PROCEEDINGS

OF

THE FIRST SYMPOSIUM

ON

THE BOTANY OF THE BAHAMAS

JUNE 11-14, 1985

College Center of the Finger Lakes

Bahamian Field Station

San Salvador, Bahamas

Editor

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Printed by Don Heuer
in the United States of America

THE PALMS OF SAN SALVADOR ISLAND, THE BAHAMAS

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Introduction

Palms are woody monocotyledons of the family Arecaceae (Palmae) in the order Arecales. They are a natural group of plants with a characteristic appearance that enables most people to recognize them without difficulty.

Palms are an ancient life form with fossil records from the Eocene period. Being composed of nondurable materials, palms do not leave good fossil records and probably existed before this time.

Palms have been regarded as being "Princes" among plants and were labeled such (as Principes) by the Swedish botanist Carl von Linnaeus, the father of the modern binomial system of plant nomenclature. He recognized palms as a distinct group of plants and described several species. Principes is the name of the quarterly journal of the Palm Society (Jones, 1984).

In the literature the estimate of the number of palms varies from 2500 to 3500 in 210 to 236 genera. A more accurate modern estimation is probably about 2800 species in 212 genera. Additional species are being discovered and described even today. The variation in numbers arises because of disagreements among botanists on the delimitations of species and genera (Jones, 1984)

Palms are a fairly complex group of plants with numerous variations around a basic theme. Although there have been attempts to classify them, most have been unsatisfactory and have

caused unnecessary confusion. Fortunately in recent years there has been an intensive study of palms carried out both in the laboratory and in the field. Chief among these researchers was the late Dr. H. E. Moore Jr. of the L. H. Bailey Hortorium at Cornell University. Dr. Moore devoted his life to the study of palms and has presented a classification published in 1973 entitled The Major Groups of Palms and their Distribution. This system of palm classification was directed toward a better understanding of the evolution of palms and attempts to place genera in a system of classification that expresses relationships more clearly than previous systems. The classification was based upon first hand acquaintance with the species in the field. This enabled the author to describe some structures of the plant such as the inflorescence (flower cluster) that might not have been seen in the herbarium. This information along with the valuable work in anatomy described by his colleague Dr. Natalie Uhl, in addition to cytological studies, has led to the classification presented by Dr. Moore.

A culmination of the work begun by Hal Moore is being compiled by Drs. Uhl and Dransfield. Entitled Genera Palmarum it will be published by the Palm Society at the end of this year.

Palms of San Salvador

Of the 15 major groups of palms described by Moore, 3 groups are represented on San Salvador Island, Bahamas (Tables 1 and 2). In order to be able to recognize the various palm species one must be familiar with their distinguishing characteristics (Table 3, Blomberry and Rodd, 1984). The first major feature to consider when characterizing a palm is the type of trunk it

TABLE I

PRELIMINARY ARRANGEMENT OF GROUPS OF PALMS ACCORDING TO ASCENDING LEVELS OF SPECIALIZATION (AFTER MOORE 1973)

I CORYPHOID PALMS
II PHOENICOID PALM
III BORASSOID PALMS
IV LEPIDOCARYOID PALMS
V NYPOID PALMS
VI CARYOTOID PALMS
VII PSEUDOPHENICOID PALMS
VIII CEROXYLOID PALMS
IX CHAMAEDOREOID PALMS
X IRIARTEOID PALMS
XI PODOCOCCOID PALMS
XII ARECOID PALMS
XIII COCOSOID PALMS
XIV GEONOMOID PALMS
XV PHYTELEPHANTOID PALMS

Groups Represented on San Salvador Island, Bahamas

TABLE 2

PALMS OF SAN SALVADOR ISLAND

GROUP	GENUS	COMMON NAME
CORYPHOID	Coccothrinax argentata	Silver Thatch Silver-Top Bay-Top
	C. inagensis	
	Thrinax morrisii	Small Fruited Thatch-Palm Buffalo-Top Brittle-Thatch Palm
	Sabal palmetto	Pond-Top Pond Thatch Hat Palmetto
PSEUDOPHOENICOID	Pseudophoenix sargentii	Hog Cabbage Palm Hog Palmetto Buccaneer Palm
COCOSOID	Cocos nucifera	Coconut

possesses (Table 4). All of the palms found on San Salvador have a solitary trunk type (Fig. 1). A second major diagnostic feature is the leaves (Table 5). Typically, the petiole is expanded at its base and it clasps the trunk for a significant length (Fig. 2). This structure is often called the sheathing base, leaf base or leaf sheath. The inflorescence or flower cluster (Fig. 8) is another major diagnostic feature of palms (Table 6). The position, type, and shape (morphology) of the inflorescence are noteworthy features for classification. The flowers (Table 7) and fruits (Table 8) are also used as diagnostic features in separating the species. It should be noted that unisexual flowers are a derived state in the palms. This state has been achieved by the degeneration of the carpals or stamens into sterile organs accompanied by reduction in size or virtual disappearance.

General Palm Habitats

Palms are usually found in tropical rainforests or in dry open areas subject to periodic inundation with water. They can survive dry seasons because their deep roots can tap ground water during these periods. Palms are generally absent from arid habitats. Even those found in deserts will only survive where their roots can tap permanently underground water supplies. Characteristically, palms growing in open sites are frequently found in extensive colonies, usually of a single species (Fig. 5). In order to reduce exposure to solar radiation and water loss by transpiration, young leaves of palms emerge vertically or nearly so (spear leaves, Fig. 10).

TABLE 3
DISTINGUISHING CHARACTERISTICS OF PALMS

Types of Trunks

Kinds and Position of Leaves

Types and Position of Flower Groups (Inflorescences)

Kinds and Numbers of Modified Leaves (Bracts) Covering Inflorescences

Position, Color, Types of Flowers

Fruit Types and Sizes

TABLE 4
DIAGNOSTIC FEATURES OF PALMS: TRUNKS

Types of Tunks:	Solitary
	Multiple
	Branching
	Trunkless
	Subterranean
	Climbing

TABLE 5
DIAGNOSTIC FEATURES OF PALMS: LEAVES

Leaf Position:	Scattered Along Upper Part of Trunk
	Borne at Top in a Crown
Leaf Shape:	Palmate--Hand or Fan Shaped
	Costapalmate--Fan Shaped Where Petiole Continues Through the Blade as a Midrib
	Pinnate--Feather-shaped
Leaf Base Position:	Completely Encircling Trunk
	Partly Encircling Trunk
Leaf Base Life:	Persistant
	Shed with Leaf
Leaf Base Integrity:	Undivided
	Split
Leaflet Habit:	In One Plