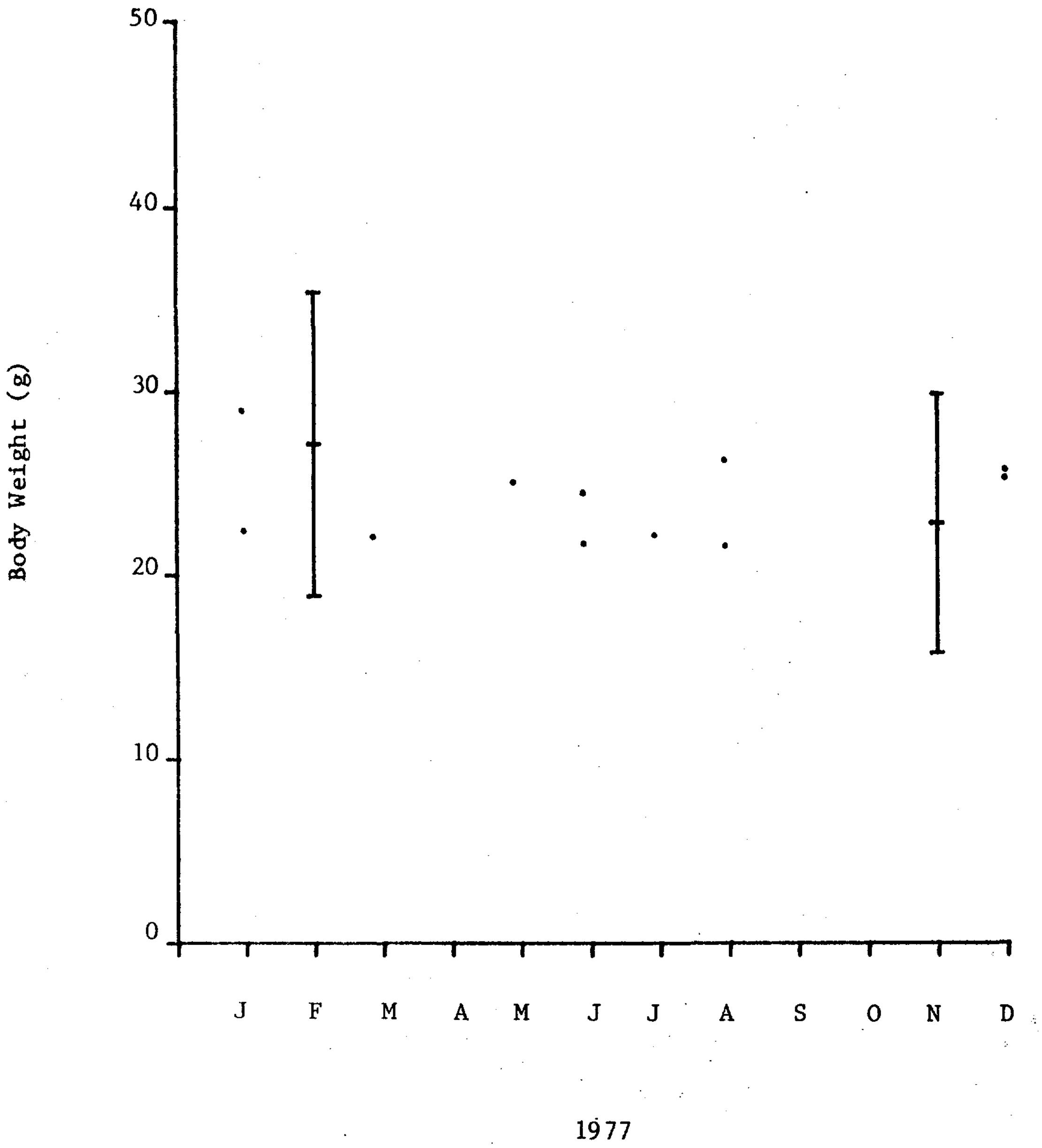


Figure 146. Mean body weight of female cotton mice on the beach grid, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weight when sample was less than three.

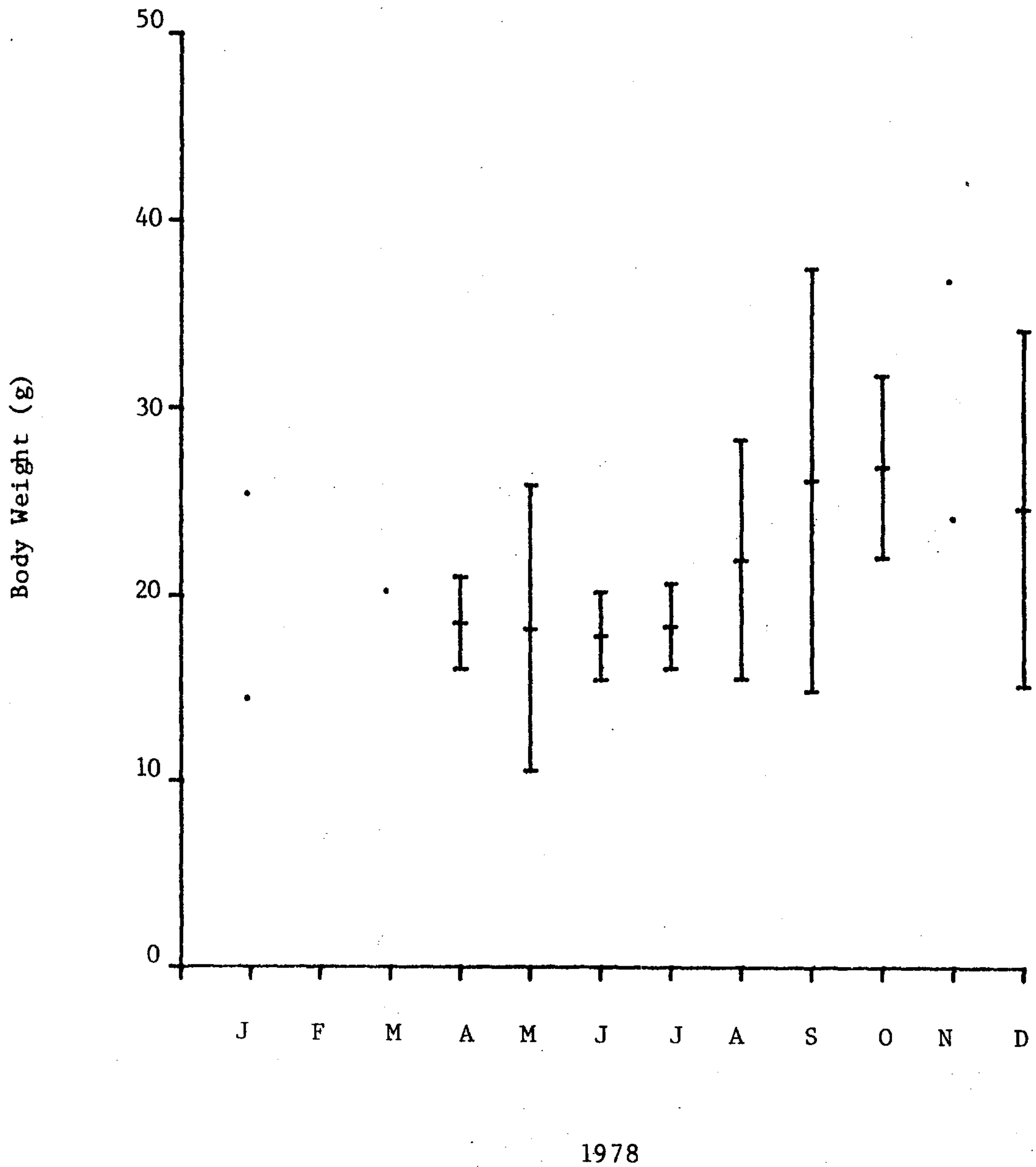
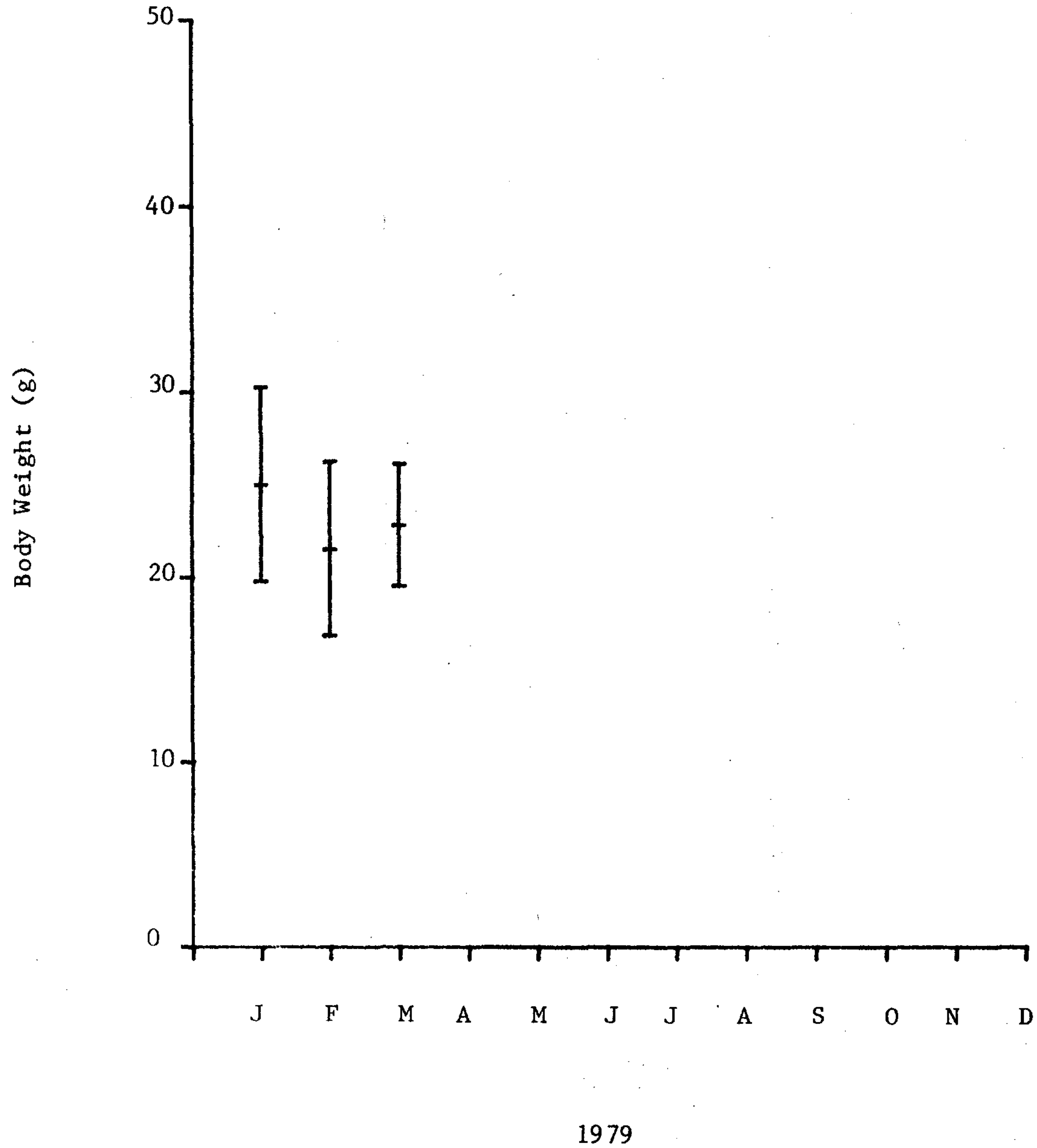


Figure 147. Mean body weight of female cotton mice on the beach grid, 1979. Brackets enclose a 95% confidence interval.



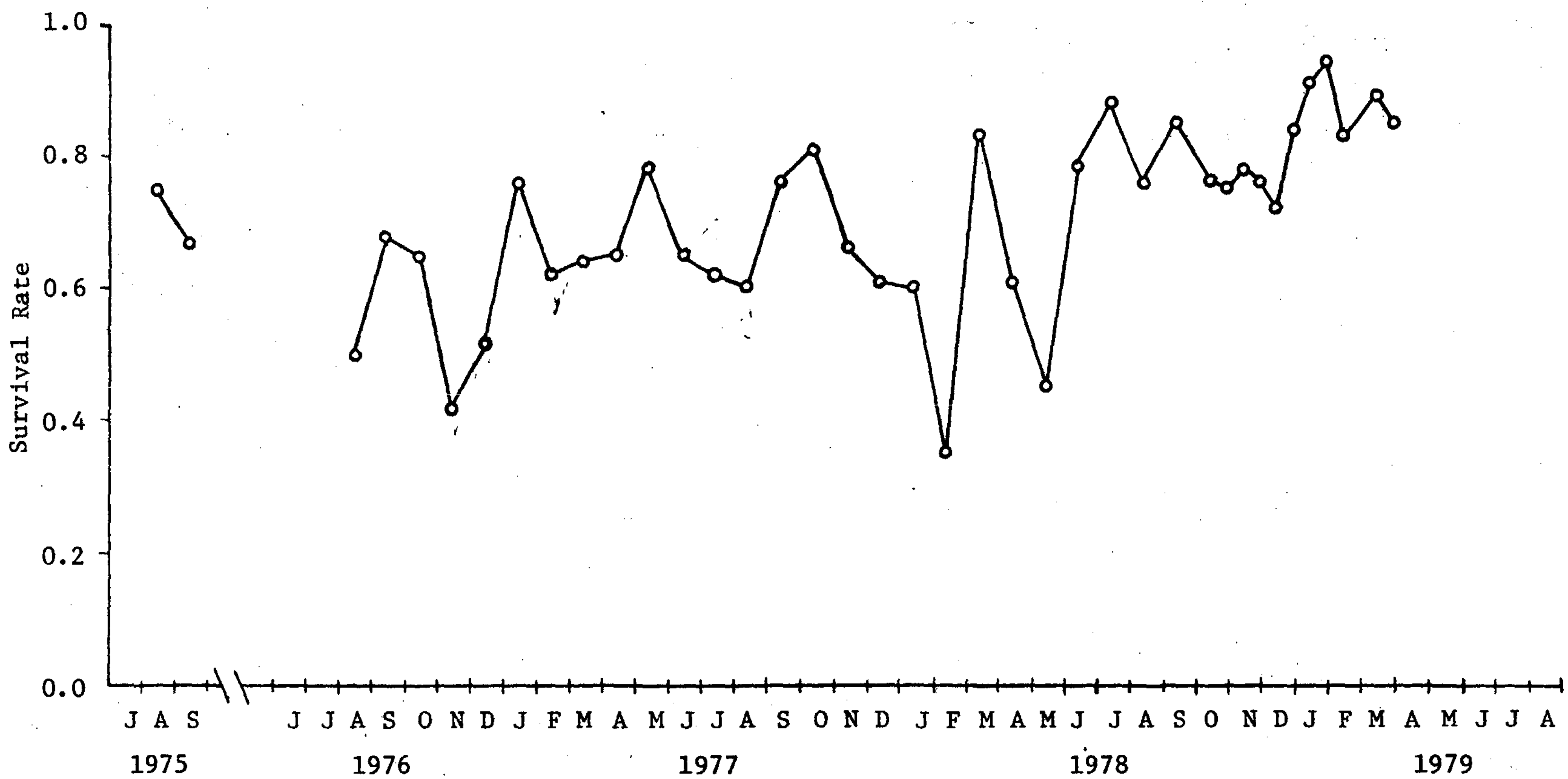


Figure 148. Four week survival rate of beach mice on the Beach Grid.

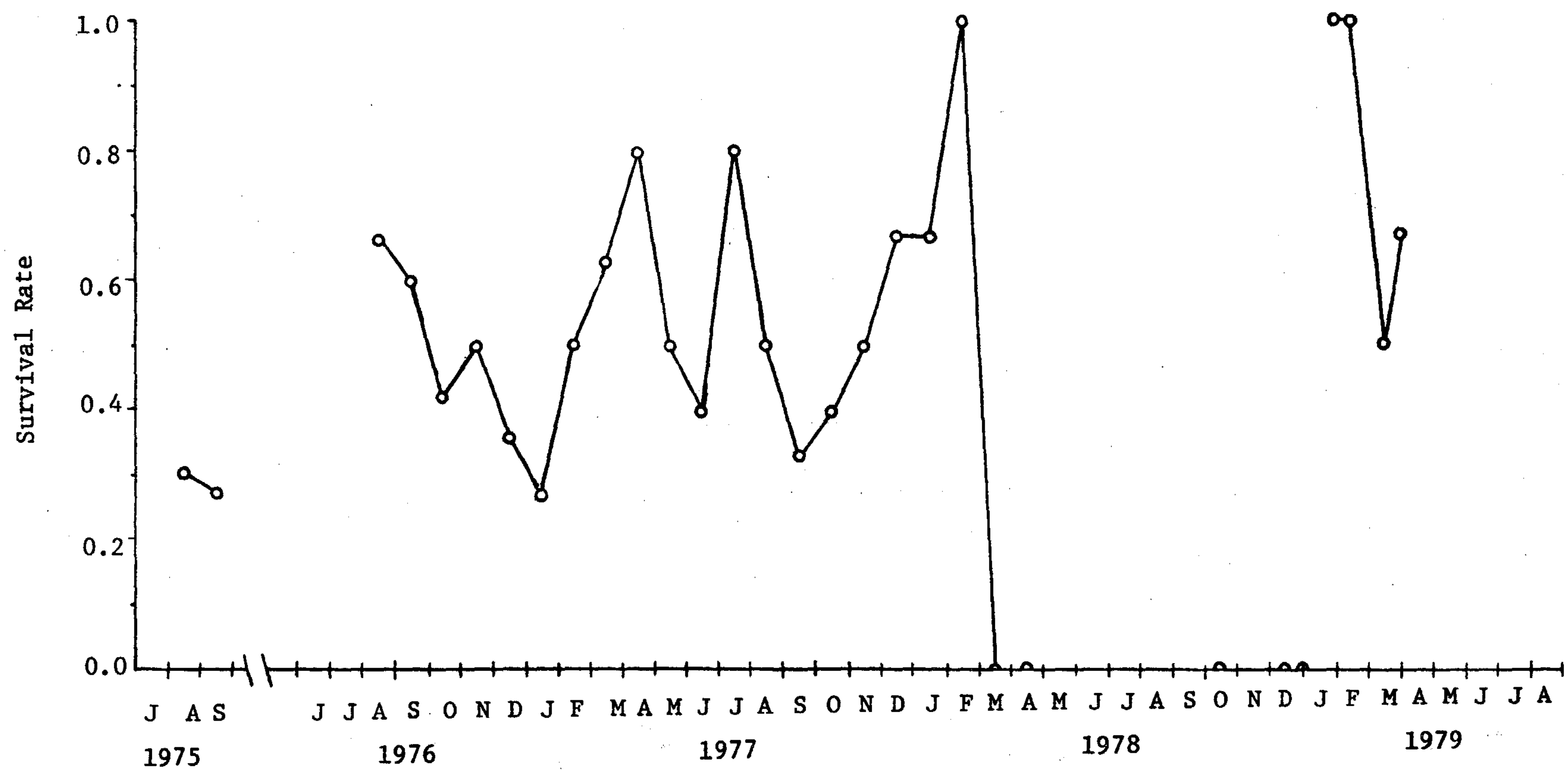


Figure 149. Four week survival rate of cotton rats on the Beach Grid.

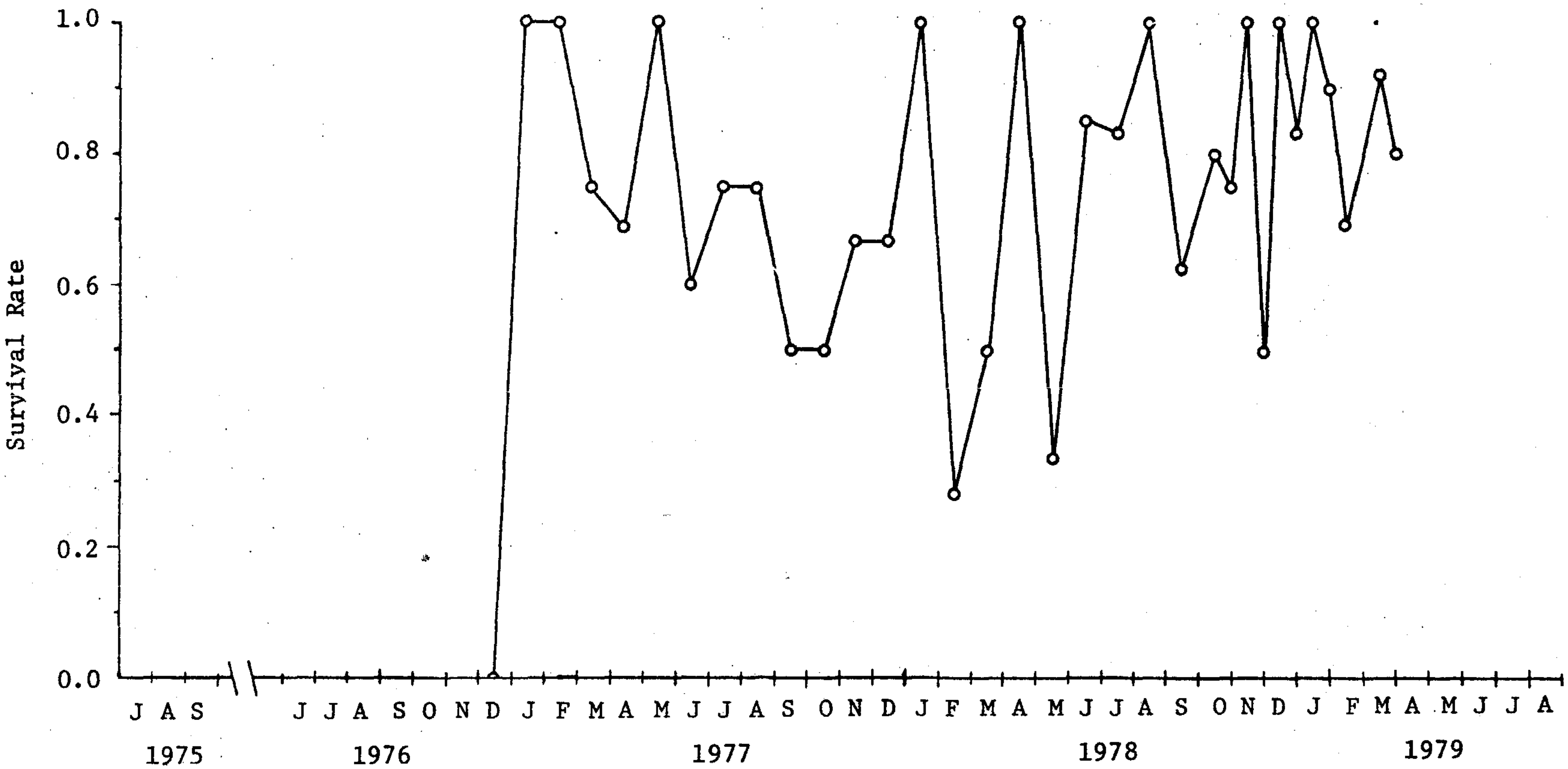


Figure 150. Four week survival rate of cotton mice on the Beach Grid.

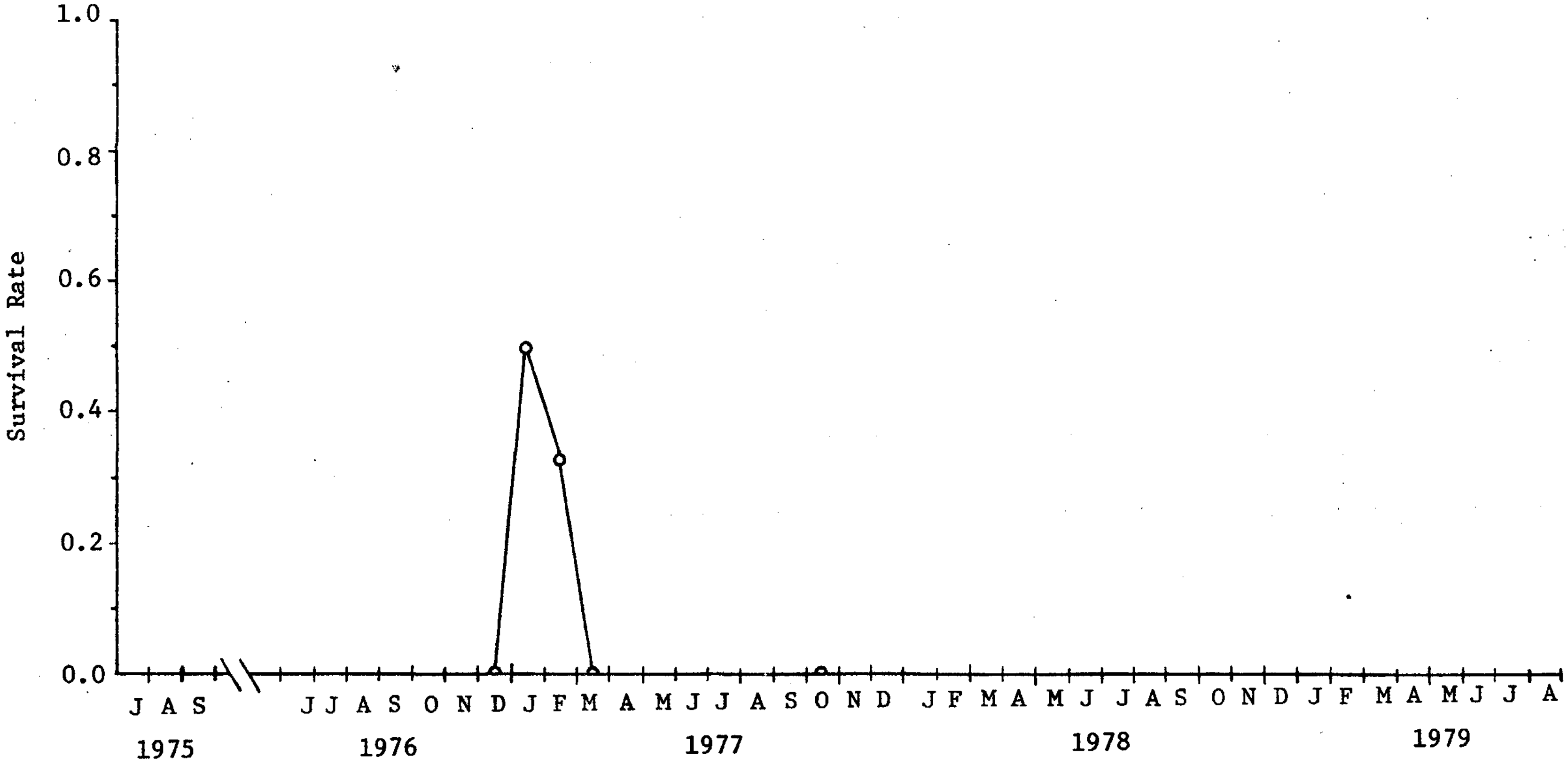


Figure 151. Four week survival rate of roof rats on the Beach Grid.

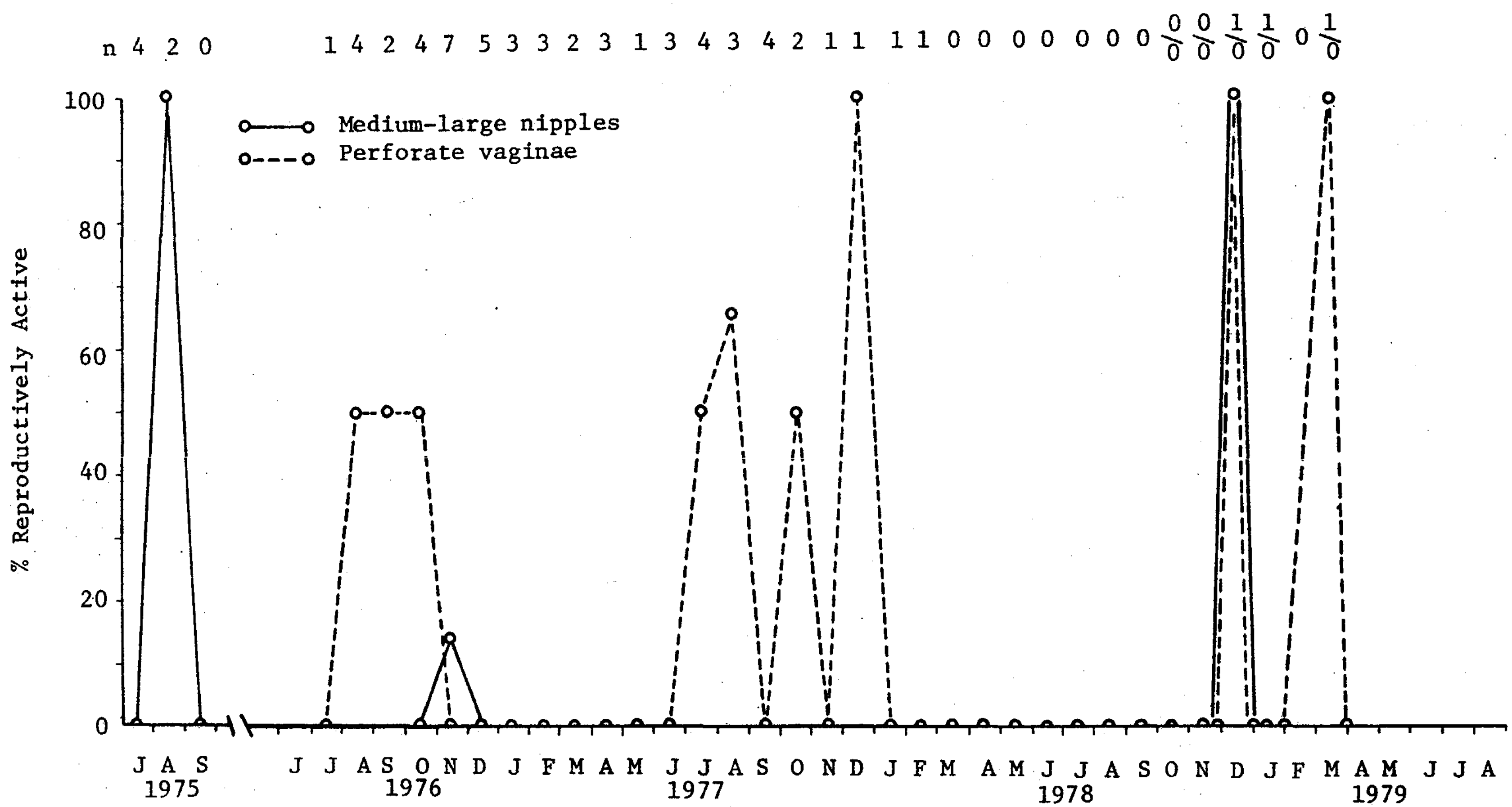


Figure 152. Monthly percentage of adult female cotton rats in reproductive condition on the Beach Grid.

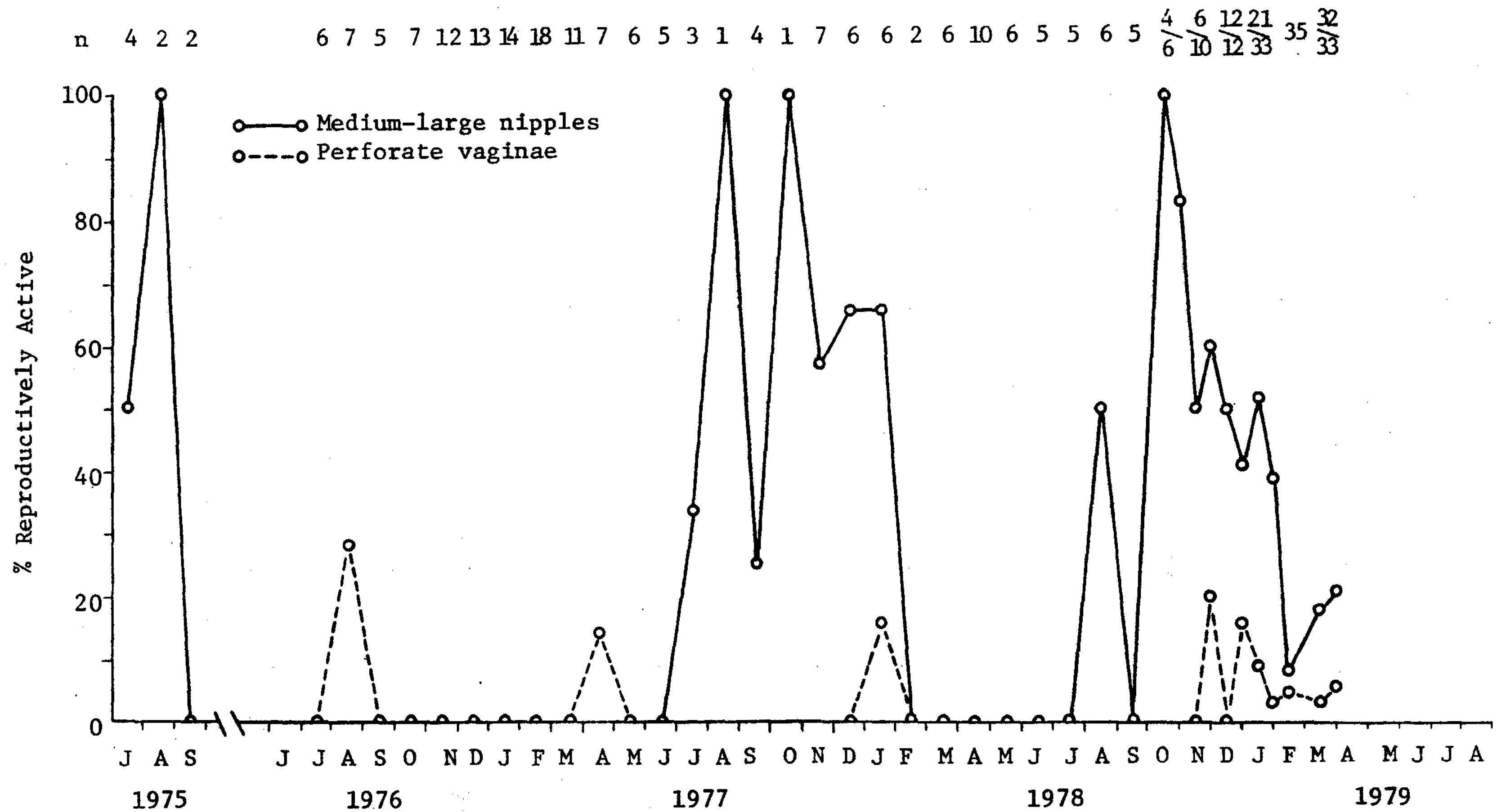


Figure 153. Monthly percentage of adult female beach mice in reproductive condition on the Beach Grid.

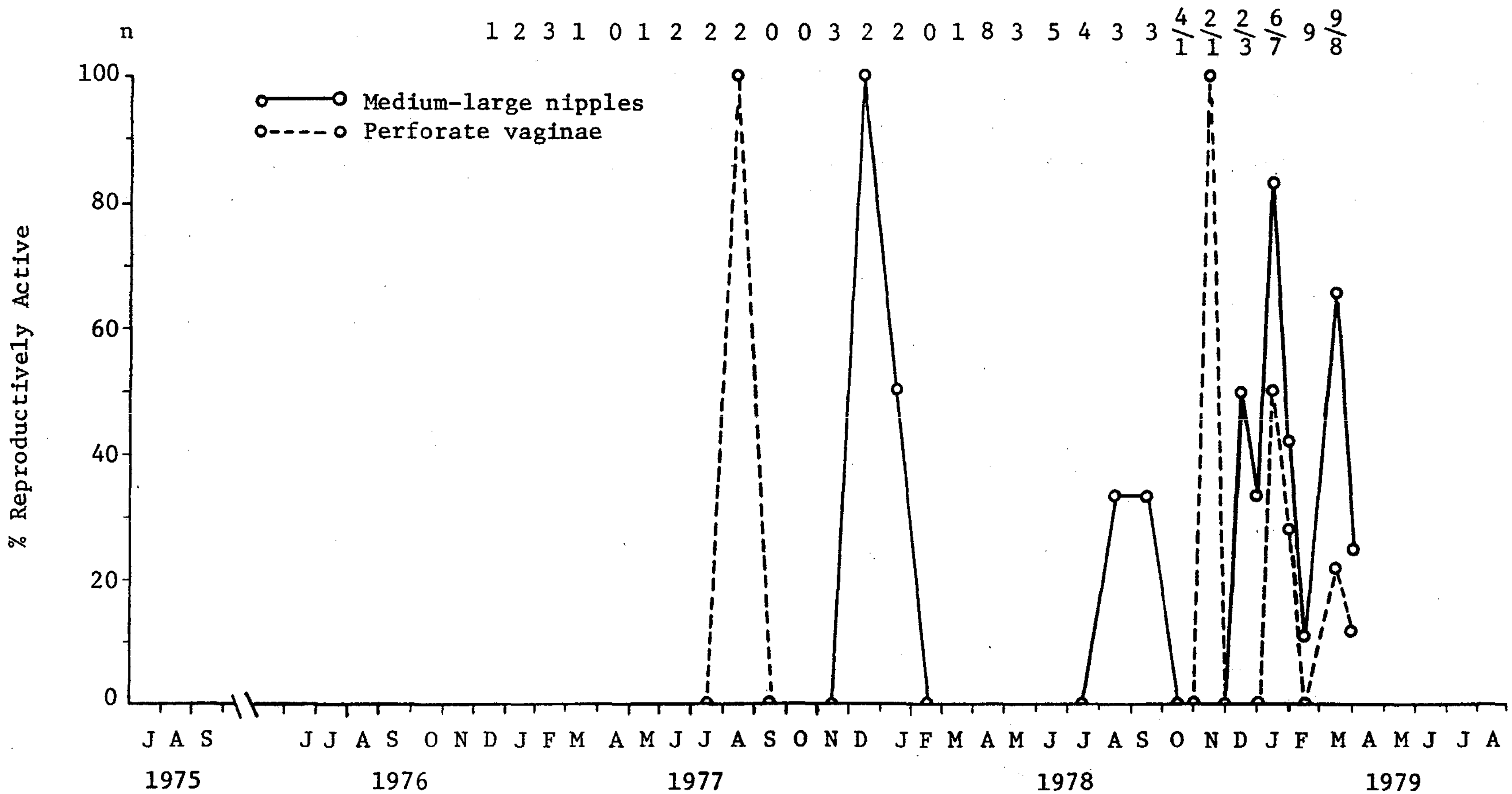


Figure 154. Monthly percentage of adult female cotton mice in reproductive condition on the Beach Grid.

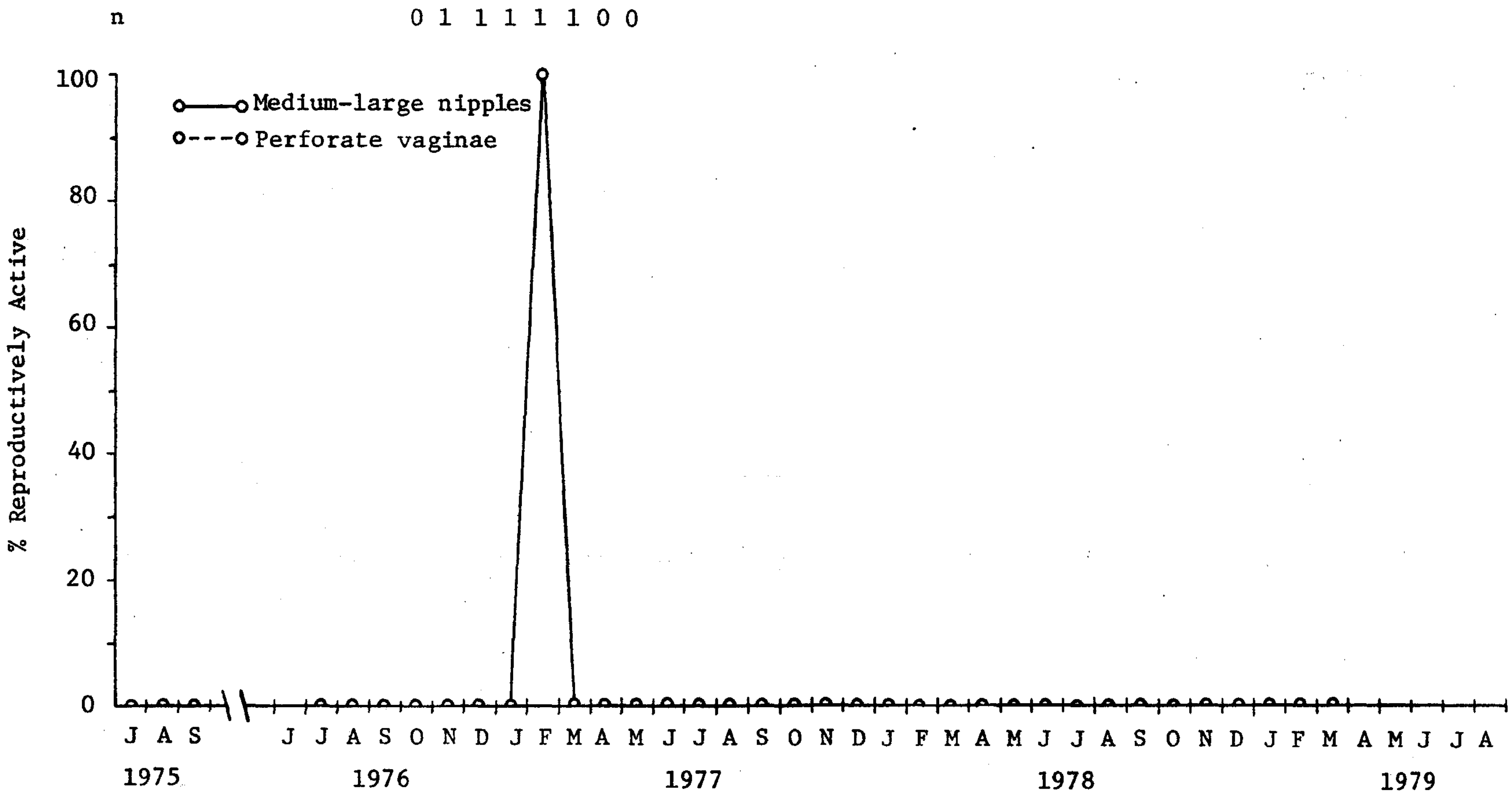


Figure 155. Monthly percentage of adult roof rats in reproductive condition on the Beach Grid.

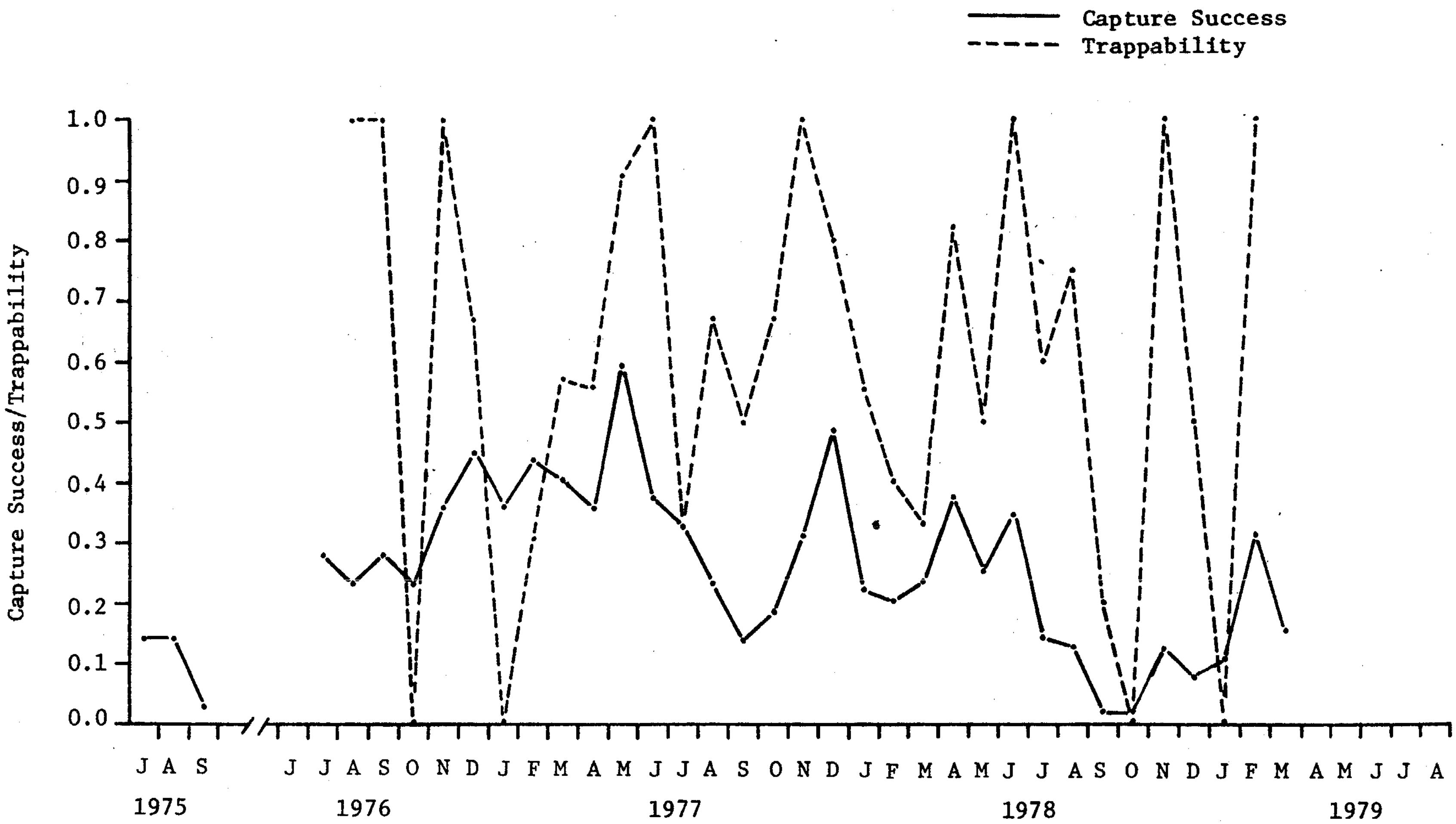


Figure 156. Capture success (total capture of all species/traps on grid) and trappability of beach mice (number caught/number known to be alive) on the Dune Scrub Grid.

Figure 157. Number of captures of small mammals per month on the Dune Scrub Grid.

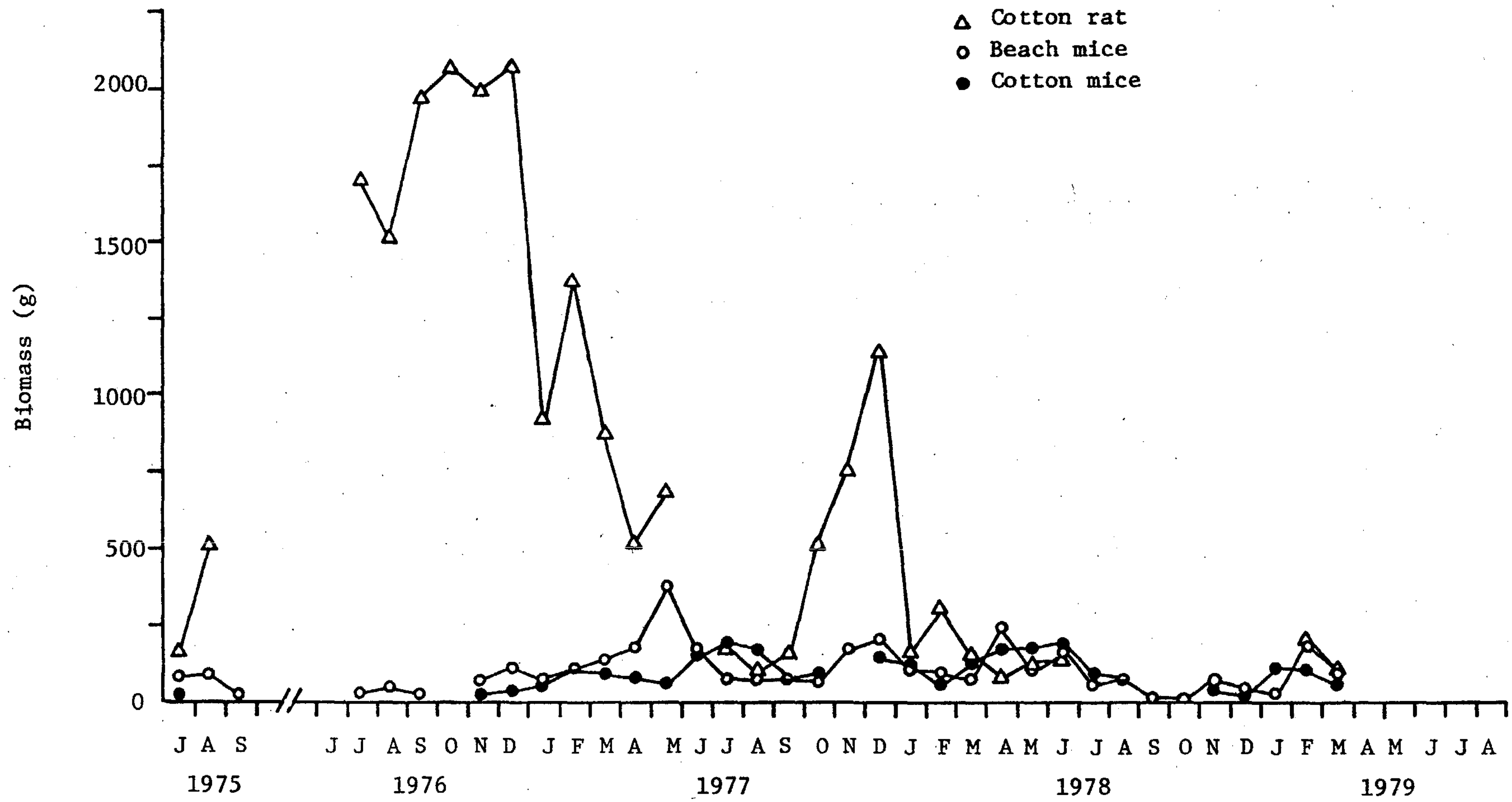


Figure 158. Biomass (live weight) of small mammals on the Dune Scrub Grid.

Figure 159. Mean body weight of male cotton rats on the dune scrub grid, 1976. Brackets enclose a 95% confidence interval.

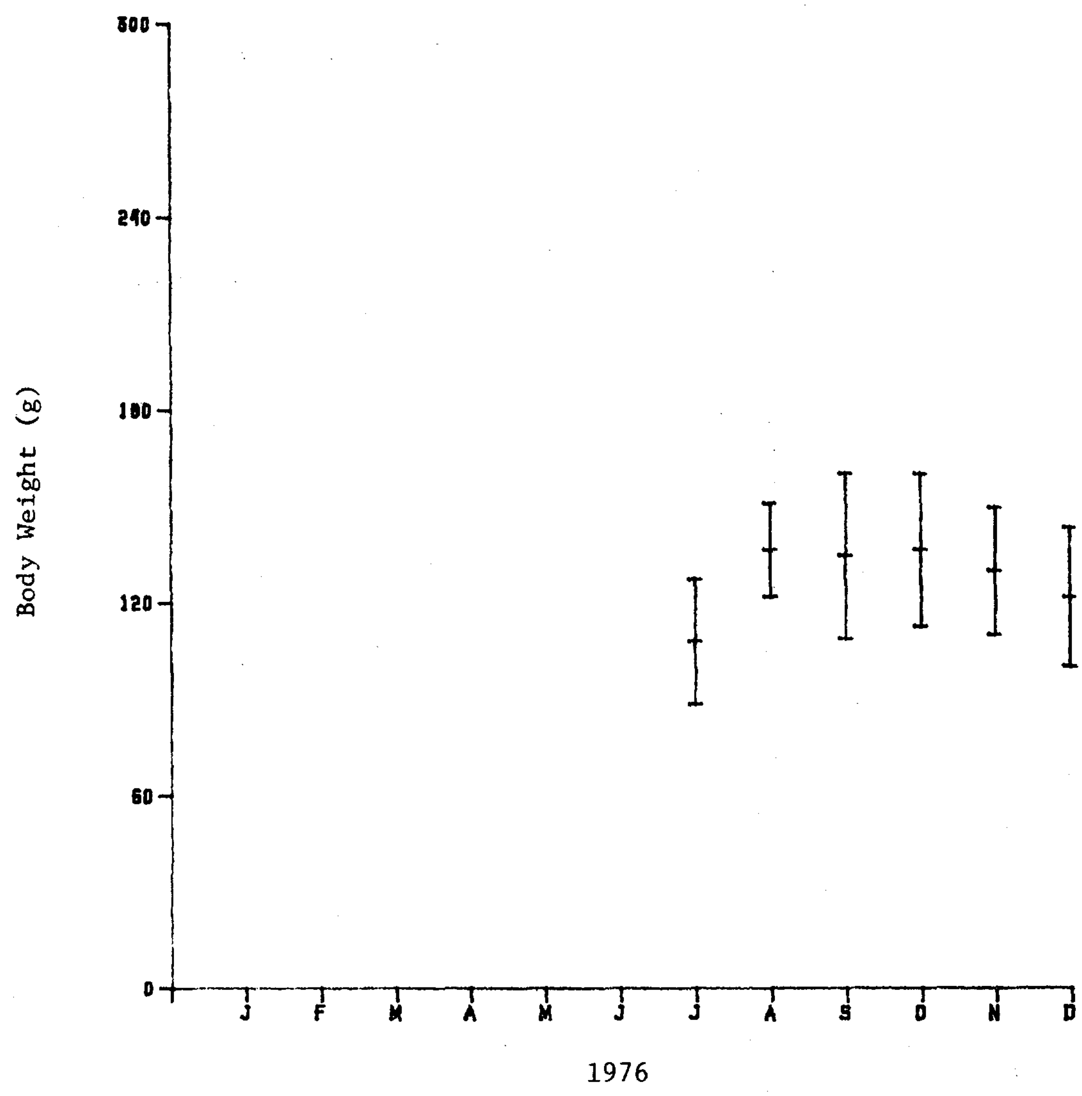


Figure 160. Mean body weight of male cotton rats on the dune scrub grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weight when sample was less than three.

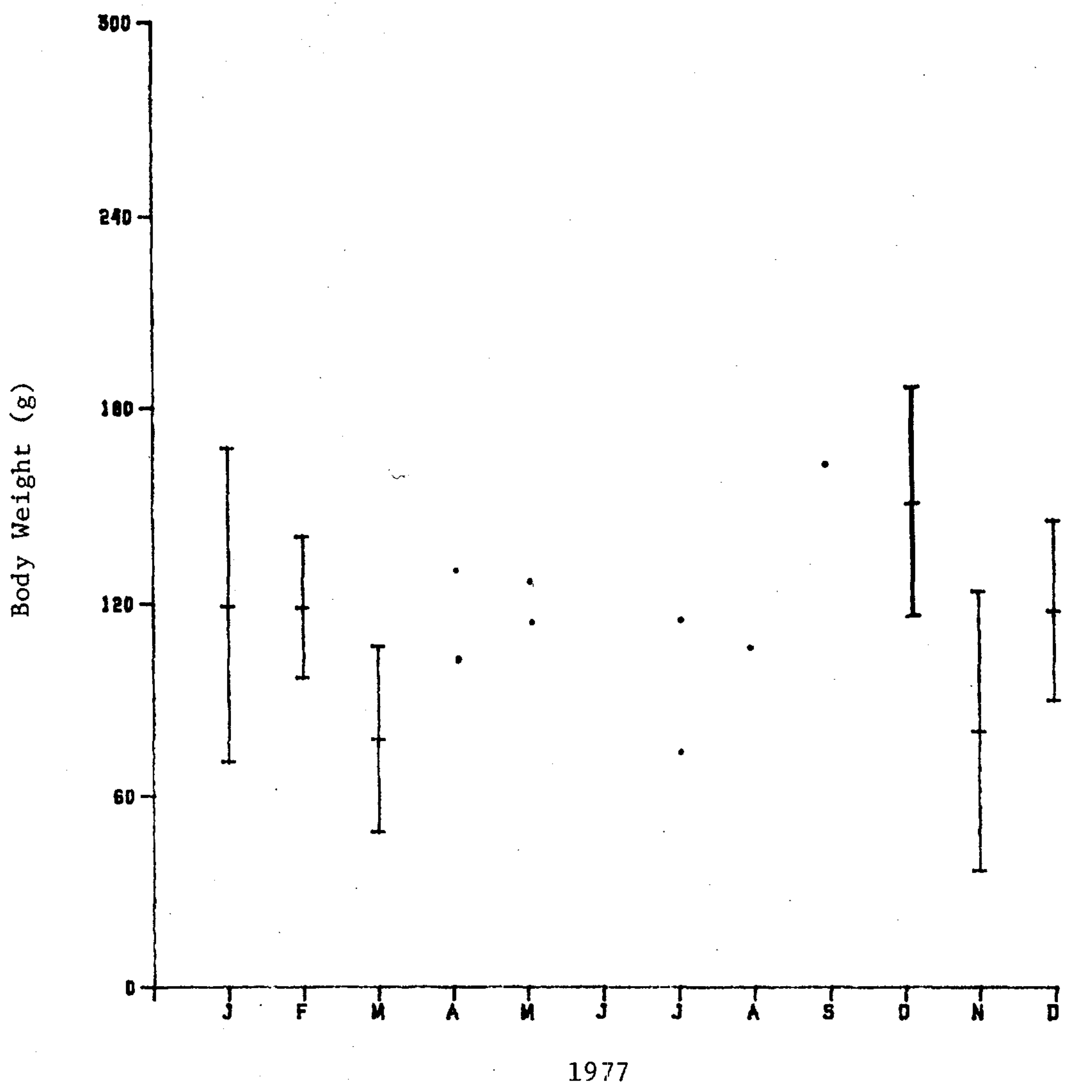


Figure 161. Mean body weight of female cotton rats on the dune scrub grid, 1976. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

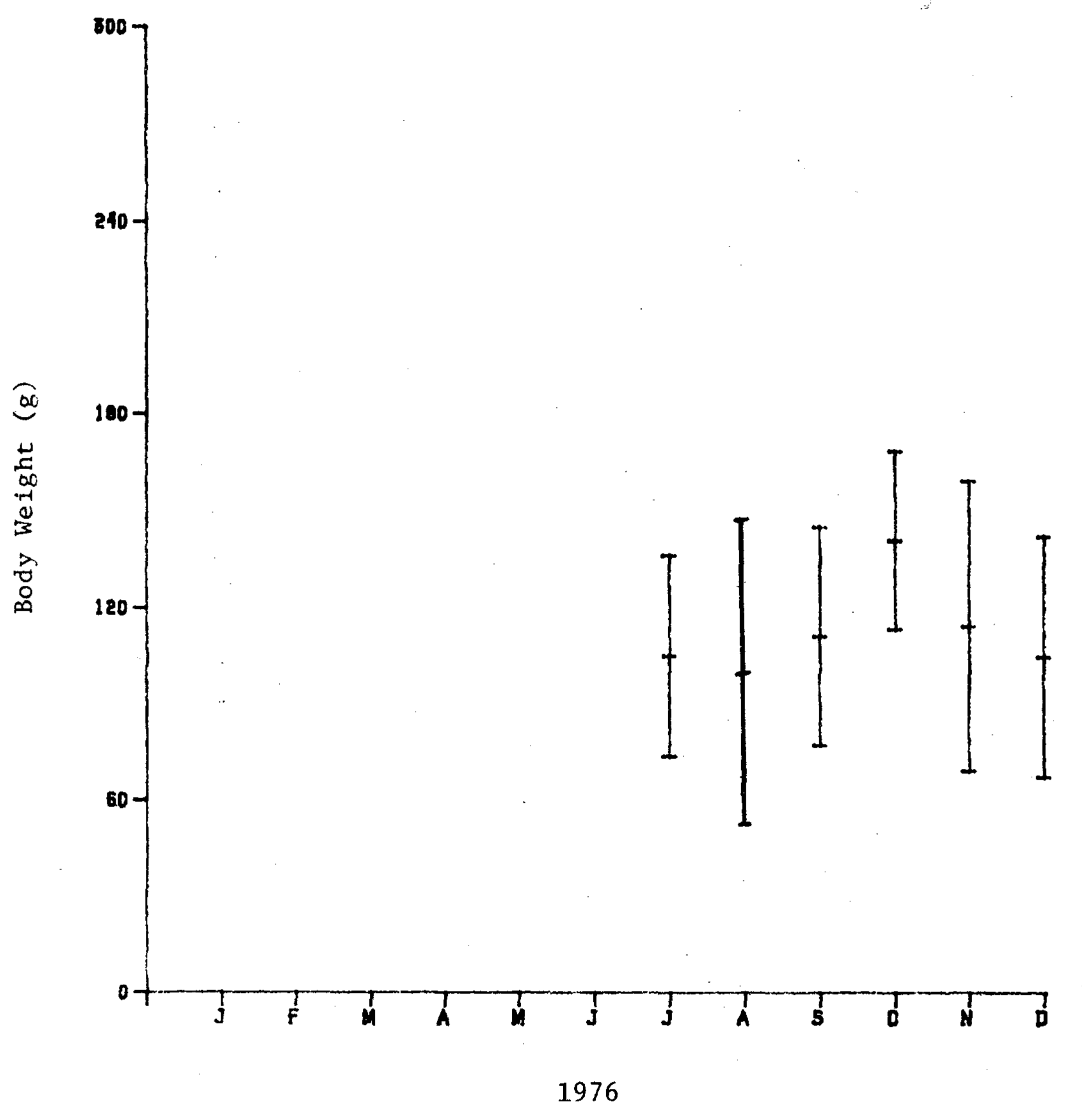


Figure 162. Mean body weight of female cotton rats on the dune scrub grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

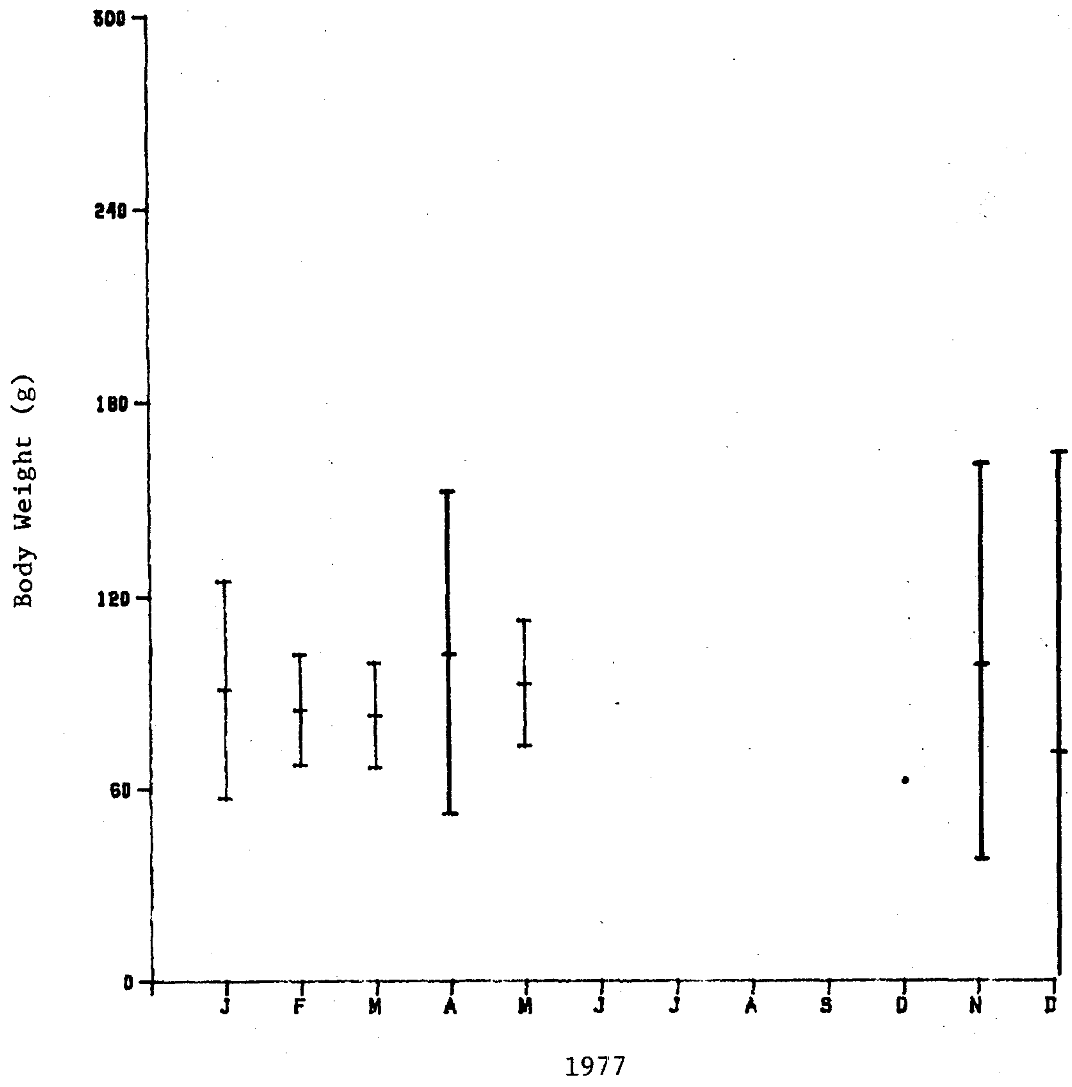


Figure 163. Mean body weight of female cotton rats on the dune scrub, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weight when sample was less than three.

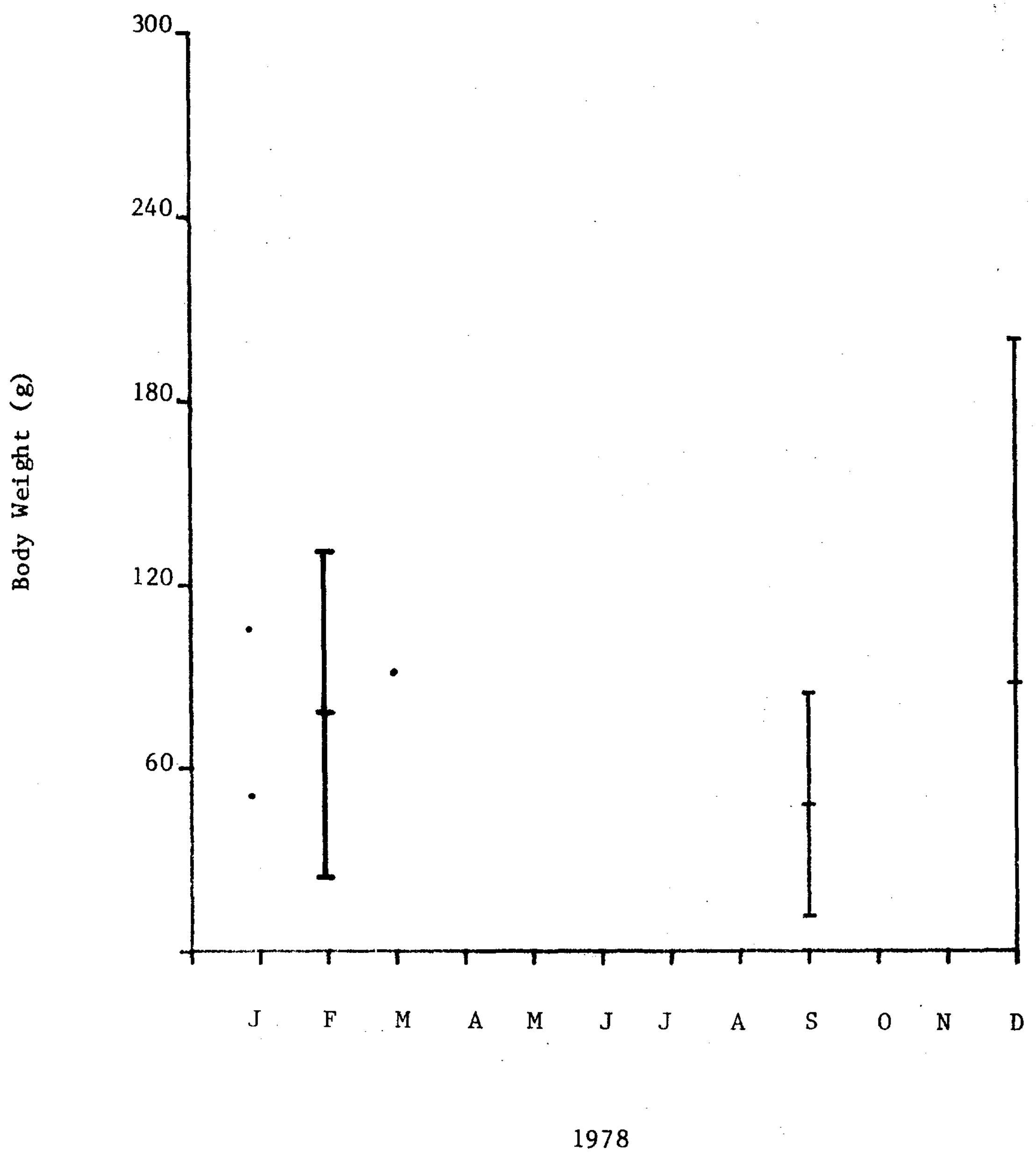


Figure 164. Mean body weight of male beach mice on the dune scrub grid, 1976. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

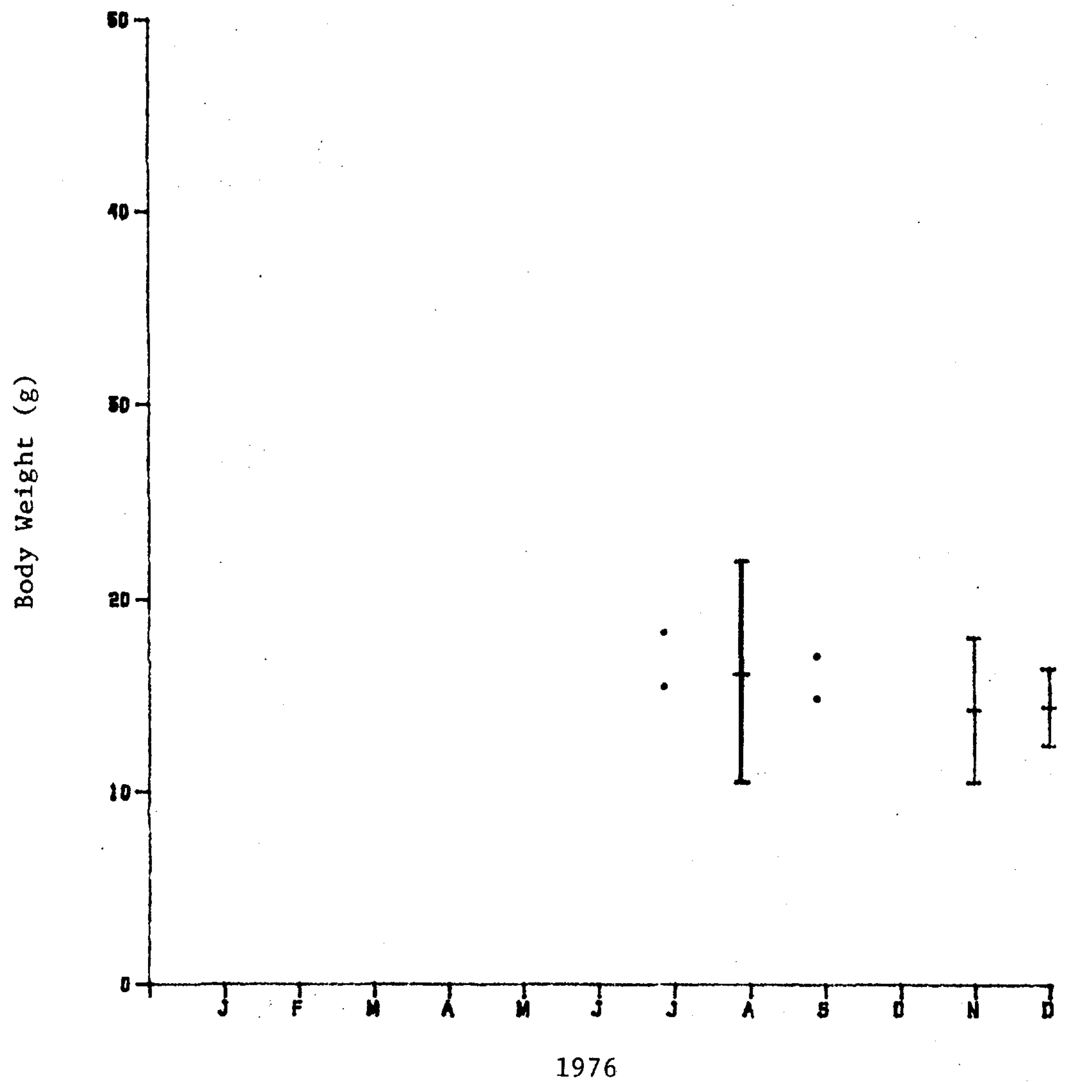


Figure 165. Mean body weight of male beach mice on the dune scrub grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

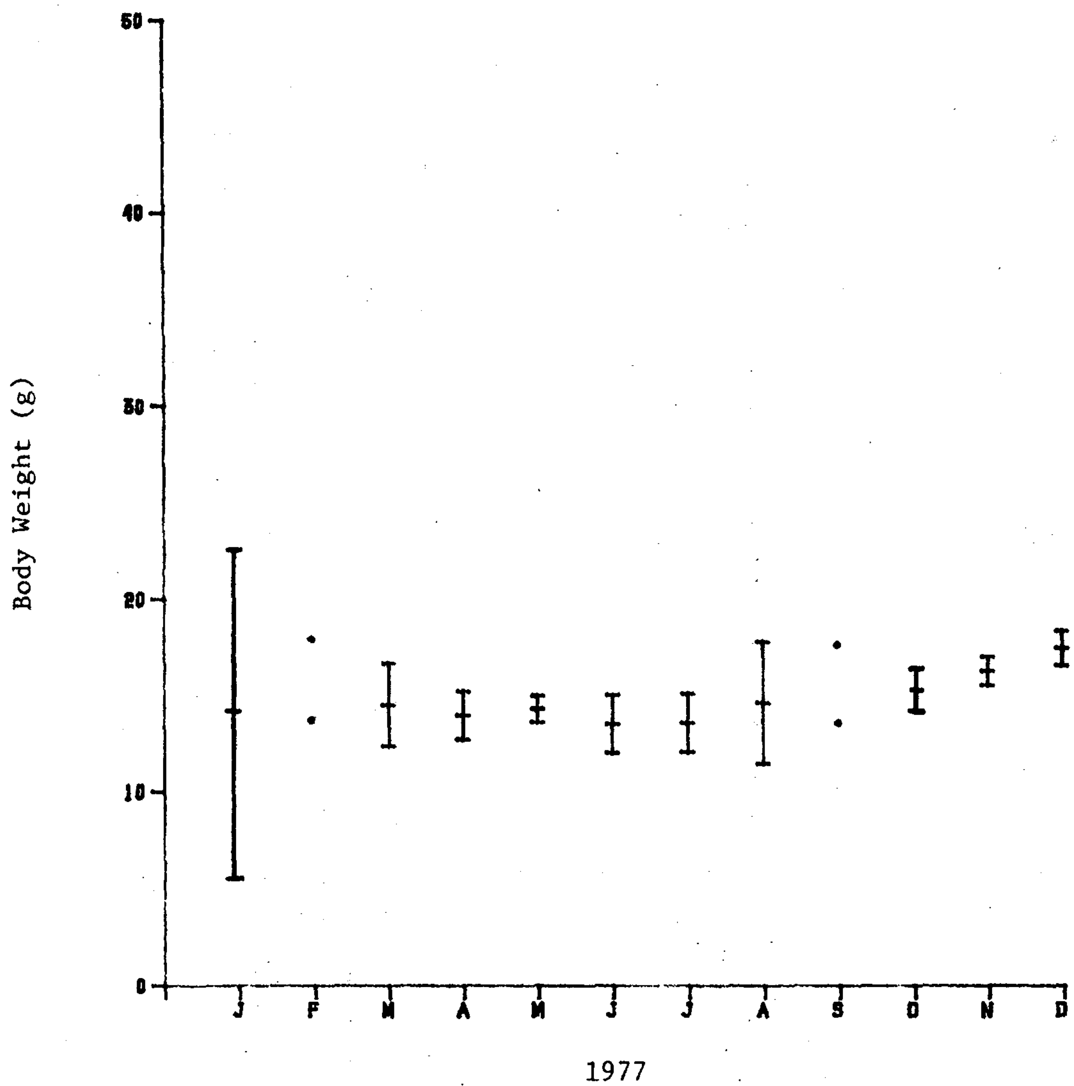


Figure 166. Mean body weight of male beach mice on the dune scrub, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

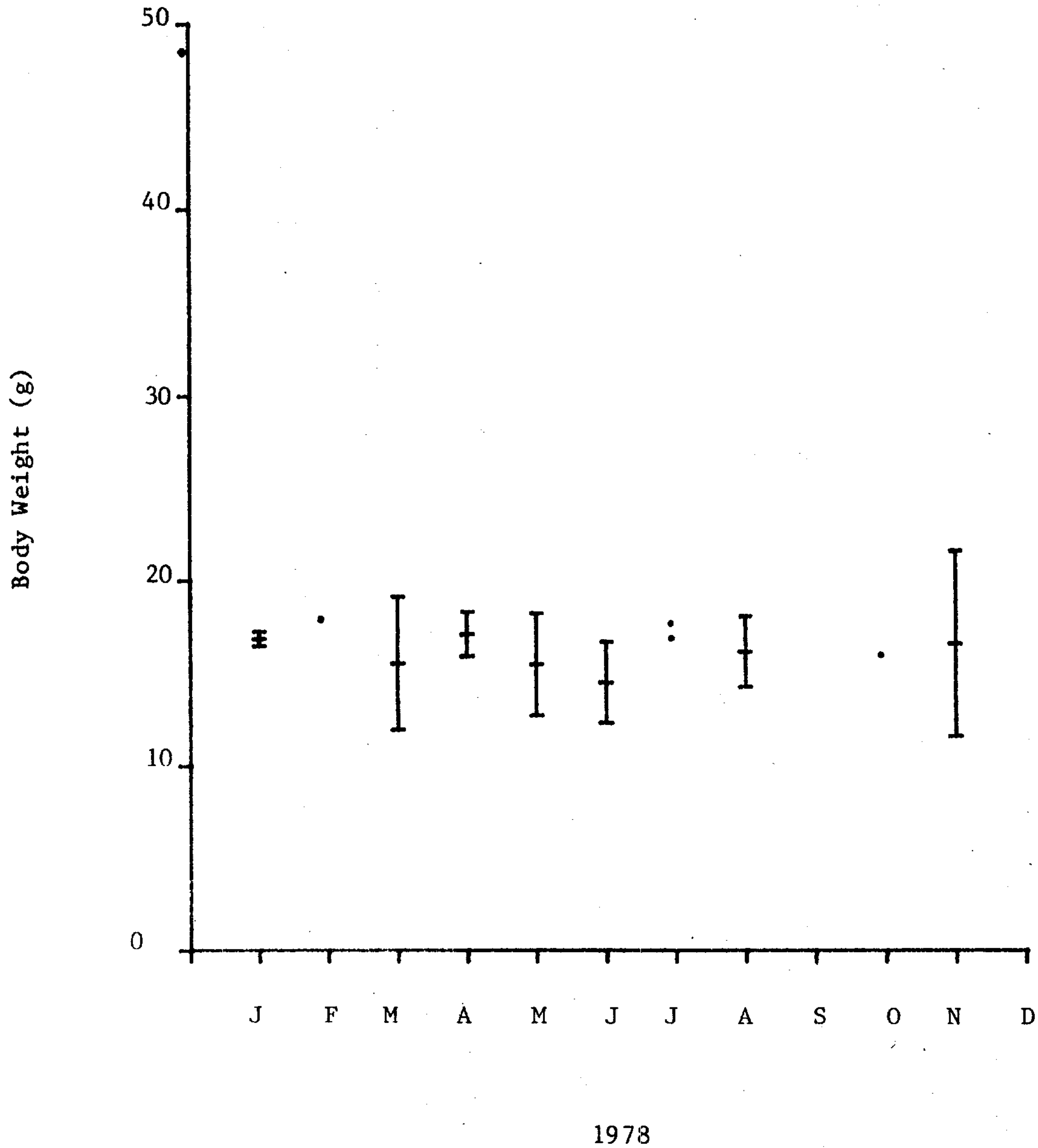


Figure 167. Mean body weight of male beach mice on the dune scrub, 1979. Brackets enclose a 95% confidence interval. Dots indicate body weight when sample was less than three.

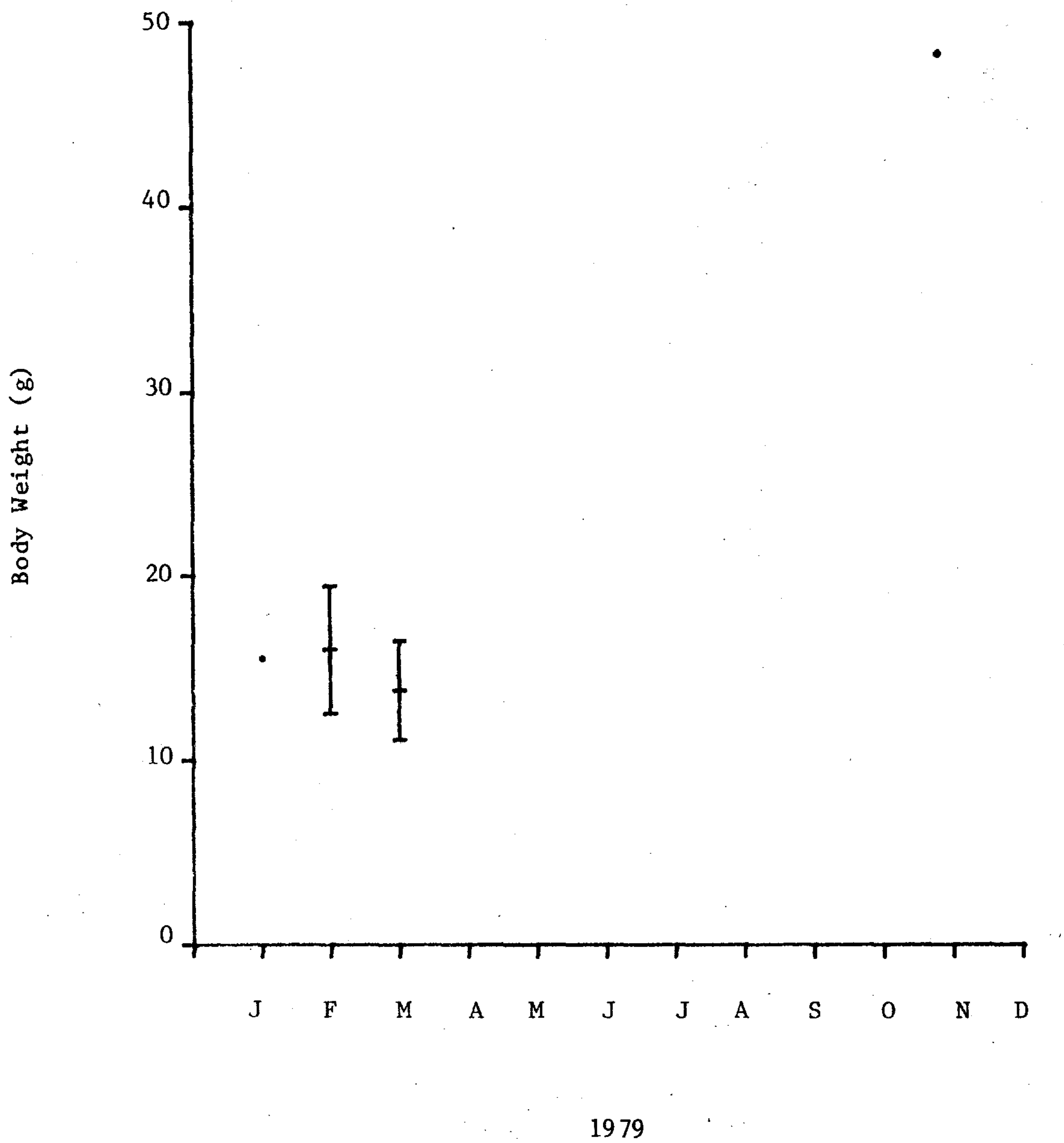


Figure 16C. Mean body weight of female beach mice on the dune scrub grid, 1976. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

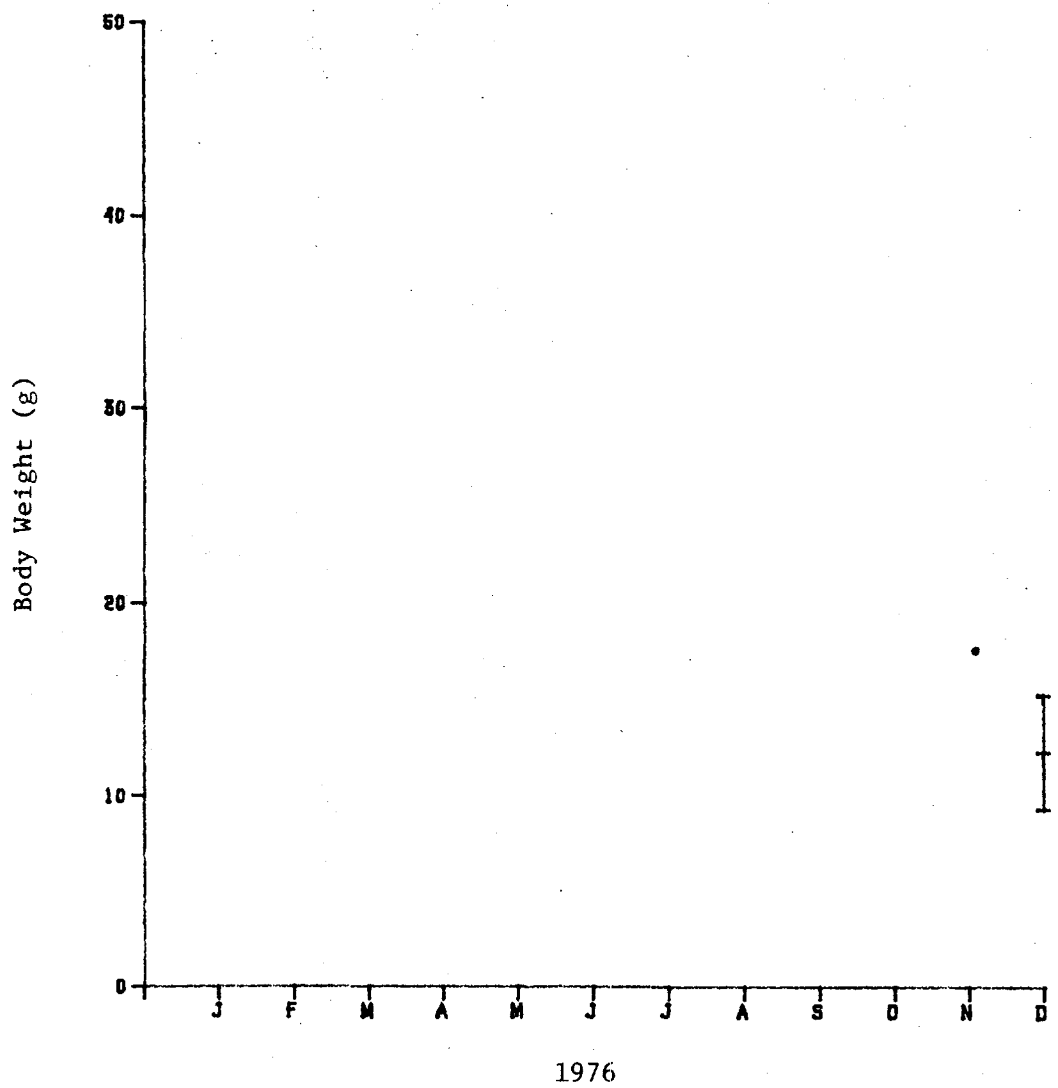


Figure 169. Mean body weight of female beach mice on the dune scrub grid, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

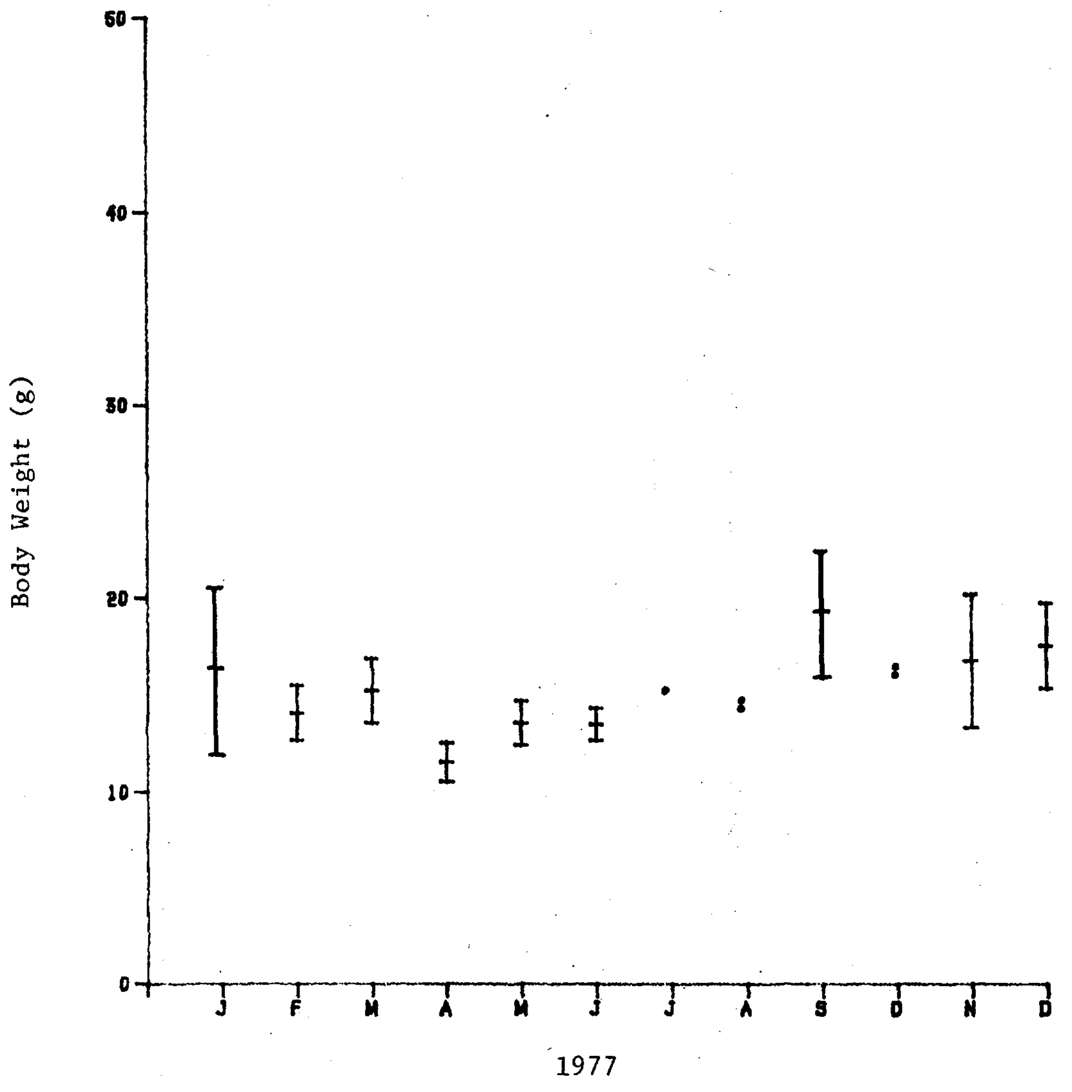


Figure 170. Mean body weight of female beach mice on the dune scrub, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weight when sample was less than three.

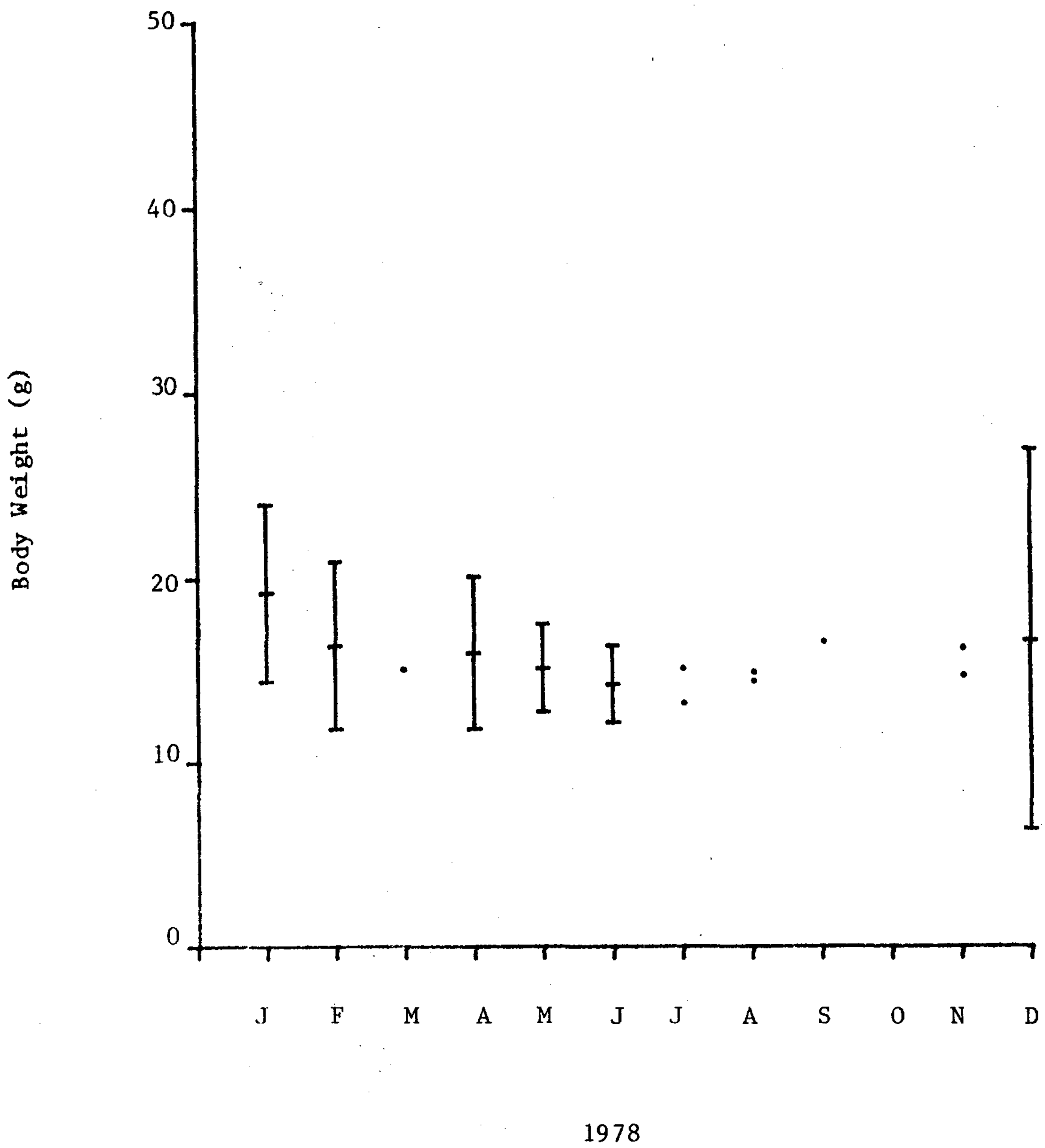


Figure 171. Mean body weight of female beach mice on the dune scrub, 1979. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

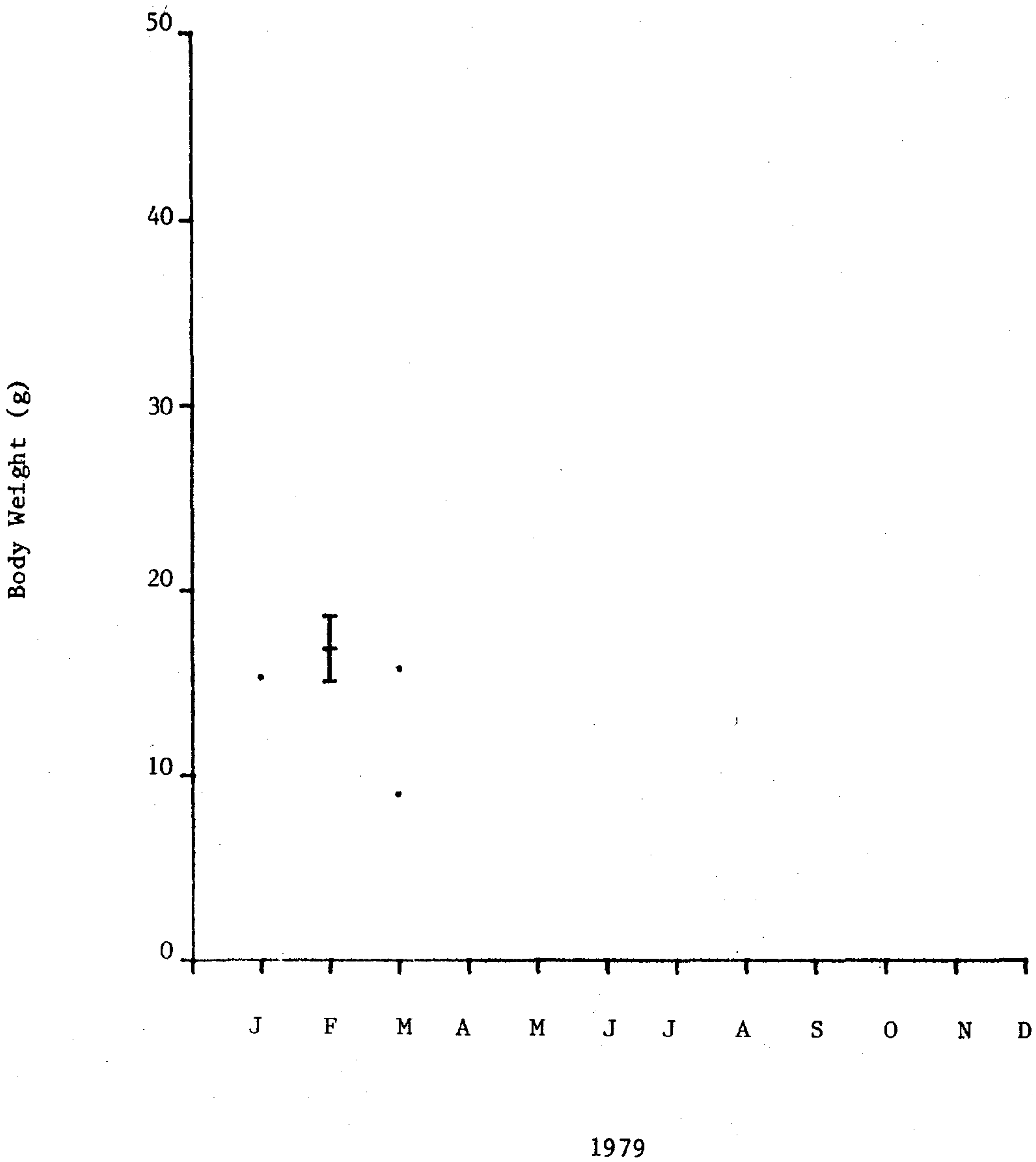


Figure 172. Mean body weight of male cotton mice on the dune scrub, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

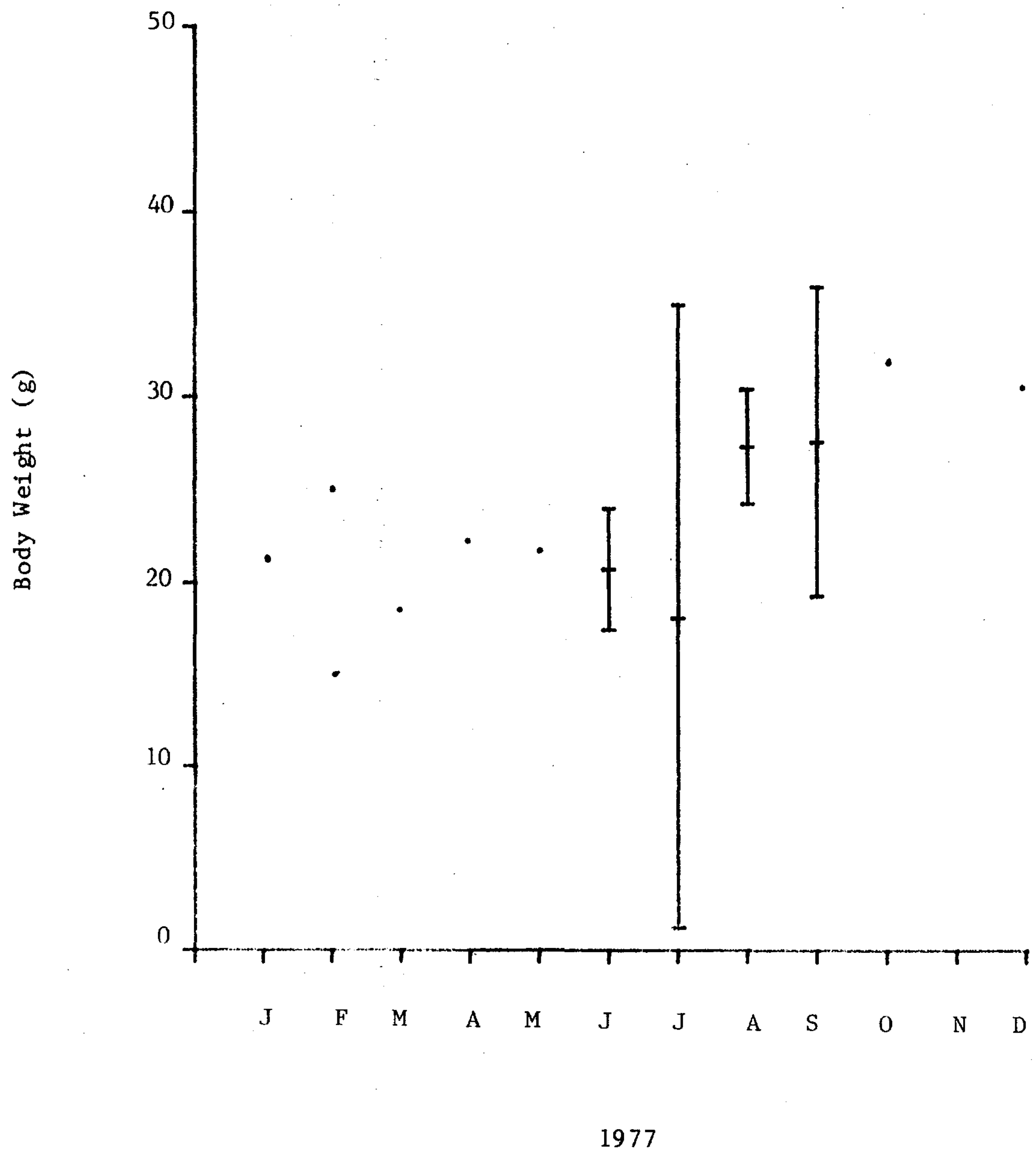


Figure 175. Mean body weight of male cotton mice on the dune scrub, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weight when sample was less than three.

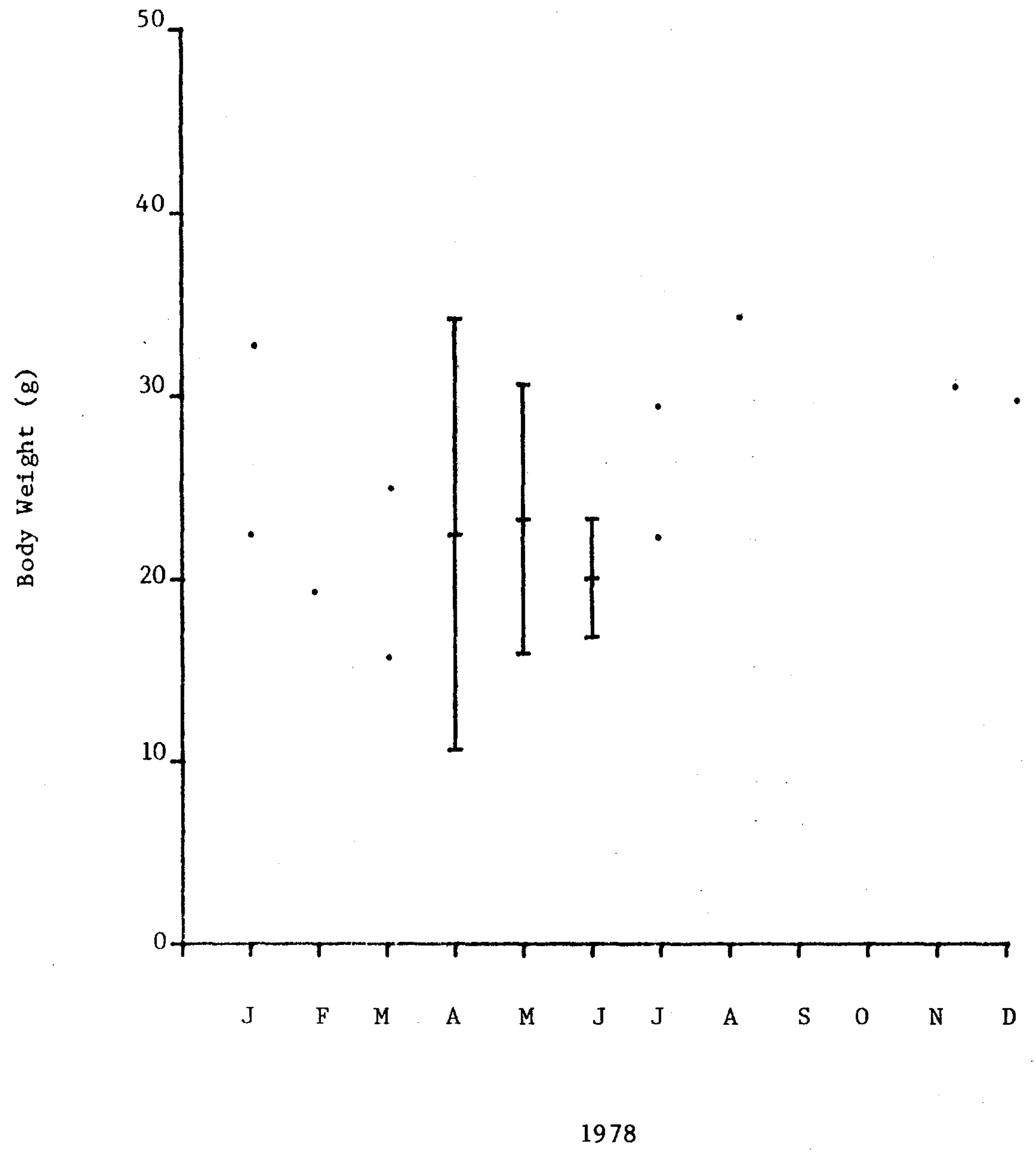


Figure 174. Mean body weight of male cotton mice on the dune scrub, 1979. Brackets enclose a 95% confidence interval. Dots indicate weights when sample was less than three.

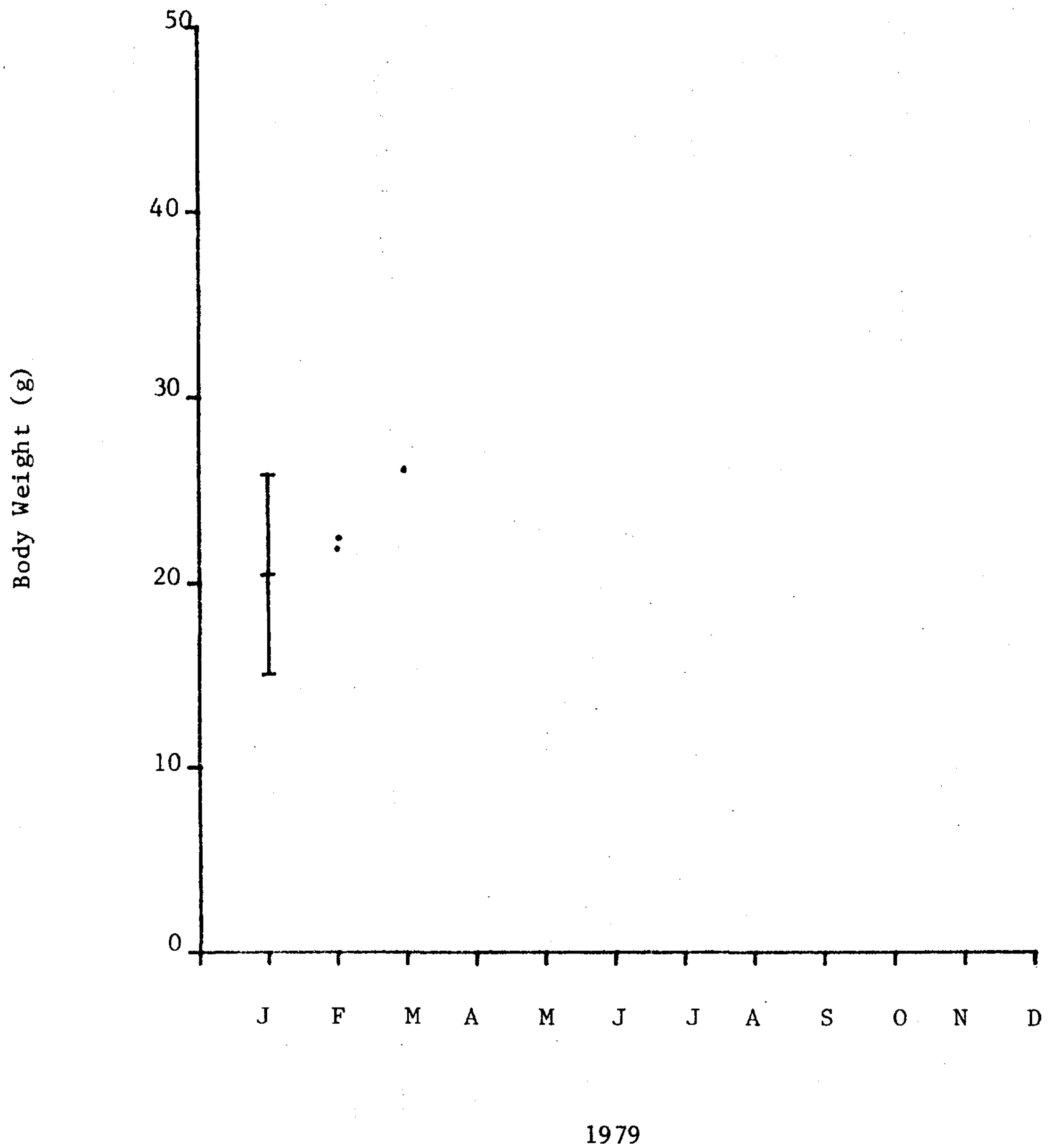


Figure 175. Mean body weight of female cotton mice on the dune scrub, 1977. Brackets enclose a 95% confidence interval. Dots indicate body weights when sample was less than three.

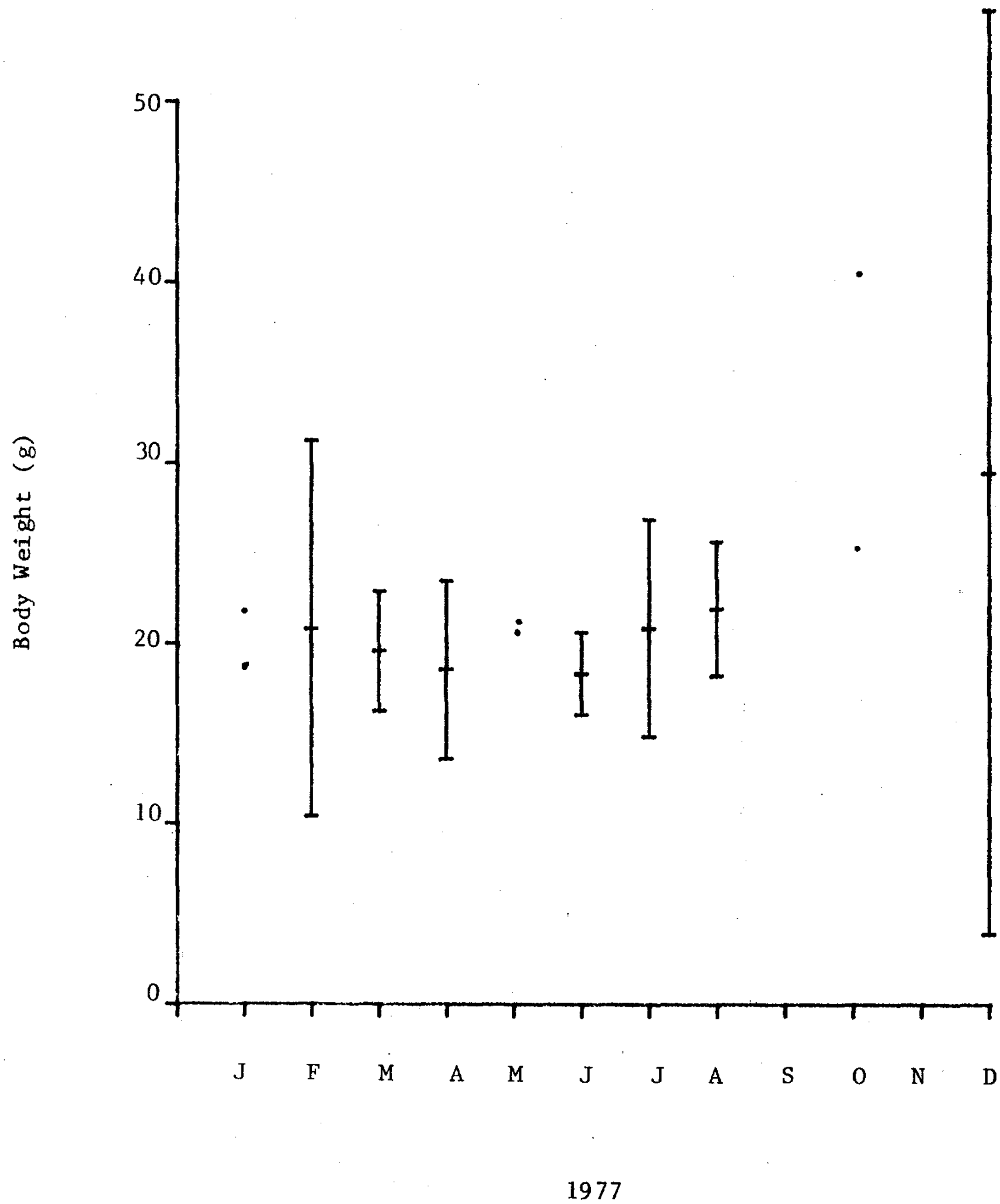


Figure 176. Mean body weight of female cotton mice on the dune scrub, 1978. Brackets enclose a 95% confidence interval. Dots indicate body weight when sample was less than three.

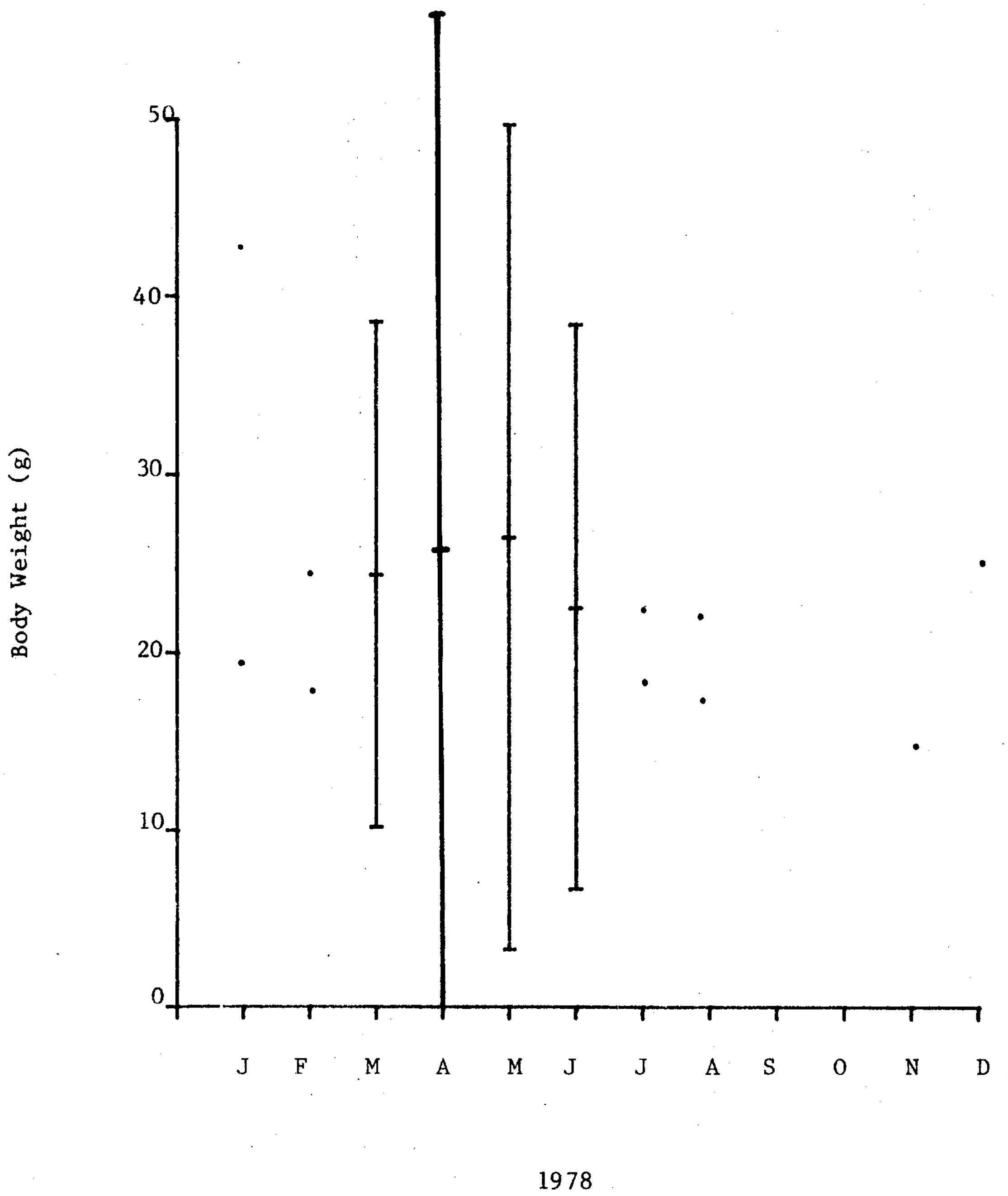
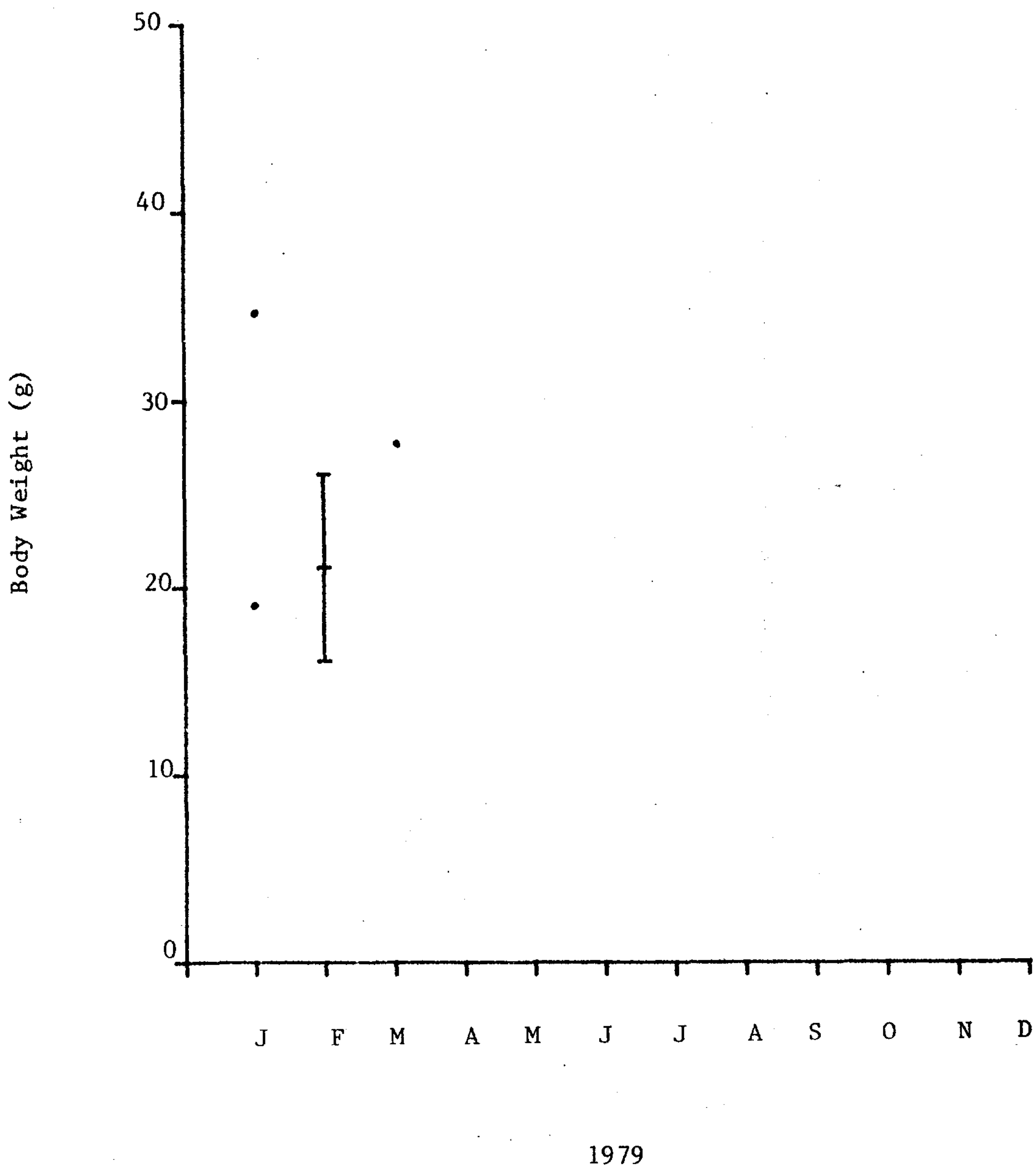


Figure 177. Mean body weight of female cotton mice on the dune scrub, 1979. Brackets enclose a 95% confidence interval. Dots indicate body weight when sample was less than three.



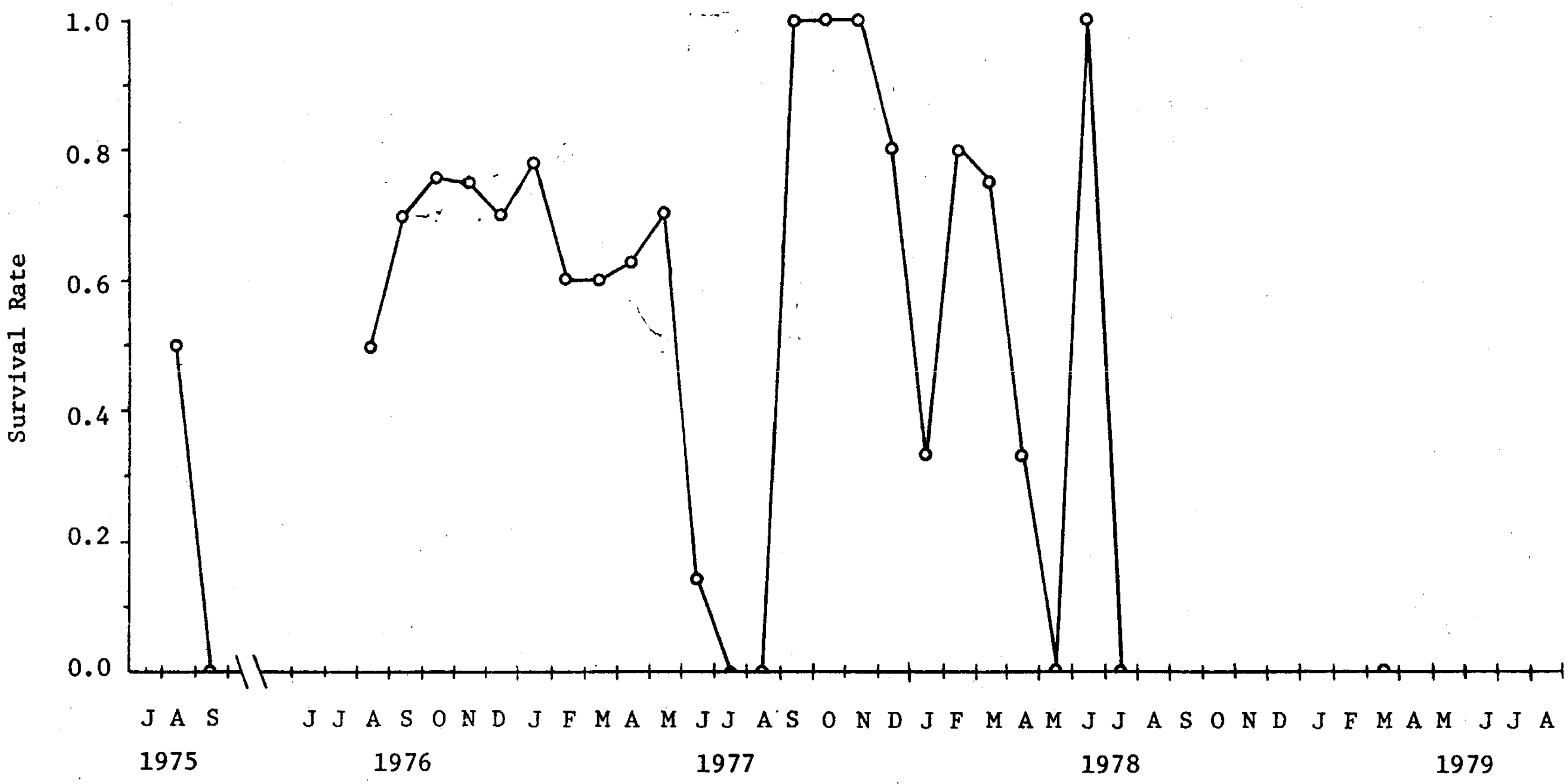


Figure 178. Four week survival rate of cotton rats on the Dune Scrub Grid.

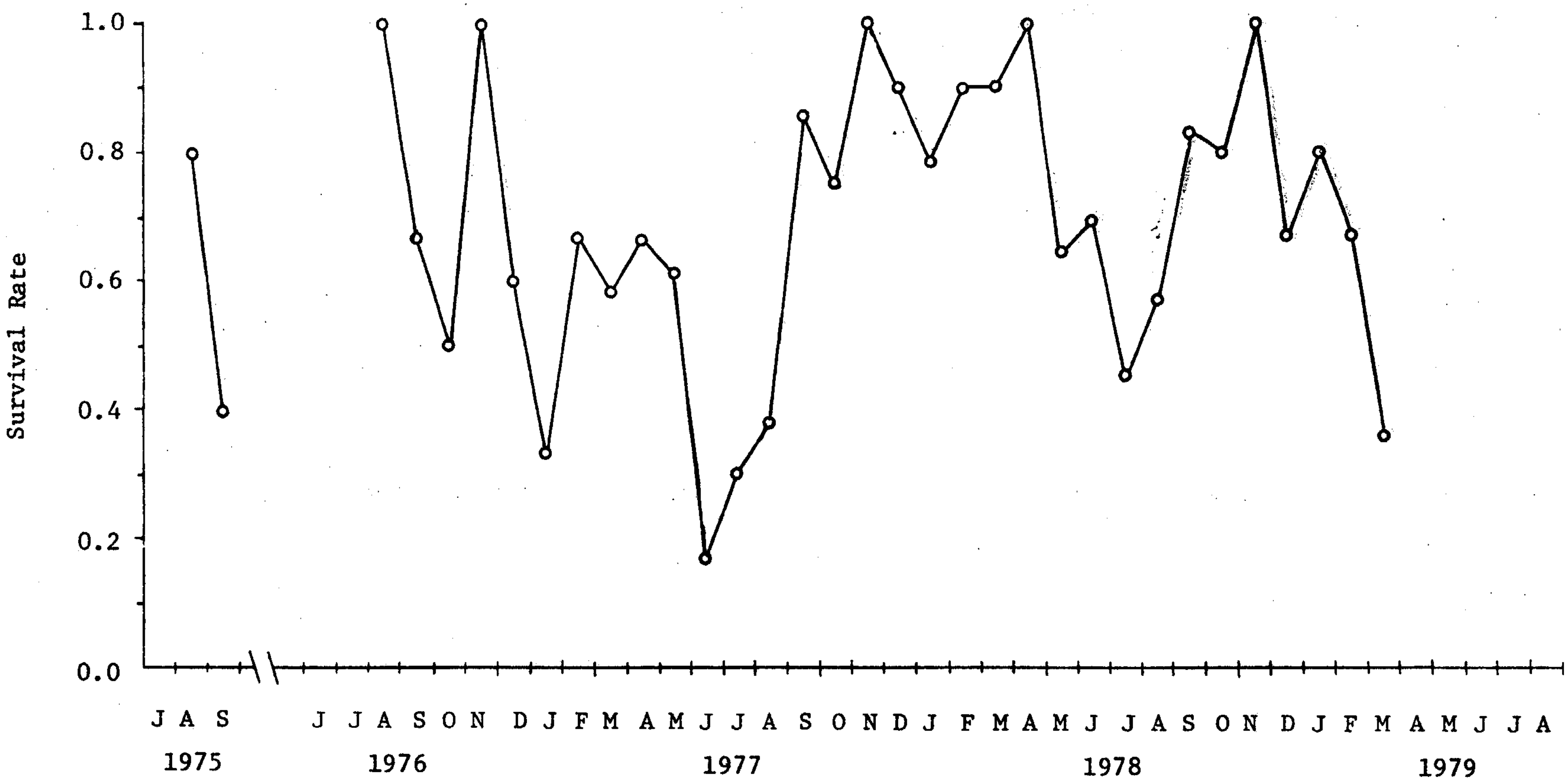


Figure 179. Four week survival rate of beach mice on the Dune Scrub Grid.

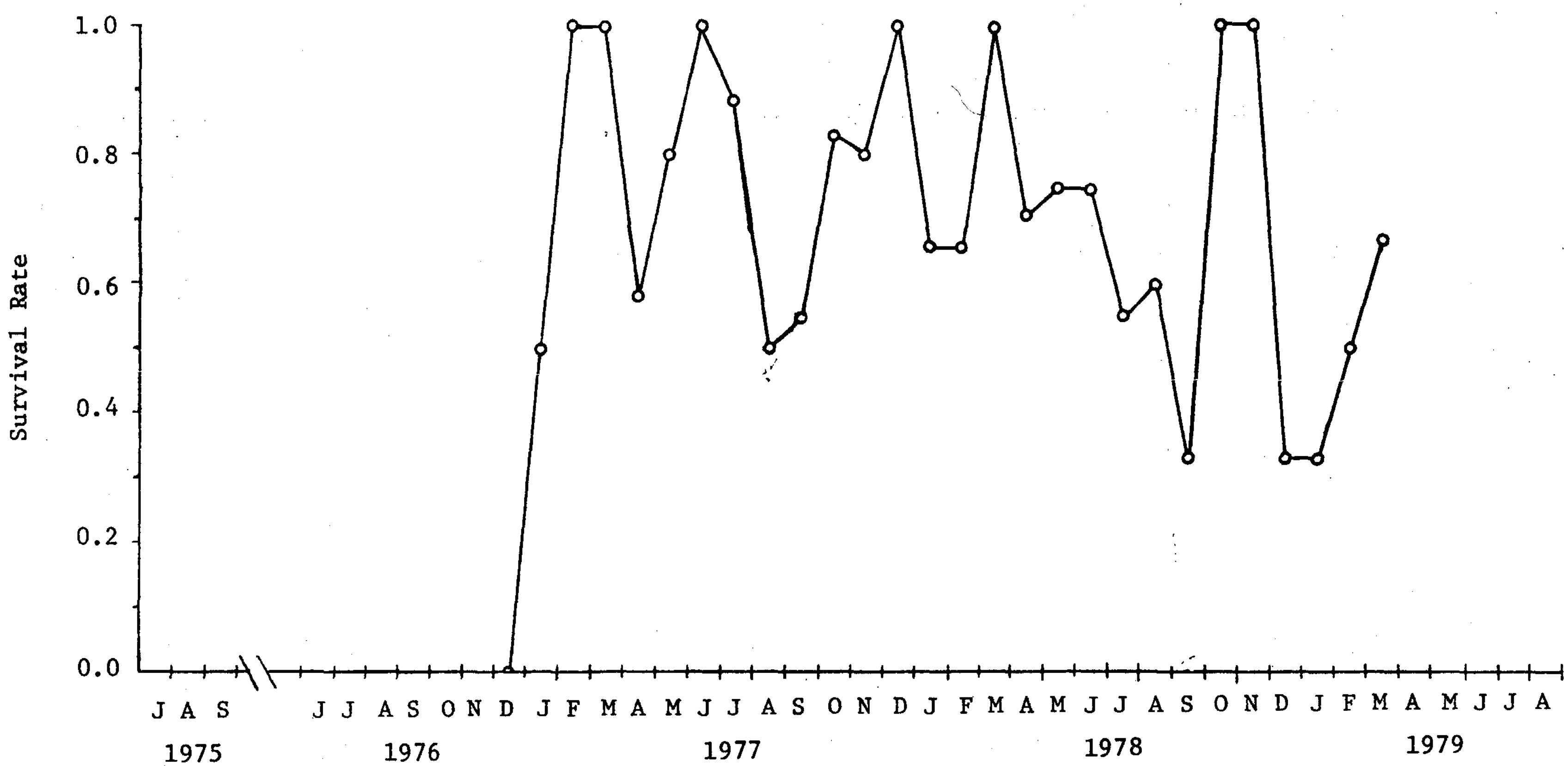


Figure 180. Four week survival rate of cotton mice on the Dune Scrub Grid.

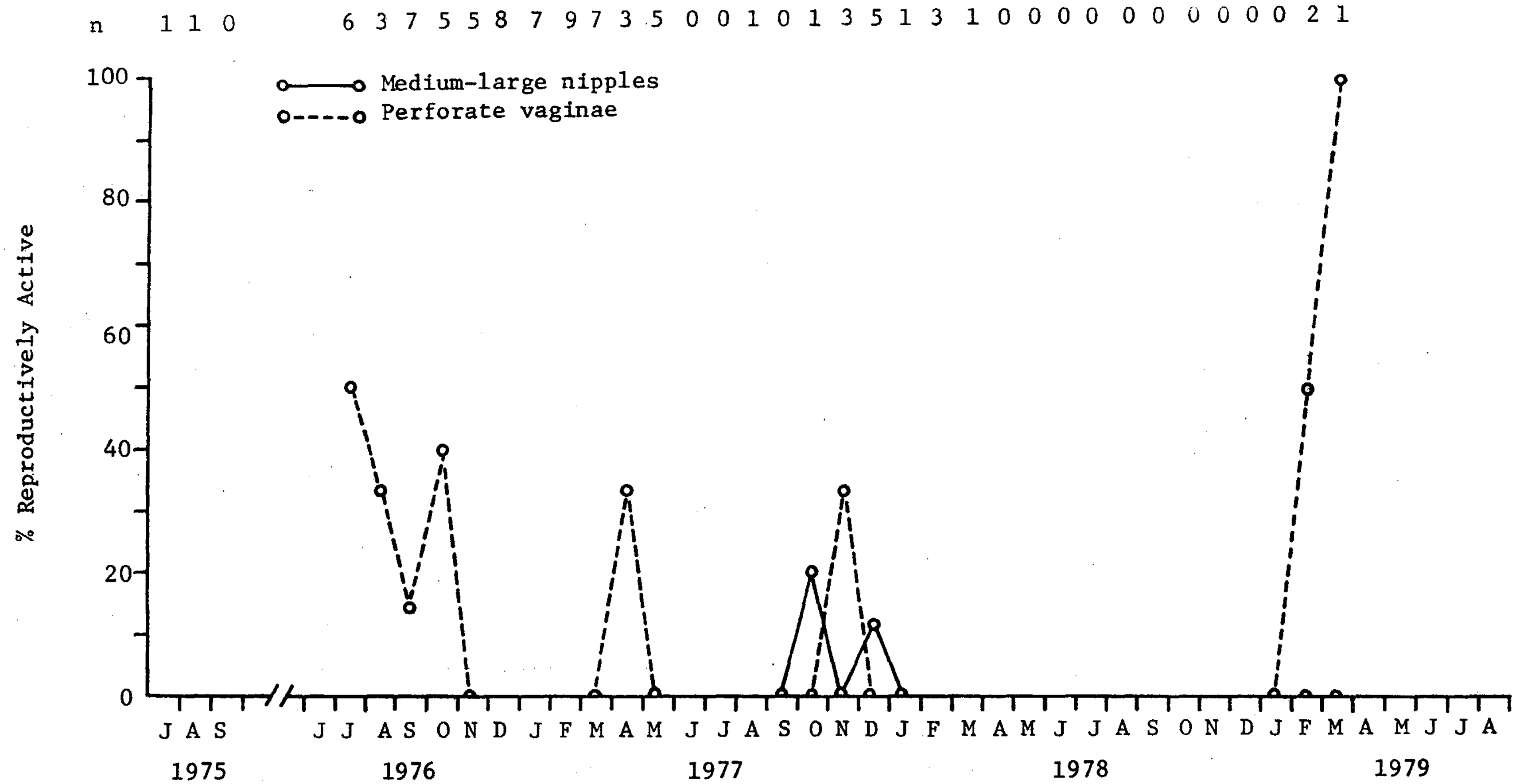


Figure 181. Monthly percentage of adult female cotton rats in reproductive condition on the Dune Scrub Grid.

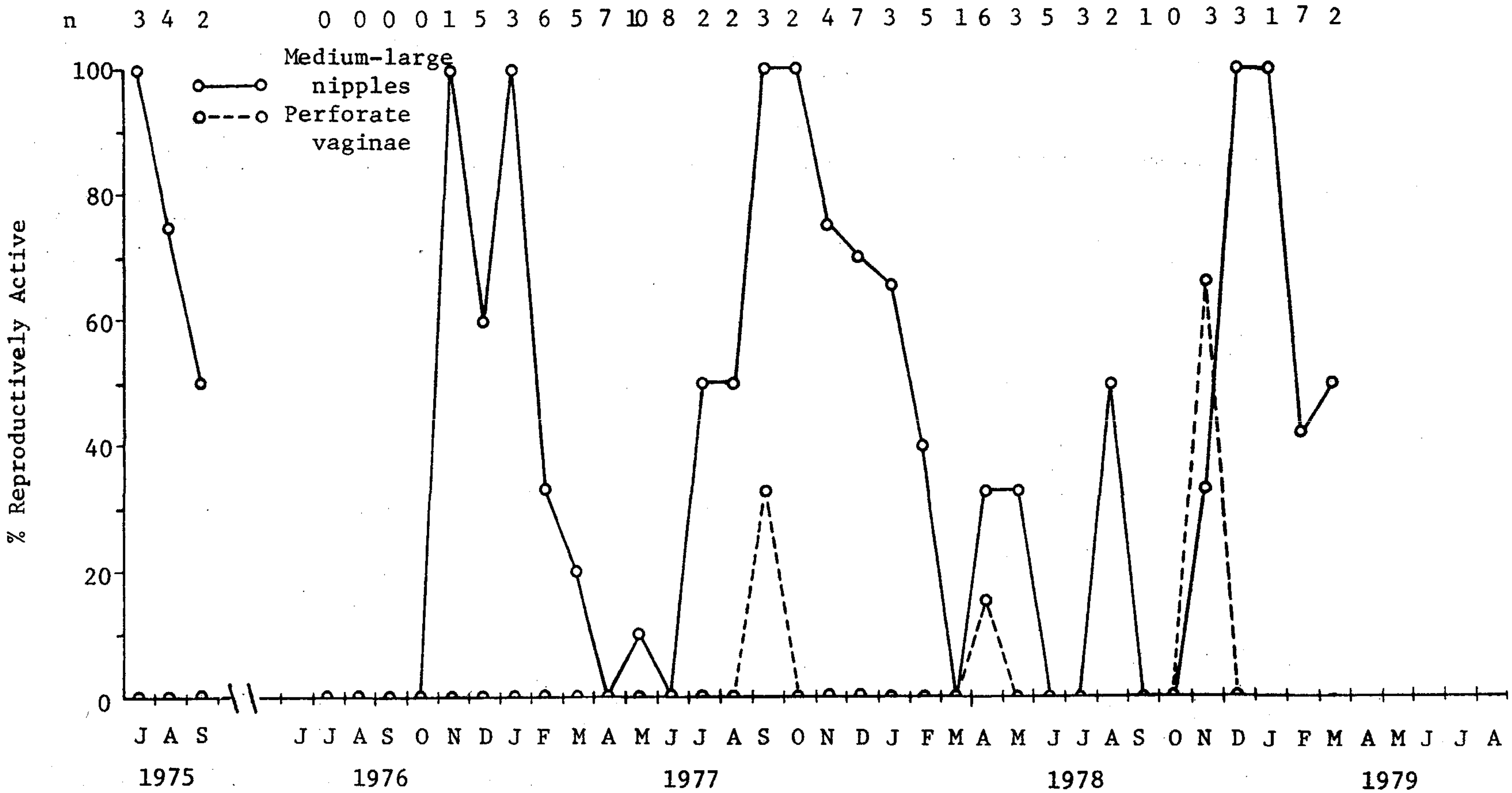


Figure 182. Monthly percentage of adult female beach mice in reproductive condition on the Dune Scrub Grid.

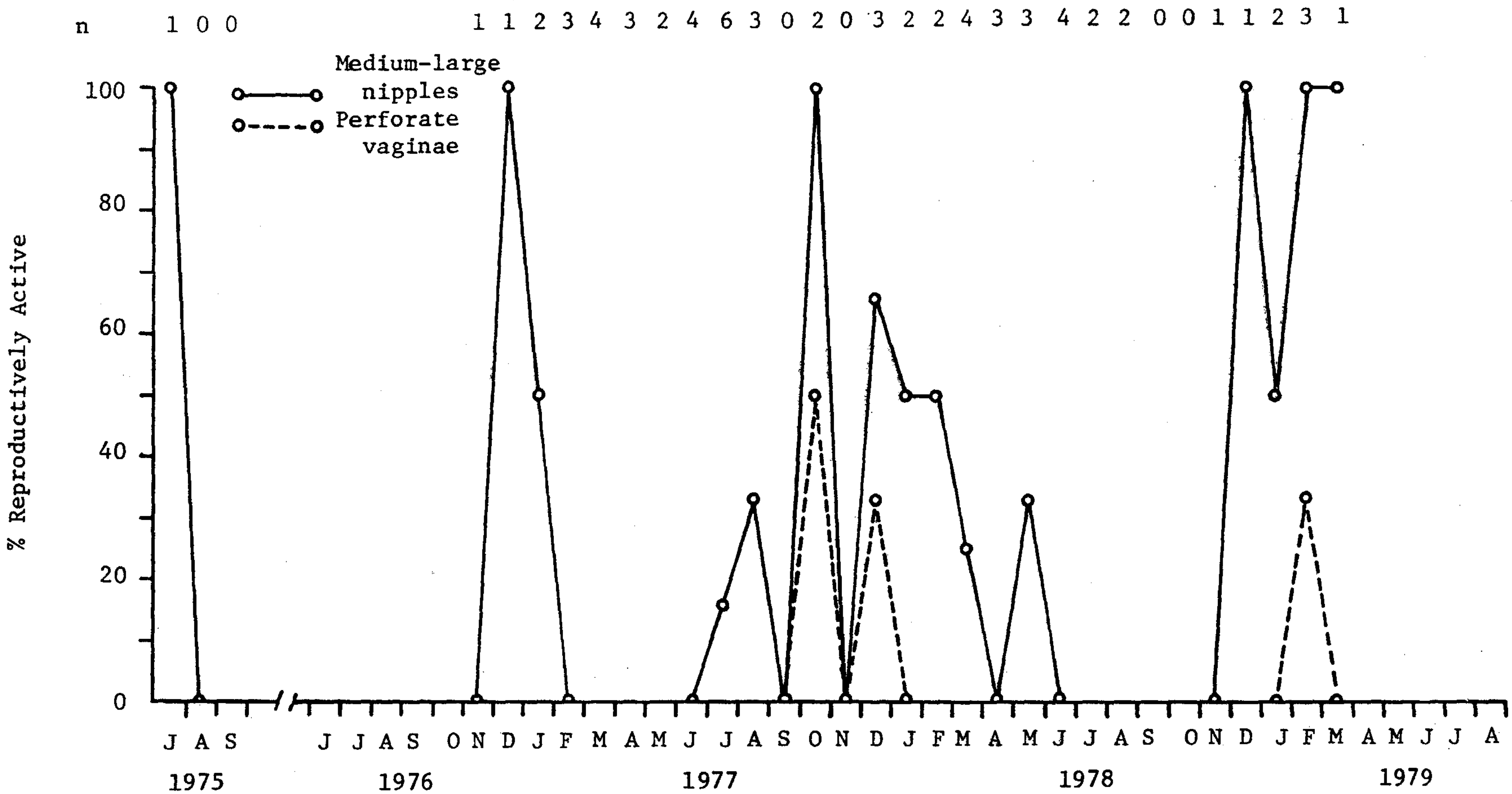


Figure 183. Monthly percentage of adult female cotton mice in reproductive condition on the Dune Scrub Grid.

SPECIES LISTS FOR THE

PLANT STUDY AREAS

Happy Hammock

Canopy Trees

Sabal palmetto (Walt.) Lodd. ex Shultes, Cabbage Palm
Quercus virginiana Mill. Live Oak
Celtis laevigata Willd. Hackberry,
Quercus laurifolia Michx. Laurel Oak
Acer rubrum var. tridens Wood, Southern Red Maple.
Acer negundo L. Box Elder
Ulmus americana L., White or American Elm

Sub-Canopy Trees

Ficus aurea Nutt, Shangler fig
Citrus sinensis (L.) Osbeck, Sweet Orange
Morus rubra L. Red Mulberry
Myrsine guianensis (Aubl.) Kuntze
Ardisia escallonioides Schlecht. and Cham. Marlberry
Nectandra coriacea (Sw.) Grieseb. Lancewood
Myrcianthes fragrans (Sw.) McVaugh
Cornus foemina Mill. Stiff Cornel
Persea palustris (Raf.) Sarg. Swamp Bay
Myrica cerifera L. Wax Myrtle
Juniperus silicicola (Small) Bailey, Southern Red Cedar
Ilex cassine var. cassine L. Dahoon
Eugenia exillaris (Sw.) Willd. White Stopper
Forresteria segregata (Jacq.) Krug & Urban, Florida Privet

Shrubs

Leucothoe populifolia (Lam.) Dippel Leucothoe
Psychotria nervosa Sw. Wild Coffee
Psychotria sulzneri Small Wild Coffee
Baccharis glomeruliflora Pers. Groundsel Tree
Bumelia (Michx.) Vent. var. reclinata

Sub-Shrubs

Rivina humilis L. Rouge Plant
Kosteletzkya virginica (L.) Presl ex Gray, Salt Marsh Mallow
Verbena scabra vahl

Herbs

Nephrolepis cordifolia (L.) Presl Boston Fern
Nephrolepis exaltata (L.) Schott Boston Fern
Thelypteris normalis (C. Chr.) Moxley
Thelypteris interrupta (Fee) Schelpe var. versicolor (R. St. John) A. R. Smith
Thelypteris palustris Schott
Dryopteris ludoviciana (Kunze) Small, Shield Fern
Psilotum nudum (L.) Beauv. Whisk Fern
Acrostichum danaeaefolium Langsd. & Fisch. Leather Fern

Happy Hammock

Herbs

Arisaema triphyllum (L.) Schott Jack in the Pulpit
Ponthieva racemosa (Walt.) Mohr, Shadow Witch
Habenaria odontopetala (Reichenb. F.) Small
Andropogon virginicus var. glomeratus (Walt.) BSP Beard Grass
Panicum joorii Shultes
Oplismenus setarius (Lam.) Roem. & Schultes
Boehmeria cylindrica (L.) Sw. Button Hemp
Pluchea camphorata (L.) DC. Marsh Fleabane
Cicuta maculata L. Water Hemlock
Polygonum hydropiperoides Michx. Knotweed
Samolus parviflorus Raf. Pineland Pimpernel
Hydrocotyle umbellata L. Marsh Pennywort
Pontederia cordata var. cordata L. Pickerelweed
Cynoctonum mitreola (L.) Britt. Mitterwort
Pavonia spinifex (L.) Cav.
Lactuca graminifolia Michx. Lettuce
Rhynchospora miliacea (Lam.) Gray Beak Rush
Panicum dichotomiflorum Michx.
Panicum ciliatum Ell.
Verbesina laciniata (Poir.) Nutt. Crownbeard
Cyperus tetragonus Ell.

Vines

Toxicodendron radicans (L.) Kuntze ssp. Poison Ivy
Vitis rotundifolia Michx. Muscadine Grape
Vitis aestivalis Michx. Summer Grape
Parthenocissus quinquefolia (L.) Planchon, Virginia Creeper
Aster carolinianus Walt.
Vicia floridana S. Watts Vetch
Ipomoea alba L. Moon Flowers
Melothria pendula L. Creeping Cucumber
Cynanchum scoparium Nutt. Leafless Cynanchum
Smilax bona-nox L. Green Brier
Mikania scandens (L.) Willd. Climbing Hempweed
Matelea suberosa (L.) Shinners.
Valeriana scabra L. var. scabra

Epiphytes

Tillandsia usneoides (L.) Spanish Moss
Tillandsia utriculata L. Ball Moss
Polypodium polypodioides (L.) Sm. Golden Polypody
Encyclia tampensis (Lindl.) Orchid
Vittaria lineata (L.) Sm.
Campyloneurum phyllitidis (L.) Presl

INDIAN RIVER HAMMOCK (MAINLAND)

Canopy Trees

Fraxinus tomentosa Michaux f. Red or Pumpkin Ash
Quercus laurifolia Michx. Laurel Oak
Acer rubrum var. tridens Wood, Southern Red Maple
Magnolia virginiana L. Sweet Bay
Sabal palmetto (Walt.) Lodd. ex Shultes Cabbage Palm
Magnolia grandiflora L. Bull Bay
Ulmus americana L., American Elm
Quercus virginiana var. virginiana Mill. Live Oak

Sub-Canopy Trees

Nectandra coriacea (Sw.) Grieseb. Lancewood
Carica papaya L. Papaya
Persea borbonia (L.) Spreng. Red Bay
Persea palustris (Raf.) Sarg. Swamp Bay
Myrcianthes fragrans (Sw.) McVaugh
Morus rubra L. Red Mulberry
Diospyros virginiana L. Persimmon
Zanthoxylum fagara (L.) Sarg. Wild Lime
Zanthoxylum clava-herculis L. Hercules Club

Shrubs

Chiococca alba (L.) Hitch
Asimina parviflora (Michaux.) Dunnal Dwarf Pawpaw
Psychotria sulzneri Small Wild Coffee
Psychotria nervosa Sw. Wild Coffee
Serenoa repens (Bartr.) Small Saw Palmetto
Osmanthus americanus (L.) Gray, Wild Olive
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Callicarpa americana L. Beauty Berry
Ardisia escallonioides Schlecht. & Cham. Marlberry
Myrsine guianensis (Aubl.) Kuntze
Rubus trivialis Michx. Southern Dewberry

Herbs

Thelypteris interrupta (Wild.) Iwatsuki
Thelypteris normalis (C. Chr.) Moxley
Thelypteris quadrangularis (Fee) Schelpe var. versicolor (R. St. John) A.R. Smith
Blechnum serrulatum Richard
Nephrolepis cordifolia Presl. Boston Fern
Psilotum nudum (L.) Beauv. Whisk Fern
Pteridium aquilinum (L.) Sadebeck Bracken Fern

INDIAN RIVER HAMMOCK

Herbs

Chasmanthium sessiliflorum (Poir.) Vates
Panicum ciliatum Ell.
Panicum joorii Shultes
Rhynchospora miliacea (Lam.) Gray Beak Rush
Pontedaria cordata var. cordata L. Pickerlweed
Oplismenus setarius (Lam.) Roem & Shultes.
Verbesina laciniata (Poir.) Nutt. Crown Beard
Cicuta mexicana C. & R. Water Hemlock
Scleria triglomerata Michaux.
Rivina humilis L. Rouge Plant

Vines

Ipomoea alba L. Moon Flowers
Vitis rotundifolia Michx. Muscadine Grape
Vitis aestivalis Michx. Summer Grape
Mikania scandens (L.) Willd. Climbing Hempwood
Gelsimium sempervirens (L.) Aiton f. Yellow Jessamine
Cynanchum laeve Michaux. Persoon Milkweed
Toxicodentron radicans (L.) Kuntze ssp. Poison Ivy
Smilax bona-nox L. Green Brier

Epiphytes

Polypodium polypodioides (L.) Watt, Resurrection Fern
Polypodium plumula Humb. & Bonpl. ex Willd.
Encyclia tampensis (Lindl.) Orchid
Tillandsia usneoides L. Spanish Moss
Tillandsia utriculata L.
Tillandsia recurvata L. Ball Moss
Phlebodium aureum (L.) Sm. Golden Polypody

ROSS' HAMMOCK

Canopy Trees

Quercus virginiana var. virginiana Mill. Live Oak
Quercus virginiana var. maritima (Michx.) Sarg.
Quercus laurifolia Michx. Laurel Oak
Carya glabra (Mill.) Sweet
Juniperus silicicola (Small) Bailey, Southern Red Cedar
Sabal palmetto (Walt.) Lodd. ex Shultes, Cabbage Palm
Magnolia grandiflora L. Bull Bay

Sub-Canopy Trees

Zanthoxylum clava-herculis L. Hercules Club
Morus rubra L. Red Mulberry

Shrubs

Ilex ambigua (Michx.) Chapn.
Vaccinium stamineum var. caesium L. Gooseberry
Ilex vomitoria Ait. Yaupon
Callicarpa americana L. Beauty Berry
Osmanthus americanus var. americanus (L.) Gray, Wild Olive
Serenoa repens (Bartr.) Small Saw Palmetto
Myrica cerifera L. Wax Myrtle
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Amorpha fruticosa L.
Asimina parviflora (Michaux.) Dunnal, Dwarf Pawpaw

Herbs

Andropogon virginicus L. Broom Sedge
Scleria triglomerata Michaux.
Chasmanthium sessiliflorum (Poir.) Yates
Cnidoscolus stimulosus (Michx.) Engelm & Gray, Tread Softly
Verbesina laciniata (Poir.) Nutt Crown Beard
Vernonia gigantea (Walt.) Trel. Ironweed
Solidago arguta Aiton. Goldenrod
Panicum joorii Shultes
Panicum ciliatum or lancearium Ell.
Valeriana scabra L. var. scabra

Vines

Smilax bona-nox L. Greenbrier
Smilax auriculata Walt. Greenbrier
Campsis radicans (L.) Seemann Trumpet Vine
Vitis aestivalis Michx. Summer Grape
Toxicodendron radicans (L.) Kuntze ssp. Poison Ivy
Parthenocissus quinquefolia (L.) Planchon. Virginia Creeper
Galactia elliottii Nuttall.
Ipomoea alba L. Moon Flowers
Phaseolus polystachios L. BSP
Ipomoea tuba (Schlect) G. Don, Moon Vine

ROSS' HAMMOCK

Epiphytes

Epidendrum conopseum R. Browne
Polypodium polypodioides (L.) Watt Ressurection Fern
Phlebodium aureum (L.) Sm. Golden Polypody
Tillandsia usneoides L. Spanish Moss
Tillandsia utriculata L.
Tillandsia recurvata L. Ball Moss
Tillandsia setacea Sw.
Vittaria lineata (L.) Sm.
Encyclia tampensis (Lindl.) Orchid

BLACK HAMMOCK

Canopy Trees

Celtis laevigata Willd. Sugar Berry
Fraxinus tomentosa Michaux. f. Red Ash
Sabal palmetto (Walt.) Lodd ex Shultes Cabbage Palm
Carya aquatica (Michx. f.) Nutt. Water Hickory
Acer rubrum Wood, Southern Red Maple
Liquidambar styraciflua L. Sweet Gum
Quercus laurifolia var. hemispherica Michx, Willow Oak
Nyssa sylvatica marsh. var. biflora (Walt.) Sarg. Black Gum
Ulmus americanus L. White or American Elm
Magnolia virginiana L. Sweet Bay
Taxodium distichum (L.) Richard Bald Cypress
Juniperus silicicola (Small) Bailey, Southern Red Cedar

Sub-Canopy Trees

Sambucus simpsonii Rehder, Southern Elderberry
Citrus sinensis (L.) Osbeck, Sweet Orange
Persea palustris (Raf.) Sarg. Swamp Bay
Ilex cassine L. Dahoon
Morus rubra L. Red Mulberry
Cornus florida L. Flowering Dogwood

Shrubs

Rivina humilis L. Rouge Plant
Psychotria nervosa Sw.
Urena lobata L. Caeser Weed
Callicarpa americana L. Beauty Berry
Rhapidophyllum hystrix (Pursh) Wendl. & Drude Needle Palm
Ardisia escallonioides Schecht & Cham. Marlberry
Baccharis glomeruliflora Pers. Groundsel Tree
Itea virginica L. Virginia Willow

Herbs

Thelypteris dentata (Forsk.) E. St. John, Downy Shield Fern
Thelypteris mariana
Blechnum serrulatum Richard
Nephrolepis cordifolia Presl. Boston Fern
Acrostichum danaeaefolium Langsd. & Fisch. Leather Fern
Thelypteris interrupta (Fee) Schelpe var. versicolor (R. St. John) A. R. Smith
Thelypteris normalis (e. Chr.) Moxley
Dennstaedia bipinnata Maxon, Hay-scented Fern
Osmunda cinnamomea L. Cinnamon Fern
Nephrolepis biserrata Schott Boston Fern

BLACK HAMMOCK

Herbs

Oplismenus setarius (Laim.) Roem & Shultes
Panicum joorii Sheltes
Saururus cernuus L. Lizard's Tail
Rhynchospora inundata (Oakes) Ferm. Beak Rush
Rhynchospora miliacea (Lam.) Gray Beak Rush
Pontederia cordata L. Pickerelweed
Tradescantia L. Spiderwort
Arisaema triphyllum (L.) Schott Jack in the Pulpit
Habenaria odontopetala (Riechemb. f.) Small
Verbesina laciniata (Poir.) Nutt. Crown Beard
Lycopus rubellus Moench
Rubus trivialis Michx. Southern Dewberry

Vines

Cynanchum scoparium Nutt. Leafless Cynanchum
Mikania scandens (L.) Willd. Climbing Hempweed
Smilax bona-nox L. Greenbrier
Toxicodendron radicans (L.) Kuntze ssp. Poison Ivy
Matelea suberosa (L.) Shinners
Vitis rotundifolia Michx. Muscadine Grape
Vitis aestivalis Michx. Summer Grape
Cynanchum laeve Michaux. Persoon Milkweed
Melothria pendula L. Creeping Cucumber
Apios americana Medicus Potatoe Bean
Parthenocissus quinquefolia (L.) Planchon. Virginia Creeper
Clematis crispa L.
Momordica charantia L. Wild Balsam Apple
Decumaria barbara L. Climbing Hydrangea

Epiphytes

Tillandsia fasciculata Sw.
Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Tillandsia setacea Sw.
Tillandsia utriculata L.
Tillandsia simulata Small
Polypodium polypodioides (L.) Watt. Resurrection Fern
Polypodium plumula Humb. & Bonpl. ex Willd
Campyloneurum phyllitidis (L.) Presl.
Encylia tampensis (Lindl.) Orchid
Vittaria lineata (L.) Sm.
Phlebodium aureum (L.) Sm. Golden Polypody

CASTLE WINDY HAMMOCK

Trees

Zanthoxylum fagara (L.) Sarg. Wild Lime
Quercus virginiana var. virginiana Mill. Live Oak
Persea borbonia (L.) Spreng Red Bay
Sabal palmetto (Walt.) Lodd ex Shultes Cabbage Palm
Juniperus silicicola (Small) Bailey. Southern Red Cedar
Myrcianthes fragrans (Sw.) McVaugh
Citrus sinensis (L.) Osbeck, Sweet Orange
Celtis laevigata Willd. Hackberry
Prunus caroliniana Aiton, Carolina Laurel Cherry
Quercus laurifolia Michx. Laurel Oak
Morus rubra L. Red Mulberry
Mastichodendron foetidissimum (Jacq.) Cronquist, Wild Mastic
Exothea paniculata (Juss.) Radlk. Inkwood

Shrubs

Sageretia minutiflora (Michx.) Mohr, Buckthorn
Ilex vomitoria Ait. Yaupon
Forestiera segregata (Jacq.) Krug & Urban, Florida Privet
Ardisia escallonioides Schlecht & Cham Marlberry
Ximenia americana L. Tallowwood
Psychotria nervosa Sw.
Amyris balsamifera L. Balsam Torchwood
Eugenia axillaris (Sw.) Willd. White Stopper
Serenoa repens (Bartr.) Small Saw Palmetto
Schinus terebinthefolius Raddi, Brazian Pepper Tree
Myrsine guianensis (Aubl.) Kuntze
Callicarpa americana L. Beauty Berry
Erythrina herbacea L. Coral Bean
Myrica cerifera L. Wax Myrtle
Chiococca alba (L.) Hitchc.

Herbs

Pavonia spinifex (L.) Cav.
Rivina humilis L. Rouge Plant
Salvia coccinea Buchoz Sage
Poinsettia cyathophora (Murray) Kl. & Gke
Oplismenus setarius (Lam.) Roem & Shultes
Panicum joorii Shultes
Cnidoscolus stimulosus (Michx.) Engelm & Gray. Tread Softly
Cyperus tetragonus Ell.
Commelina diffusa Burm. f. Dayflower
Verbesina laciniata (Poir.) Nutt. Crown Beard

CASTLE WINDY HAMMOCK

Vines

Mikania scandens (L.) Willd. Climbing Hempweed
Cynanchum scoparium Nutt. Leafless Cynanchum
Vitis rotundifolia Michx. Muscadine Grape
Toxicodendron radicans (L.) Kuntze ssp. Poison Ivy
Matalea suberosa (L.) Shinners
Smilax bona-nox L. Greenbrier
Smilax sp. L. Greenbrier
Vitis aestivalis Michx. Summer Grape
Melothria pendula L. Creeping Cucumber

Epiphytes

Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Tillandsia utriculata L.
Polypodium polypodioides (L.) Watt, Resurrection Fern
Epidendrum conopseum R. Browne
Encyclia tampensis (Lindl.) Orchid
Vittaria lineata (L.) Sm.
Phlebodium aureum (L.) Sm. Golden Polypody

JUNIPER HAMMOCK

Canopy Trees

Carya aquatica (michx. f.) Nutt. Water Hickory
Quercus virginiana Mill. Live Oak
Sabal palmetto (Walt.) Lodd. ex Shultes Cabbage Palm
Fraxinus tomentosa Michaux. f. Red or Pumpkin Ash
Magnolia grandiflora L. Bull Bay
Celtis laevigata Willd. Sugarberry
Juniperus silicicola (Small.) Bailey Southern Red Cedar
Carya glabra (Mill.) Sweet

Sub-Canopy Trees

Prunus caroliniana Aiton. Carolina Laurel Cherry
Viburnum obovatum Walt. Black Haw
Ilex vomitoria Ait. Yaupon

Shrubs

Erythrina herbacea L. Coral Beans
Serenoa repens (Bartr.) Small Saw Palmetto
Callicarpa americana L. Beauty Berry

Herbs

Ruellia caroliniensis (J. F Gmel) Steud
Setaria macrosperma (Scribn. & Merrill) Schum Foxtail Grass
Oplismenus setarius (Lam.) Roem & Shultes
Chasmanthium sessiliflorum (Poir.) Yates
Phyllanthus tenellus Roxb.
Cyperus tetragonus Ell.
Commelina erecta (Michx.) Fern. Day Flower
Hedyotis procumbens (J.F. Gmel.) Fosberg, Innocence
Blechnum serrulatum Richard
Panicum joorii Shultes
Panicum trifolium Nash
Cyperus polystachyos Rottb. var. texensis (Torr.) Fern.
Elephantopus carolinianus Willd. Elephant's Foot
Verbesina laciniata (Poir.) Nutt. Crown Beard
Polymnia uvedalia L., Bears Foot

Vines

Smilax bona-nox L. Greenbrier
Mikania scandens (L.) Willd. Climbing Hempwood
Parthenocissus quinquefolia (L.) Planchon. Virginia Creeper
Toxicodendron radicans (L.) Kuntze ssp. Poison Ivy
Vitis rotundifolia Michx. Muscadine Grape
Matelea suberosa (L.) Shinners

JUNIPER HAMMOCK

Epiphytes

Tillandsia utriculata L.
Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Polypodium polypodioides (L.) Walt, Ressurection Fern
Phlebodium aureum (L.) Sm. Golden Polypody
Encyclia tampensis (Lindl.) Orchid
Harrisella porrecta (Reichen. f.) Fawc & Rendle.

HAMMOCK ON RT. 3

Canopy Trees

Quercus virginiana var. virginiana Mill. Live Oak
Ulmus americana L. White or American Elm
Sabal palmetto (Walt.) Lodd. ex Shultes Cabbage Palm
Celtis laevigata Willd. Sugarberry
Krugiodendrum ferreum (Vahl) Urban, Black Ironwood

Sub-Canopy Trees

Quercus nigra L. Water Oak
Morus rubra L. Red Mulberry
Citrus sinensis (L.) Osbeck, Sweet Orange
Cornus foemina Mill. Stiff Cornel
Persea palustris (Raf.) Sarg. Swamp Bay
Prunus caroliniana Aiton, Carolina Laurel Cherry
Ardisia escallonioides Schlecht & Charm. Marlberry
Myrcianthes fragrans (Sw.) McVaugh
Myrsine guianensis (Aubl.) Kuntze
Myrica cerifera L. Wax Myrtle

Shrubs

Psychotria sulzneri Small Wild Coffee
Psychotria nervosa Sw. Wild Coffee
Urena lobata L. Caesar Weed
Ilex vomitoria Ait. Yaupon
Ilex glabra (L.) Gray, Gallberry, Inkberry
Sageretia minutiflora (Michx.) Mohr, Buckthorn
Callicarpa americana L. Beauty Berry
Baccharis glomeruliflora Pers. Groundsel Tree
Erythrina herbacea L. Coral Beans
Rubus trivialis Michx. Southern Dewberry

Herbs

Pteridium aquilinum (L.) Sadebeck Bracken Fern
Asplenium platyneuron (L.) Oakes Spleenwort
Acrostichum danaeaefolium Langsd. & Fisch. Leather Fern
Blechnum serrulatum Richard
Woodwardia virginica (L.) Sm. Chain Fern
Osmunda cinnamomea L. Cinnamon Fern
Thelypteris normalis (C. Chr.) Moxley
Oplismenus setarius (Lam.) Roem & Shultes
Panicum joorii Shultes
Panicum ciliatum Ell.
Erechtites hieracifolia (L.) Raf. var hieracifolia
Cyperus tetragonus Ell.

HAMMOCK ON RT. 3

Herbs

Cyperus polystachyos Rottb. var. texensis (Torr.) Fern
Boehmeria cylindrica (L.) Sw. Button Hemp
Scleria triglomerata Michaux.
Habenaria odontopetala (Reichenb. f.) Small
Panicum dichotomiflorum Michx.
Carex lupulina Muhl. ex Schk. Sedge
Hydrocotyle umbellata L. Marsh Pennywort
Cynoctonum mitreola (L.) Britt. Mitterwort
Andropogon virginicus var. glomeratus (Walt.) BSP Beard Grass
Verbena tampensis Nash Vervain

Vines

Mikania scandens (L.) Willd. Climbing Hempweed
Vitis routundifolia Michx. Muscadine Grape
Vitis aestivalis Michx. Summer Grape
Smilax bona-nox L. Greenbrier
Parthenocissus quinquefolia (L.) Planchon. Virginia Creeper
Toxicodendron radicans (L.) Kuntze ssp. Poison Ivy
Ampelopsis arborea (L.) Rusby, Pepper Vine
Apios americana Medicus Potato Bean
Impomoea alba L. Moon Flowers
Matelea suberosa (L.) Shinners

Epiphytes

Tillandsia utriculata L.
Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Phlebodium aureum (L.) Sm. Golden Polypody
Vittaria lineata (L.) Sm.
Ophioglossum palmatum L. Hand Fern
Encyclia tampensis (Lindl.) Orchid
Polypodium polypodioides (L.) Watt. Resurrection Fern

INDIAN MOUND HAMMOCK (CAPE CANAVERAL)

Canopy Trees

Persea borbonia (L.) Spreng. Red Bay
Quercus virginiana var. virginiana Mill. Live Oak
Prunus caroliniana Aiton Carolina Laurel Cherry
Mastichodendron foetidissimum (Jacq.) Cronquist Wild Mastic
Ficus aurea Nutt. Strangler Fig
Exothea paniculata (Juss.) Radik. Inkwood
Chrysophyllum oliviforme L. Satan Leaf
Bursera simaruba (L.) Sarg. Gumbo Limbo
Carya floridana Sarg.
Quercus nigra L. Water Oak
Sabal palmetto (Walt.) Lodd. ex Shultes Cabbage Palm

Sub-Canopy Trees

Ardisia escallonioides Schlecht & Charm. Marlberry
Eugenia axillarix (Sw.) Willd. White Stopper
Eugenia foetida Pers.
Eugenia uniflora L. Surinam Cherry
Krugiodendron ferreum (Vahl.) Urban, Black Ironwood
Capparis flexuosa L. Bay-leaved Caper Tree
Zanthoxylum fagara (L.) Sarg. Wild Lime
Chiococca alba (L.) Hitch
Bumelia tenax (L.) Willd. Tough Buckthorn
Myrcianthes fragrans (Sw.) McVaugh

Shrubs

Erythrina herbacea L. Coral Beans
Psychotria nervosa Sw.
Rivina humilis L. Rouge Plant
Capsicum annum L. var. minimum (Mill.) Heiser Cayenne Pepper
Callicarpa americana L. Beauty Berry
Ximenia americana L. Tallowwood
Serenoa repens (Bartr.) Small Saw Palmetto

Herbs

Kalanchoe pinnata Pers.
Dicliptera assurgens (L.) Juss.
Commelina erecta (Michx.) Fern. Day Flower

Vines

Smilax bona-nox L. Greenbrier
Vitis rotundifolia Michx. Muscadine Grape
Vitis aestivalis Michx. Summer Grape
Cereus pterantha (L.) Mill.

INDIAN MOUND HAMMOCK (CAPE CANAVERAL)

Epiphytes

Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Tillandsia utriculata L.
Polypodium polypodioides (L.) Watt., Resurrection Fern
Phlebodium aureum (L.) Sm. Golden Polypody

JEROME ROAD HAMMOCK

Trees

Quercus virginiana Mill. Live Oak
Quercus laurifolia Michx. Laurel Oak
Sabal palmetto (Walt.) Lodd. ex Shultes Cabbage Palm
Persea palustris (Raf.) Sarg. Swamp Bay
Diospyros virginiana L. Persimmon
Myrsine guianensis (Aubl.) Kuntze
Ilex cassine L. Dahoon
Myrica cerifera var. cerifera L. Wax Myrtle
Cornus foemina Mill. Stiff Cornel
Pinus elliottii var. densa Little & Dorman Slash Pine
Acer rubrum Wood. Southern Red Maple
Celtis laevigata Willd. Sugarberry
Morus rubra L. Red Mulberry
Ulmus americana L. White or American Elm
Schinus terebinthefolius Raddi, Brazilian Pepper Tree

Shrubs

Psychotria sulzneri Small Wild Coffee
Rhus copallina L. Winged Sumac
Vaccinium myrsinites Lam.
Bumelia reclinata (Michx.) Vent. var. reclinata
Serenoa repens (Bartr.) Small Saw Palmetto
Hypericum hypericoides (L.) Grantz St. John's Wort
Baccharis glomeruliflora Pers. Groundsel Tree
Kosteletzkya althaeifolia (Chapm.) Rusby
Lyonia fruticosa (Michx.) G. S. Torr. Staggerbush
Kosteletzkya virginica (L.) Presl. ex Gray, Salt Marsh Mallow

Herbs

Thelypteris normalis (C. Chr.) Moxley
Pteridium aquilinum (L.) Sadebeck Bracken Fern
Woodwardia virginica (L.) Sm. Chain Fern
Mecardonia acuminata (Walt.) Small
Hyptis alata (Raf.) Shinners, Musky Mint
Tripsacum dactyloides L. Eastern Gama Grass
Panicum polycaulon Nash.
Rubus trivialis Michx. Southern Dewberry
Blechnum serrulatum Richard.
Stillingia sylvatica L. Queen's Delight
Panicum joorii Shultes
Andropogon virginicus L. Broomsedge

JEROME ROAD HAMMOCK

Herbs

Trichostema dichotomum L. Blue Curls
Elephantopus elatus Bertoni Elephant's Foot
Eupatorium aromaticum L.
Scutellaria integrifolia L. Skull Cap
Graphalium obtusifolium
Cassia fasciculata Michaux, Partridge Pea
Cirsium horridulum Michx. Purple Thistle
Eupatorium mikanioides Chapm. Semaphore Eupatorium
Pluchea rosea R. K. Godfrey Marsh Fleabane
Hedyotis procumbens (J. F. Gmel.) Fosberg, Innocence
Acalypha gracilens Gray. Three-Seeded Mercury
Erianthus giganteus (Walt.) Muhl. Sugarcane Plume Grass
Habenaria odontopetala (Reichenb. f.) Small
Eryngium prostratum Nutt. Eryngos
Cladium jamaicensis Crantz Saw Grass
Phoebanthus grandiflora (T & G) Blake
Lobélia siphilitica L. Great Lobelia
Verbena tampensis Nash Vervain
Scleria triglomerata Michaux.

Vines

Toxicodendron radicans (L.) Kuntz ssp. Poison Ivy
Vitis rotundifolia Michx. Muscadine Grape
Vitis shuttleworthii House, Calusa Grape
Parthenocissus quinquefolia (L.) Planchon. Virginia Creeper
Mikania scandens (L.) Willd. Climbing Hempweed
Ipomoea acuminata (Vahl) R & S, Morning Glory
Smilax bona-nox L. Greenbrier
Vitis aestivalis Michx. Summer Grape
Cynanchum scoparium Not. Leafless Cynanchum
Ampelopsis arborea (L.) Rusby, Pepper Vine

Epiphytes

Vittaria lineata (L.) Sm.
Phlebodium aureum (L.) Sm. Golden Polypody
Tillandsia utriculata L.
Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Polypodium polypodioides (L.) Watt, Resurrection Fern

WISCONSIN VILLAGE GRID
(Pine Flatwoods)

Trees

Pinus elliottii var. densa Little & Dorman Slash Pine

Shrubs

Serenoa repens (Bartr.) Small Saw Palmetto
Lyonia lucida (Lam.) K. Koch. Fetterbush
Lyonia fruticosa (Michx.) G.S. Torr Staggerbush
Befaria racemosa Vent. Tarflower
Myrica cerifera L. Wax Myrtle
Quercus myrtifolia Willd. Myrtle Oak
Quercus minima (Sarg.) Small Dwarf Live Oak
Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus chapmanii Sarg. Scrub Oak
Quercus pumila Walt. Running Oak
Ilex galbra (L.) Gray, Gallberry

Sub-Shrubs

Vaccinium myrsinites Larn. Shiny Blueberry
Asimina reticulata Shuttlew. ex. chapm. Paw Paw
Hypericum reductum P. Adams. St. John's Wort
Satureja rigida Bartr. ex Benth. Pennyroyal
Myrica cerifera var. pumila Michx. Dwarf Wax Myrtle
Gaylussacia dumosa (Andrews) T. & G., Dangleberry
Lechea torreyi Leggett ex Britt. Pinweed
Agalinis fasciculata (Ell.) Raf. False Foxglove

Herbs

Aristida stricta Michx. Three-Awn Grass
Aristida spiciformes Ell. Three-Awn Grass
Panicum patentifolium Nash. Panic Grass
Syngonanthus flavidulus (Michx.) Ruhland. Bantum Buttons
Lachnocaulon anceps (Walt.) Morong. Bog Button
Sericocarpus bifoliatus Michaux. White Topped Aster
Liatris tenuifolia var. laevigata (Nutt.) Robinson Blazing Star
Carphephorus corymbosus (Nutt.) T. & G.
Carphephorus odoratissimus (J. F. Gmel.) Herb.
Cacalia lanceolata Nutt. var. elliottii Kral & R.K. Godfry
Solidago microcephala (Greene) Bush. Goldenrod
Solidago fistulosa Mill. Goldenrod
Schizachyrium stoloniferum Nash.
Heterotheca graminifolia (Michx.) Shinners, Silkgrass
Pteridium aquilinum (L.) Kuhn. Bracken Fern
Andropogon virginicus L. Broom Sedge

Vines

Galactia elliottii Nutt. Milk Pea
Smilax auriculata Walt. Greenbrier

HEADQUARTERS PINE FLATWOODS (KSC HEADQUARTERS AND RT. 3)

Trees

Pinus elliottii var. densa Little & Dorman Slash Pine

Shrubs

Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus myrtifolia Willd. Myrtle Oak
Quercus chapmanii Sarg. Scrub Oak
Ximenia americana L. Tallowwood
Serenoa repens (Bartr.) Small. Saw Palmetto
Lyonia lucida (Lam.) K. Koch. Fetterbush
Befaria racemosa Vent. Tarflower
Lyonia fruticosa (Michx.) G.S. Torr. Stagerbush
Ilex glabra (L.) Gray, Gallberry
Zanthoxylum clava-herculis L. Hercules Club
Rhus copallina L. Winged Sumac
Baccharis halimifolia L. Groundsel-Tree

Dwarf Shrubs

Asimina reticulata Shuttlew. ex Chapm. Paw Paw
Quercus minima (Sarg.) Small Dwarf Live Oak
Vaccinium myrxinites Lam. Shiny Blueberry
Gaylussacia dumosa (Andrews) T. & G., Danglewood
Myrica cerifera var. pumila Michx. Dwarf Wax Myrtle
Hypericum reductum P. Adams St. John's Wort

Herbs

Pteridium aquilinum (L.) Kuhn. Bracken Fern
Selanginella arenicola Underw. Spike Moss
Aristida stricta Michaux. Three Awn Grass
Helianthemum corymbosum Michx. Frostweed
Panicum patentifolium Nash. Panic Grass
Eryngium aromaticum Baldw. Fragrant Eryngium
Schizachyrium stolonifera Nash.
Solidaga fistulosa Mill. Goldenrod
Satureja rigida Bartr. ex Benth. Pennyroyal
Lechea torreyi Leggett ex. Britt. Pinweed
Heterotheca graminifolia (Michx.) Shinners, Silk Grass
Cuthbertia ornata Small Roselings
Andropogon virginicus L. Broom Sedge
Ludwigia maritima F. Harper.
Solidago microcephala (Greene) Bush. Goldenrod

Vines

Galactia elliottii Nutt. Milk Pea
Smilax auriculata Walt. Greenbrier
Vitis rotundifolia Michx. Muscadine Grape

Epiphytes

Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss

UCF PINE FLATWOODS

Trees

Pinus palustris Mill. Southern Long-Leaf Pine
Pinus serotina Michaux. Pond Pine

Shrubs

Serenoa repens (Bartr.) Small Saw Palmetto
Lyonia fruticosa (Michx.) G. S. Torr. Staggerbrush
Lyonia lucida (Lam.) K. Koch, Fetterbush
Ilex glabra (L.) Gray, Gallberry
Quercus minima (Sarg.) Small, Dwarf Live Oak
Quercus pumila Walt. Running Oak
Myrica cerifera var. pumila Michx. Dwarf Wax Myrtle

Dwarf Shrubs

Asimina reticulata Shuttlew. ex Chapm. Paw Paw
Hypericum reductum P. Adams St. John's Wort
Hypericum tetrapetalum Lam. St. John's Wort
Vaccinium myrsinites Lam. Shiny Blueberry
Gaylussacia frondosa (L.) T. & G. Dangleberry
Gaylussacia dumosa (Andrews) T. & G. Dwarf Huckleberry
Palafoxia integrifolia (Nutt.) T. & G.

Herbs

Pterocaulon pycnostachyum (Michx.) Ell. Rabbit Tobacco
Aristida stricta Michaux. Three-Awn Grass
Aristida spiciformes Ell. Three-Awn Grass
Aster squarrosus Walter.
Andropogon virginicus L. Broom Sedge
Hedyotis procumbens (J.F. Gmel.) Fosberg, Innocence
Schrankia nuttallii
Ludwigia maritima F. Harper
Carphephorus corymbosus (Nutt.) T. & G.
Agalinis fasciculatus (Ell.) Raf. False Foxglove
Aster reticulatus Pursh, White-Topped Aster
Euphorbia polyphylla Engelm. Spurge
Xyris caroliniana Walt. Yellow Eyed Grass
Helianthemum corymbosum Michx. Frostweed
Phoebanthus grandiflorus (T & G) Blake
Scleria ciliata Michx. Not Rush
Eupatorium recurvans Small
Helianthus radula (Pursh) T & G Sunflower
Elephantopus elatus Bertoloni Elephant's Foot
Solidago microcephala (Greene) Bush. Goldenrod
Panicum ciliatum Ell. Panic Grass
Lechea sp. L. Pinweed
Panicum webberianum Nash. Panic Grass
Panicum ensifolium Baldw. ex Ell. Panic Grass

UCF PINE FLATWOODS

Herbs

Panicum webberianum Nash. Panic Grass
Amphicarpum sp Kunth. Blue Maiden Cane
Rhyncospora plumosa Ell. Beak Rush
unknown mint
Stillingia sylvatica Garden
Lachnocaulon anceps (Walt.) Morong. Bog Buttom
Solidago chapmanii T & G Goldenrod
Sporobolus junceus (Michx.) Kunth
Polygala setacea Michx. Milkwort
Rhexia nuttallii C.M. James, Meadow Beauty
Heterotheca trichophylla (Nuttal) Shinners Golden Aster
Rhynchospora fascicularis (Michaux.) Vahl. Beak Rush
Hedyotis uniflora (L.) Lam.
Liatris sp. Schneb. Blazing Starr

Vines

Smilax auriculata Walt. Greenbrier
Galactia elliottii Nutt. Milk Pea

VOLUSIA PINE FLATWOODS

Trees

Pinus elliottii var. densa Little & Dorman Slash Pine

Shrubs

Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus myrtifolia Willd. Myrtle Oak
Quercus minima (Sarg.) Small, Dwarf Live Oak
Quercus chapmanii Sarg. Scrub Oak
Serenoa repens (Bartr.) Small, Saw Palmetto
Befaria racemosa Vent. Tarflower
Ximenia americana L. Tallowwood
Lyonia lucida (Lam.) K. Koch. Fetterbush
Persea borbonia var. humilis (Nash) Kopp
Vaccinium stamineum var. caesium Greene V. Gooseberry
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia

Dwarf Shrubs

Vaccinium myrsinites Lam. Shiny Blueberry
Hypericum reductum P. Adams, St. John's Wort
Gaylussacia dumosa (Andrews) T. & G., Dangleberry
Licania michauxii Prance, Gopher Apple

Herbs

Aristida stricta Michaux. Three-Awn Grass
Lechea torreyi Leggett ex Britt. Pinweed
Eryngium aromaticum Baldw. Fragrant Eryngium
Sorghastrum secundum (Ell.) Nash, Indian Grass
Carphephorus odoratissimum (J.F. Gmel.) Herb.
Carphephorus corymbosus (Nutt.) T. & G., Prickin Pear
Opuntia miller
Tragia urens L.
Galactia elliottii Nutt. Milk Pea
Centrosema virginianum (D.C.) Benth. Butterfly Peas
Heterotheca graminifolia (Michx.) Shinners, Silk Grass
Heterotheca trichophylla (Nuttal) Shinners Golden Aster
Andropogon virginicus L. Broom Sedge
Paronychia americana (Nutt.) Fenzl ex Walp.
Cnidoscolus stimulosus (Michx.) Engelm. & Gray, Tread Softly
Rhynchosia cinerea Nash.
Heterotheca hyssopifolia (Nutt.) R. W. Long. Golden Aster
Cacalia floridana Gray
Sericocarpus bifoliatus Michaux. White Topped Aster
Lachnocaulon anceps (Walt.) Morong Bog Buttom
Pterocaulon pycnostachyum (Michx.) Ell. Rabbit Tobacco
Liatris tenuifolia var. tenuifolia Nutt. Blazing Star

Vines

Smilax auriculata Walt. Greenbrier

UCF POND PINE (FLATWOODS)

Trees

Pinus palustris Mill. Southern Long-Leaf Pine
Pinus serotina Michaux., Pond Pine
Ilex cassine L. Dahoon
Magnolia virginiana L. Sweet Bay
Nyssa sylvatica Marsh var. biflora (Walt.) Sarg. Black Gum
Gordonia lasianthus (L.) Ellis, Loblolly Bay
Persea palustris (Raf.) Sarg. Swamp Bay

Shrubs

Ilex glabra (L.) Gray, Gallberry
Myrica cerifera L. Wax Myrtle
Lyonia lucida (Lam.) K. Koch. Fetterbush
Lyonia ligustrina (L.) DC., Male-Berry
Serenoa repens (Bartr.) Small. Saw Palmetto
Lyonia fruticosa (Michx.) G.S. Torr. Staggerbush
Pyrus arbutifolia (L.) L.f.-F.
Pyrus communis L. Pear

Dwarf Shrubs

Gaylussacia frondosa (L.) T. & G., Dangleberry
Aster reticulatus Pursh, White-top Aster
Vaccinium myrsinites Lam. Shiny Blueberry

Herbs

Andropogon virginicus L. Broom Sedge
Aristida stricta Michaux. Three-Awn Grass
Sarracenia minor Walter, Hooded-Pitcher-Plant
Rhynchospora ciliaris (Michaux.) Mohr. Beak Rush
Eupatorium aromaticum L. Dog Fennel
Scleria triglomerata Michx. Nut Rush
Sporobolus floridanus Chapm. Dropseed
Rhexia nuttallii C.M. James, Meadow Beauty
Mitchellia repens L., Partridge Berry
Eriocaulon compressum Lam. Hat Pins
Pteridium aquilinum (L.) Kuhn. Bracken Fern
Osmunda cinnamonea L., Cinnamon Fern
Woodwardia virginica (L.) Smith, Virginia Chain Fern

Vines

Vitis rotundifolia Michx. Muscadine Grap
Smilax laurifolia L. Bamboo Vine
Galactia elliottii Nutt. Milk Pea

SAND PINE SCRUB - UCF CAMPUS

Trees

Pinus clausa (Engelm.) Sarg. Sand Pine

Shrubs

Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus myrtifolia Willd. Myrtle Oak
Quercus chapmanii Sarg. Scrub Oak
Ilex ambigua (Michx.) Chapm. Holly
Vaccinium stamineum var. caesium Green. Gooseberry
Serenoa repens (Bartr.) Small Saw Palmetto
Osmanthus americanus (L.) Gray, Wild Olive
Ceratiola ericoides Michx. Rosemary
Garberia heterophylla
Persea borbonia var. humilis (Nash.) Kopp. Redbay
Befaria racemosa Vent. Tarflower
Gaylussacia frondosa (L.) T. & G. Dangle Berry
Clinopodium coccineum
Polygonella polygama (Vent.) Engelm. & Gray Jointweed
Bumelia reclinata (Michx.) Vent. var. reclinata Milk Buckthorn
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia

Dwarf Shrubs

Palafoxia feayi Gray
Gaylussacia dumosa (Andrews) T. & G. Dwarf Huckleberry
Licania michauxii Prance, Gopher Apple
Vaccinium myrsinites Lam. Shiny Blueberry

Herbs

Selaginella arenicola Undew. Spike Moss
Rhynchospora megalocarpa Gray, Beak Rush
Opuntia compressa (Salisb.) Macbride, Prickly Pear
Panicum patentifolium Nash. Panic Grass
Bulbostylis ciliatifolia (Ell.) Fern.
Seymeria pectinata (Pursh.) Kuntze
Aristida stricta Michaux. Threen Awn Grass

Vines

Galactia elliottii Nutt. Milk Peas
Smilax auriculata Walt. Greenbrier

Epiphytes

Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss

SAND PINE SCRUB - DEBARY

Trees

Pinus clausa (Engelm.) Sarg. Sand Pine

Shrubs

Serenoa repens (Bartr.) Small Saw Palmetto
Quercus myrtifolia Willd. Myrtle Oak
Quercus chapmanii Sarg. Scrub Oak
Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Persea borbonia var. humilis (Nash.) Kopp. Redbay
Ilex ambigua (Michx.) Chapm. Holly
Asimina obovata (Willd.) Nash
Osmanthus americanus (L.) Gray, Wild Olive
Vaccinium stamineum var. caesium Greene, Gooseberry
Carya floridana Sarg. Scrub Hickory
Sabal etonia Swingle ex Nash, Scrub Palmetto

Dwarf Shrubs

Vaccinium myrsinites Lam. Shiny Blueberry
Gaylussacia frondosa (L.) T. & G. Dangleberry
Licania michauxii Prance, Gopher Apple

Herbs

Rhynchospora megalocarpa Gray, Beak Rush
Andropogon virginicus L. Broom Sedge
Heterotheca graminifolia (Michx.) Shinners, Silk Grass
Solidago fistulosa Mill. Golden Rod
Cnidoscolus stimulosus (Michx.) Engelm. & Gray Tread Softly
Panicum nitidum Lam. Panic Grass

Vines

Galactia elliottii Nutt. Milk Pea
Galactia volubilis (L.) Britt. Milk Pea
Smilax pumila Walter, Greenbrier
Smilax auriculata Walt. Greenbrier
Vitis rotundifolia Michx. Muscadine Grape

Epiphytes

Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Polypodium polypodioides (L.) Walt. Resurrection Fern

SAND PINE SCRUB - ROUTE 50

Trees

Pinus clausa (Engelm.) Sarg. Sand Pine

Shrubs

Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus chapmanii Sarg. Scrub Oak
Quercus myrtifolia Willd. Myrtle Oak
Serenoa repens (Bartr.) Small Saw Palmetto
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Garberia heterophylla
Osmanthus americanus (L.) Gray, Wild Olive
Palafoxia integrifolia Nutt. T. & G.
Vaccinium stamineum var. caesium Green Gooseberry
Ceratiola ericoides Michx. Rosemary
Clinopodium coccinea
Polygonella polygama (Vent.) Engelm & Gray Jointweed
Lyonia lucida (Lam.) K. Koch, Shiny Lyonia, Fetterbush

Dwarf Shrubs

Gaylussacia dumosa (Andrews) T. & G. Dwarf Huckleberry
Licania michauxii Prance, Gopher Apple
Vaccinium myrsinites Lam. Shiny Blueberry
Myrica cerifera var. pumila

Herbs

Selaginella arenicola Undew. Spike Moss
Liatris tenuifolia Nutt. Blazing Star
Rhynchospora megalocarpa Gray, Beak Rush
Opuntia compressa (Salisb.) Macbride, Prickly Pear
Bulbostylis ciliatifolia (Ell.) Fern.
Monotropa uniflora Small. Indian Pipes
Andropogon virginicus L. Broom Sedge
Lechea cernua Small Pinweed
Seymeria pectinata (Pursh) Kuntze
Aristida intermedia
Aristida stricta Michaux. Three-Awn Grass
Euphorbia polyphylla Engelm. Spurge
Panicum chamaelonche Trin. Panic Grass
Panicum nitidum Lam. Pinic Grass
Heterotheca graminifolia (Michx.) Shinners, Silk Grass

Vines

Galactia elliottii Nutt. Milk Peas
Smilax auriculata Walt. Greenbrier

Epiphytes

Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Tillandsia fasciculata Sw.

SAND PINE SCRUB - ROUTE 405

Trees

Pinus clausa (Engelm.) Sarg. Sand Pine

Shrubs

Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus myrtifolia Willd. Myrtle Oak
Quercus chapmanii Sarg. Scrub Oak
Vaccinium stamineum var. caesium Green Gooseberry
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Serenoa repens (Bartr.) Small Saw Palmetto
Carya floridana Sarg. Scrub Hickory
Ximenia americana L. Tallowwood
Ceratiola ericoides Michx. Rosemary
Persea borbonia var. humilis (Nash.) Kopp. Redbay
Asimina sp. Adans.

Dwarf Shrubs

Licania michauxii Prance, Gopher Apple
Vaccinium myrsinites Lam. Shiny Blueberry

Herbs

Rhynchospora megalocarpa Gray, Beak Rush
Cyperus nashii Britt. Galingale
Liatris tenuifolia Nutt. Blazing Star
Opuntia compressa (Salisb.) Macbride Prickly Pear

Epiphytes

Tillandsia usnesoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss

SAND PINE SCRUB - ROCKLEDGE

Trees

Pinus clausa (Engelm.) Sarg. Sand Pine

Shrubs

Quercus virginiana Mill. var. virginiana Live Oak
Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus chapmanii Sarg. Scrub Oak
Quercus myrtifolia Willd. Myrtle Oak
Carya floridana Sarg. Scrub Hickory
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Lyonia lucida (Lam.) K. Koch. Shiny Lyonia, Fetterbush
Vaccinium stamineum var. caesium Green. Gooseberry
Ximenia americana L. Tallowwood
Serenoa repens (Bartr.) Small Saw Palmetto
Myrica cerifera L. Wax Myrtle

Dwarf Shrubs

Palafoxia integrifolia (Nutt.) T. & G.
Vaccinium myrsinites (Lam.) Shiny Blueberry

Herbs

Rhynchospora megalocarpa Gray, Beak Rush
Panicum sp. Panic Grass
Opuntia compressa (Salisb.) Macbride, Prickly Pear
Selaginella arenicola Undew. Spike Moss
Monotropa brittonii Small. Indian Pipes
Unknown grass
Unknown sedge

Vines

Smilax auriculata Walt. Greenbrier
Parthenocissus quinquefolia (L.) Planchon, Virginia Creeper
Vitis rotundifolia Michx. Muscadine Grape
Galactia elliottii Nutt. Milk Pea

Epiphytes

Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss
Tillandsia fasciculata Sw.
Tillandsia utriculata L.

SAND PINE SCRUB - WEKIVA

Trees

Pinus clausa (Engelm.) Sarg. Sand Pine

Shrubs

Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus myrtifolia Willd. Myrtle Oak
Quercus chapmanii Sarg. Scrub Oak
Ilex ambigua (Michx.) Chapm. Holly
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Garbaria heterophylla
Gaylussacia frondosa (L.) T. & G. Dangleberry
Vaccinium stamineum L. Gooseberry
Serenoa repens (Bartr.) Small Saw Palmetto
Castanea pumila? (L.) Miller, Chinkapin

Dwarf Shrubs

Licania michauxii Prance, Gopher Apple
Gaylussacia dumosa (Andrews) T. & G. Dwarf Huckleberry

Herbs

Unknown sedge
Unknown legume
Panicum sp. Panic Grass

Vines

Smilax auriculata Walt. Greenbrier
Unknown legume

Epiphytes

Tillandsia usnesoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss

COASTAL SCRUB - DUNE SCRUB GRID (CAPE CANAVERAL)

Shrubs

Ceratiola ericoides Michx. Rosemary
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus myrtifolia Willd. Myrtle Oak
Ximenia americana L. Tallowwood
Quercus chapmanii Sarg. Scrub Oak
Polygonella polygama (Vent.) Engelm. & Gray Jointweed
Serenoa repens (Bartr.) Small Saw Palmetto

Dwarf Shrubs

Vaccinium myrsinites Lam. Shiny Blueberry
Myrica cerifera var. pumila (Michx.) Small Dwarf Wax Myrtle
Licania michauxii Prance, Gopher Apple

Herbs

Seymaria pectinata (Pursh) Kuntze

Vines

Cassytha filiformis L. Love Vine
Galactia elliotii Nutt. Milk Peas
Smilax auriculata Walt. Greenbrier

Epiphytes

Tillandsia usneoides L. Spanish Moss
Tillandsia recurvata L. Ball Moss

COASTAL SCRUB - HAPPY CREEK

Shrubs

Quercus myrtifolia Willd. Myrtle Oak
Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus chapmanii Sarg. Scrub Oak
Lyonia lucida (Lam.) K. Koch, Shiny Lyonia, Fetterbush
Lyonia fruticosa (Michx.) G. S. Torr. Staggerbush
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Vaccinium stamineum var. caesium Green, Gooseberry
Polygonella polygama (Vent.) Engelm. & Gray. Jointweed
Befaria racemosa Vent. Tarflower
Serenoa repens (Bartr.) Small Saw Palmetto
Ximenia americana L. Tallowwood

Dwarf Shrubs

Vaccinium myrsinites Lam. Shiny Blueberry
Gaylussacia dumosa (Andrews) T. & G. Dwarf Huckleberry
Myrica cerifera var. pumila (Michx.) Small Dwarf Wax Myrtle
Licania michauxii Prance Gopher Apple
Yucca filamentosa L. Bear Grass

Herbs

Panicum patentifolium Nash
Rhynchospora megalocarpa Gray Beak Rush
Aristida stricta Michaux. Three Awn Grass
Carphephorus corymbosus (Nutt.) T. & G.
Polygala polygama Walt. Milkwort
Heterotheca graminifolia (Michx.) Shinners, Silk Grass

Vines

Galactia elliottii Nutt. Milk Peas
Smilax auriculata Walt. Greenbrier

COASTAL SCRUB - ROUTE 3

Shrubs

Quercus chapmanii Sarg. Scrub Oak
Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus myrtifolia Willd. Myrtle Oak
Befaria racemosa Vent. Tarflower
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Serenoa repens (Bartr.) Small Saw Palmetto
Polygonella polygama (Vent.) Engelm. & Gray Jointweed
Vaccinium arboreum Marshall, Sparkleberry
Lyonia lucida (Lam.) K. Koch, Shiny Lyonia; Fetterbush
Ilex ambigua (Michx.) Chapm. Holly
Persea borbonia var. borbonia (L.) Spring, Red Bay
Ximenia americana L. Tallowwood
Vaccinium stamineum var. caesium Green, Gooseberry

Dwarf Shrubs

Gaylussacia dumosa (Andrews) T. & G. Dwarf Huckleberry
Myrica cerifera var. pumila (Michx.) Small, Dwarf Wax Myrtle
Vaccinium myrsinites Lam. Shiny Blueberry
Licania michauxii Prance, Gopher Apple

Herbs

Aristida spiciformis Ell. Three-Awn Grass
Aristida stricta Michaux. Three-Awn Grass
Liatris tenuifolia Nutt. Blazing Star
Panicum nitidum Lam.
Rhynchospora megalocarpa Gray Beak Rush
Heterotheca graminifolia (Michx.) Shinners, Silk Grass
Andropogon virginicus L. Broom Sedge

Vines

Galactia elliottii Nutt. Milk Pea
Smilax auriculata Walt. Greenbrier

Epiphytes

Tillandsia recurvata L. Ball Moss
Tillandsia usneoides L. Spanish Moss

COASTAL SCRUB - GROUND WINDS TOWER

Trees

Pinus clausa (Engelm.) Sarg. Sand Pine

Shrubs

Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Quercus chapmanii Sarg. Scrub Oak
Quercus myrtifolia Willd. Myrtle Oak
Serenoa repens (Bartr.) Small Saw Palmetto
Befaria racemosa Vent. Tarflower
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Lyonia fruticosa (Michx.) G.S. Torr Staggerbush
Lyonia lucida (Lam.) K. Koch. Fetterbush, Shiny Lyonia
Ximenia americana L. Tallowwood
Vaccinium stamineum var. caesium Green, Gooseberry
Myrica cerifera L. Wax Myrtle
Polygonella polygama Walt. Milkwort

Dwarf Shrubs

Gaylussacia dumosa (Andrews) T. & G. Dwarf Huckleberry
Vaccinium myrsinites Lam. Shiny Blueberry
Ilex vomitoria Ait. Yaupon
Hypericum reductum P. Adams St. John's Wort
Petalastemon feayi Chapm. Prairie Clover
Licania michauxii Prance, Gopher Apple

Herbs

Bulbostylis ciliatifolia (Ell.) Fern.
Andropogon virginicus L. Broom Sedge
Rhynchospora megalocarpa Gray Beak Rush
Heterotheca sp. Michx.
Paronychia americana (Nutt.) Fenzl. ex Walp
Eryngium aromaticum Baldw. Fragrant Eryngium
Lechea torreyi Leggett ex Britton Pinweed
Seymeria pectinata (Pursh) Kuntze
Tillandsia recurvata L. Ball Moss
Tillandsia fasciculata Sw.
Panicum patentifolium Nash
Aristida stricta Michaux. Three-Awn Grass

Liatris tenuifolia var. laevigata (Nutt.) Robinson Blazing Star
Pteridium aquilinum (L.) Kuhn Bracken Fern
Lachnocaulon minus (Chapm.) Small Bog Buttons
Satureja rigida Bartr. ex Benth. Pennyroyal

Vines

Smilax auriculata Walt. Greenbrier
Galactia volubilis (L.) Britt Milk Pea

COASTAL SCRUB - CAPE ROSEMARY

Shrubs

Ceratiola eridoides Michx. Rosemary
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Serenoa repens (Bartr.) Small Saw Palmetto
Ximenia americana L. Tallowwood
Quercus chapmanii Sarg. Scrub Oak
Quercus myrtifolia Willd. Myrtle Oak
Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak
Polygonella polygama (Vent.) Engelm. & Gray Jointweed

Dwarf Shrubs

Licania michauxii Prance. Gopher Apple
Vaccinium myrsinites Lam. Shiny Blueberry

Vines

Galactia elliottii Nutt. Milk Peas

COASTAL SCRUB - COMPLEX 34

Trees

Quercus virginiana var. virginiana Mill. Live Oak
Quercus virginiana var. maritima (Michx.) Sarg. Sand Live Oak

Shrubs

Quercus myrtifolia Willd. Myrtle Oak
Lyonia ferruginea (Walt.) Nutt. Rusty Lyonia
Serenoa repens (Bartr.) Small. Saw Palmetto
Myrica cerifera L. Wax Myrtle

Vines

Smilax auriculata Walt. Greenbrier
Vitis rotundifolia Michx. Muscadine Grape

BEACH GRID (CAPE CANAVERAL) - ZONE 2

Shrubs

Serenoa repens (Bartr.) Small Saw Palmetto
Coccoloba uvifera (L.) L. Sea Grape
Bumelia tenax (L.) Willd. Tough Buckthorn
Chiococca alba (L.) Hitche. Snowberry

Dwarf Shrubs

Licania michauxii Prance, Gopher Apple
Phyllanthus abnormis Baillon
Croton punctatus Jacq.

Herbs

Polygala grandiflora Walt. Milkwort
Uniola paniculata L. Sea Oats
Opuntia compressa (Salisb.) Macbride, Prickly Pear
Cnidoscolus stimulosus (Michx.) Engelm & Gray, Tread Softly
Heterotheca subaxillaris (Lam.) Britt & Rusby Golden Aster
Chloris petraea Sw. Finger Grass
Andropogon virginicus L. Broom Sedge
Chamaesyce maculata (L.) Small Spurge
Syngonanthus flavidulus (Michx.) Ruhland Bantum Buttons
Commelina diffusa Burm. f. Day Flower

Vines

Smilax auriculata Walt. Greenbrier
Ipomoea stolonifer (Cyr.) J.F. Gmel.
Strophostyles helvola (L.) Ell.
Galactia volubilis (L.) Britt Milk Pea

LC 39-B BEACH SITE

Shrubs

Scaevola plumieri (L.) Vahl. Goodenia
Atriplex arenaria Nutt. Sand Atriplex
Coccoloba uvifera (L.) L. Sea Grape
Yucca aloifolia L. Spanish Bayonet
Lantana camara L. Shrub Verbena

Dwarf Shrubs

Croton punctatus Jacq.

Herbs

Uniola paniculata L. Sea Oats
Heterotheca subaxillaris (Larn.) Britt & Rusby Golden Aster
Panicum amarulum Hitchc. & Chase, Beach Grass
Ipomoea stolonifera (Cyr.) J.F. Gmel.
Opuntia compressa (Salisb.) Macbride, Prickly Pear
Cenchrus incertus M.A. Curtis Sandbur
Spartina patens (Ait.) Muhl. Slender Cordgrass
Hydrocotyle bonariensis Lam. Water Penny Wort
Unknown Asteraceae

BEACH GRID (CAPE CANAVERAL) - ZONE 1

Shrubs

Scaevola plumieri (L.) Vahl. Goodenia
Atriplex arenaria Nutt. Sand Atriplex
Serenoa repens (Bartr.) Small. Saw Palmetto
Bumelia tenax (L.) Willd. Tough Buckthorn
Coccoloba uvifera (L.) L. Sea Grape
Caesalpinia bonduc Roxb. Yellow Nicker
Yucca aloifolia L. Spanish Bayonet

Dwarf Shrubs

Croton punctatus Jacq.
Phyllanthus abnormis Baillon
Licania michauxii Prance, Gopher Apple

Herbs

Uniola paniculata L. Sea Oats
Heterotheca subaxillaris (Lam.) Britt. & Rusby Golden Aster
Panicum amarulum Hichc. & Chase, Beach Grass
Polygala grandiflora Walt. Milkwort
Ipomoea stolonifer (Cyr.) J.F. Gmel.
Ipomoea pes-caprae (L.) Browne Rail Road Vine
Opuntia compressa (Salisb.) Macbride, Prickly Pear
Canavalia rosea Adans. Bay Bean
Sporobolus virginicus L. Broom Sedge
Sesuvium maritimum (Walt.) BSP, Sea Purslane
Hymenocallis latifolia (Mill.) Roem, Spider Lily
Cenchrus incertus M.A. Curtis Sandbur
Chloris petraea Sw. Finger Grass
Chamaesyce maculata (L.) Small. Spurge
Spartina patens (Ait.) Muhl. Slender Cordgrass
Hydrocotyle bonariensis Lam. Water Pennwort
Cakile fusiformis Greene. Sea Rocket
Andropogon virginicus L. Broom Sedge
Paspalum vaginatum Sw.
Cnidoscolus stimulosus (Michx.) Engelm. & Gray - Tread Softly
Physalis viscosa var. maritima (M.A. Curtis) Waterfall
Commelina diffusa Burm. f. Pay Flower

BEACH GRID (CAPE CANAVERAL) - ZONE 3

Shrubs

Coccoloba uvifera (L.) L. Sea Grape
Serenoa repens (Bartr.) Small Saw Palmetto
Myrica cerifera L. Wax Myrtle
Bumelia tenax (L.) Willd. Tough Buckhorn
Chiococca alba (L.) Hitchc.
Yucca aloifolia L. Spanish Bayonet
Sabal palmetto (Walt.) Lodd. ex Shultes, Cabbage Palm
Erythrina herbacea L. Coral Beans
Quercus virginiana Mill. var. virginiana Live Oak
Myrcianthes fragrans (Sw.) McVaugh
Myrsine guianensis (Aubl.) Kuntze
Lantana camara L. Shrub Verbena

Sub-Shrubs

Phyllanthus abnormis Baillon
Trichostema suffrutescens Kearney Blue Curls
Cassia fasciculata Michaux, Partridge Pea
Licania michauxii Prance, Gopher Apple

Herbs

Opuntia compressa (Salisb.) Macbride Prickly Pear
Chamaesyce maculata L. Small
Strophostyles helvola (L.) Ell.
Cnidoscolus stimulosus (Michx.) Engelm. & Gray, Tread Softly Plants
Mikania cordifolia (L.) Willd. Climbing Hempweed
Gilia rubra (L.) Heller
Galium hispidulum Michx. Bedstraw
Solidago fistulosa Mill. Goldenrod
Commelina diffusa Burm. f. Dayflower
Chloris petraea Sw. Bermuda Grass

Vines

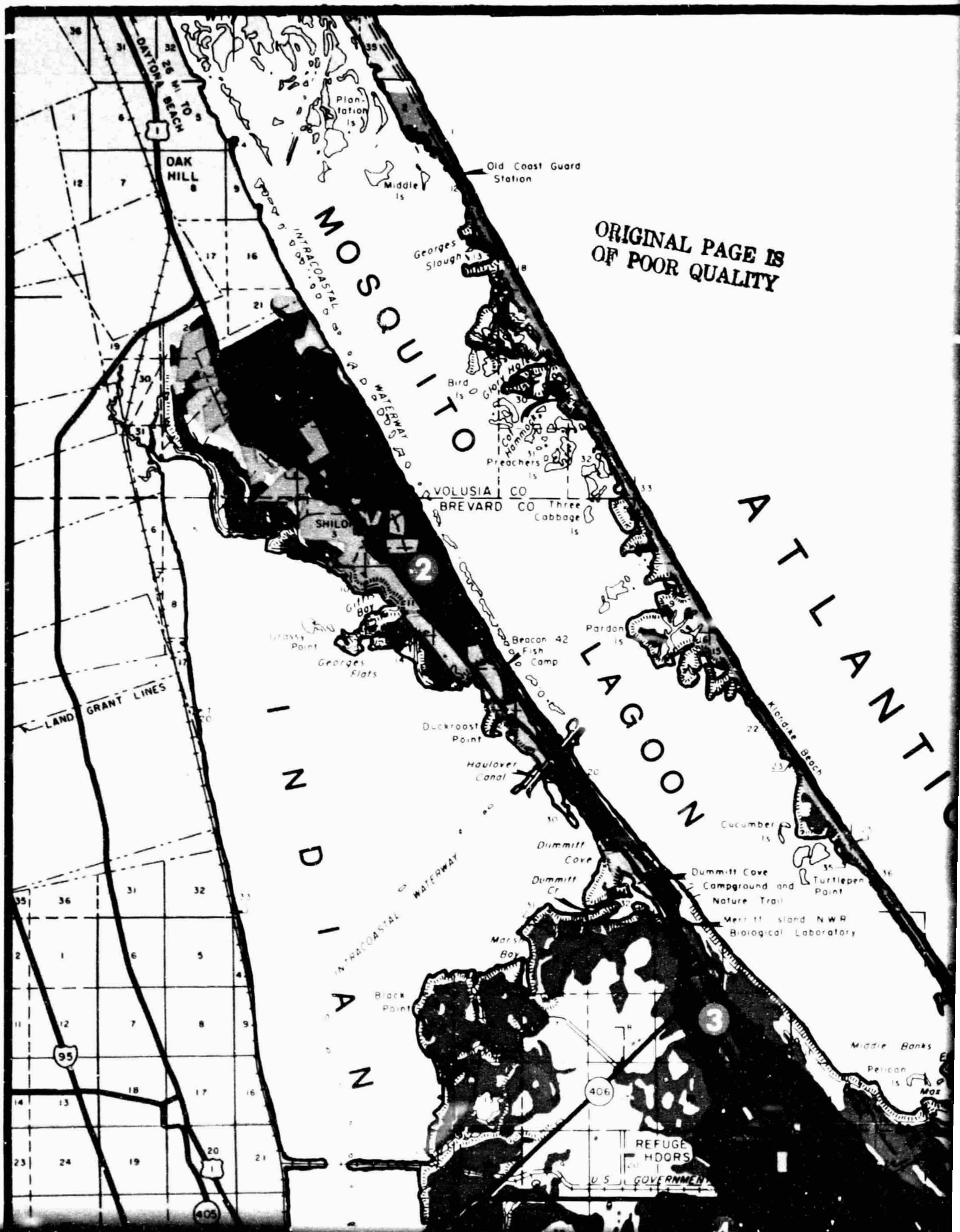
Smilax auriculata Walt. Greenbriers

COASTAL STRAND - CAPE CANAVERAL

Shrubs

Serenoa repens (Bartr.) Small Saw Palmetto
Myrcianthes fragrans (Sw.) McVaugh
Myrica cerifera L. Wax Myrtle
Chiococca alba (L.) Hitch.
Bumelia tenax (L.) Willd. Tough Buckhorn
Zanthoxylum clava-herculis L. Hercules Club
Forestiera segregata (Jacq.) Krug & Urban, Florida Privet

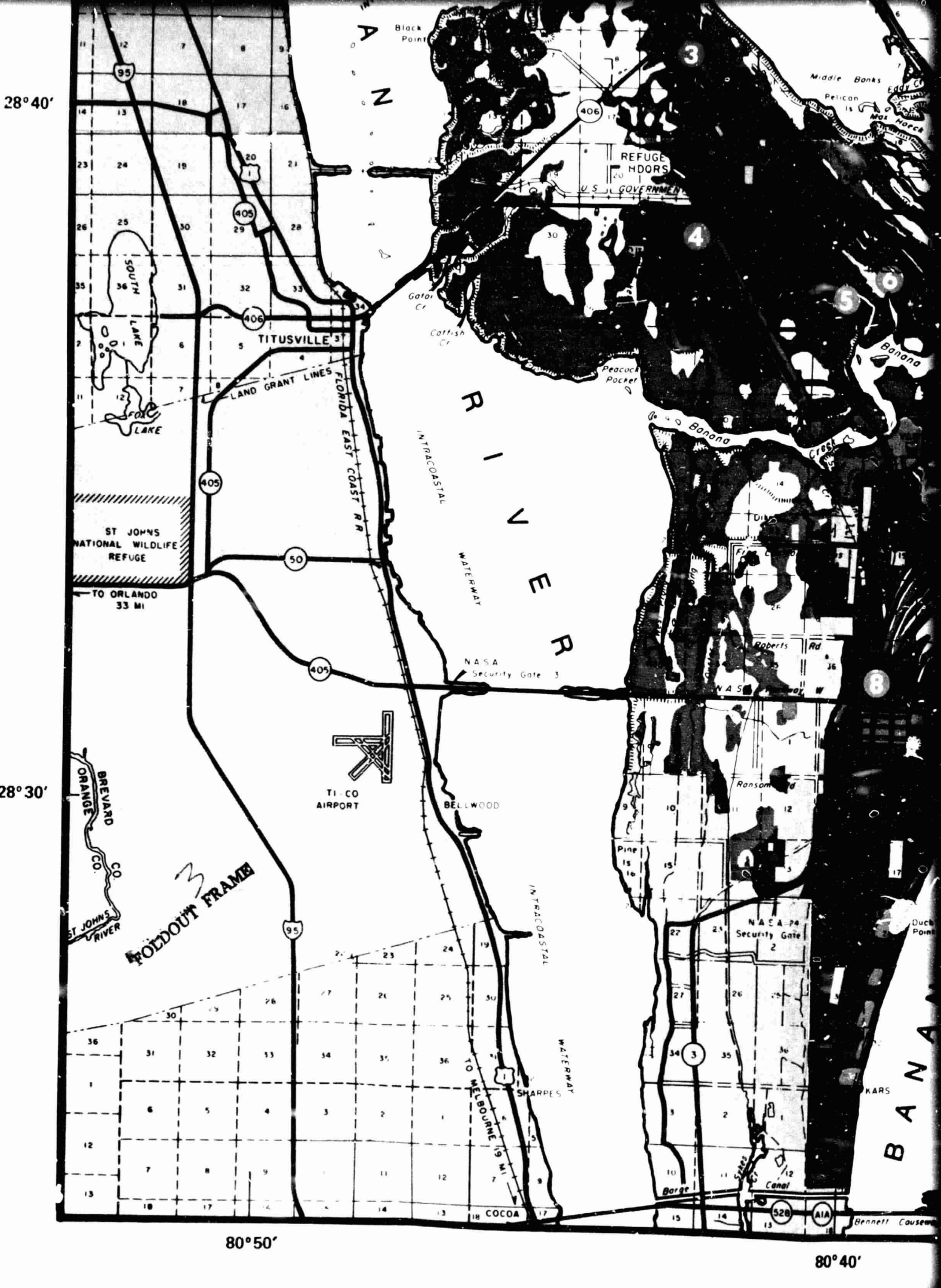
Major Vegetation Types on ... Space Center and Ca...



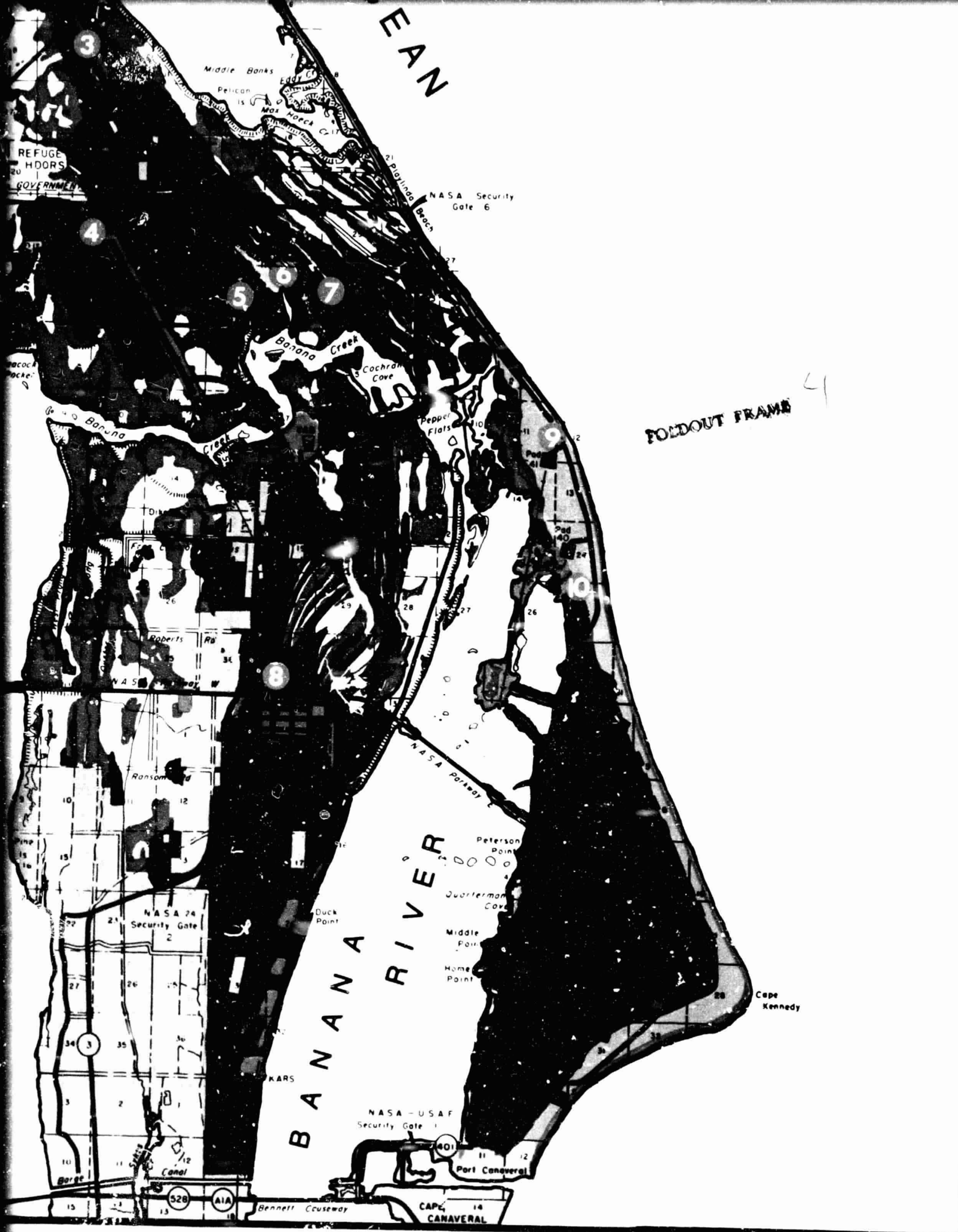
Types on the John F. Kennedy
er and Canaveral Peninsula

OCEAN OR LAGOON
INLAND WATER, MOSQUITO IMPOUNDMENT
ADJACENT LAND AREAS
COASTAL DUNE
COASTAL STRAND
COASTAL SCRUB
FLATWOODS
HAMMOCKS
MARSH (WETLANDS - NONWOODY COVER)
SWAMP (WETLANDS - WOODY COVER)
GROVES
ROADS, FACILITIES
RUDERAL
DIKES
RAILROADS
REFERENCE STANDS (SEE REVERSE)

SOURCE: DR. I. J. STOUT
UNIVERSITY OF CENTRAL FLORIDA
KSC CONTRACT NAS 10-8986



28°40′
28°30′
80°50′
80°40′
Black Point
Middle Banks
Pelican Is
REFUGE HDQRS
U.S. GOVERNMENT
TITUSVILLE
SOUTH LAKE
FOX LAKE
LAND GRANT LINES
FLORIDA EAST COAST R R
INTRACOASTAL WATERWAY
R I V E R
Gator Cr
Catfish Cr
Peacock Pocket
Banana Creek
Banana
ST JOHNS NATIONAL WILDLIFE REFUGE
TO ORLANDO 33 MI
NASA Security Gate 3
TI-CO AIRPORT
BELLWOOD
BREVARD CO.
ORANGE CO.
ST JOHNS RIVER
FOLDOUT FRAME
NASA 24 Security Gate 2
Roberts Rd
Ransom Rd
Pine
TO MELBOURNE 19 MI
SHARPES
COCOA
Barge Canal
Bennett Causeway
Duck Point
B A N A



FOLDOUT FRAME 4

80°40'

80°30'

COMMUNITY CLASSIFICATION

The distribution of major plant community types on Merritt Island and Cape Canaveral appears as a complex mosaic. Upland communities are classified as: hammocks, pine flatwoods, coastal scrub, coastal strand, and coastal dunes. Citrus groves are also designated among the upland sites. Wetlands are noted as of two general types, wetlands dominated by woody plants (swamp) and wetlands dominated by nonwoody plants (marsh).

Hammocks are forests primarily dominated by broad-leafed evergreen trees. A well-developed tree layer, usually consisting mostly of live oak and Sabal palm, is always present. A shrub layer varying in height from 0.5 to 3 meters is present. An herb layer may or may not be well developed; however, some herbaceous plants are always present.

Flatwoods are usually dominated by a tree layer of slash pine. However, in areas such as the central portion of the island, the tree layer may be absent. The shrub layer is dominated by saw palmetto but has several additional woody plant species. A well-developed herb layer is present.

Coastal Scrub is an impenetrable thicket of woody plants dominated by myrtle oak. It appears as one layer varying in height from 1 to 3 meters. Little herb layer vegetation is present.

Coastal Strand is a dense thicket of woody plants usually dominated by saw palmetto. Its profile is a single layer from 1 to 4 meters in height; the shrubs on the eastern margin usually are hedged by the salt spray.

Coastal Dune is a single layer of grass, herbs, and dwarf shrubs and is confined to the front of the primary dunes. It exists completely within the salt spray zone, and sea oats is the most obvious species present.

Citrus Groves are the only agricultural areas that exist within the KSC boundaries.

Swamps (wetlands - woody cover) are areas adjacent to the marshes and are characterized by woody shrubs and trees. The mangroves are included within the vegetation type.

Marshes (wetlands - nonwoody cover) are extensive areas of grass and herbs which occur in soils saturated with water. Spartina marsh is a major constituent of this vegetation type. During wet times of the year, some of these areas are covered with standing water.

Ruderal are disturbed areas around structures and facilities and are maintained by man. They are predominantly composed of cultivated grasses, herbs, and in some cases, shrubs and trees.

REFERENCE STANDS

Ten permanent vegetation stands representing the major vegetation types on Merritt Island were selected and extensively sampled over a 3-year period. Species detail within these stands gives a good indication of the vegetation which actually occupies the island.

1. Volusia Pineland (north of KSC boundary and not included on this map) has a mixture of 29 species; five of the six leading dominants are shrubs (i.e., fetterbush and oak). Slash pine is the primary overstory species and wire grass dominates the herb layer.

2. Juniper Hammock has a relatively low number of plant species. The herb layer is dominated by sedges and grasses. The tree and shrub layers consist mostly of holly, *Sabal* palm, hickory, live oak, and juniper.

3. Route 3 Hammock has a relatively large number (63) of plant species. Wild coffee, Virginia creeper, poison ivy, muscadine, and greenbrier are major contributors to the shrub layer. Live oak and *Sabal* palm dominate the tree layer. *Oplismenus* is the principal constituent of the herb layer.

4. Wisconsin Village has a lack of pronounced dominance among its 37 species. A single large slash pine exists in the area along with several seedlings. Wire grass, fetterbush, saw palmetto, and dwarf live oak are the most common plants at the site.

5. Route 3 Scrub contains 27 different species. Myrtle oak, blueberry, and saw palmetto are the dominant species. Most of the species are typical scrub species, but a few are characteristic of flatwoods (i.e., fetterbush and tarflower).

6. Happy Creek Scrub is conspicuously dominated by myrtle oak. Other shrubs which are prominent are fetterbush, huckleberry, and blueberry. Wire grass dominates the herb layer and tarflower, a plant characteristic of flatwoods, is common.

7. Happy Hammock has the most numerous (76) species of all the stands examined. The herb layer is poorly developed and is largely dominated by ferns and grasses. A dense shrub layer is present and is predominantly wild coffee and *Myrsine*. The tree dominants are *Sabal* palm, lancewood, and live oak.

8. Headquarters Pineland is a fairly typical flatwoods area which has a sparse overstory of slash pine. The shrub vegetation is dominated by saw palmetto, fetterbush, scrub live oak, and myrtle oak. Wire grass and tarflower are the primary herb species.

9. Beach Grid is a primary dune community dominated by sunflowers, *Heterotheca subaxillaris*, and sea oats. Most of the 26 species found in the area are herbs. Other common herbs are several grasses, sand *Atriplex*, morning glory vines, and *Croton*.

10. Dune Scrub Grid has myrtle and live oak as the dominant species. The shrub layer is very dense and, in addition to the above 2 species, is primarily composed of saw palmetto, rosemary, blueberry, and fetterbush.

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15. Abstract

The Terrestrial Community Analysis report is composed of two separate studies. The first was conducted on vegetation in or around the Merritt Island area. Thirty sites were selected for this study from plant communities which were relatively free of logging, grazing, and clearing operations. The vegetation analysis was designed to yield a quantitative description and ecological explanation of the major types of upland vegetation in order to determine the possible future effects of NASA space activities on them. The second study was conducted on small mammal populations on Merritt Island. Changes in their relative abundance, species diversity, standing crop biomass, reproductive activity and other demographic features were documented during the study period. The objective of the research was to gather sufficient information on these populations so that it would be possible later to detect even the smallest non-natural behavior changes in the mammals which might be attributable to NASA space activities.

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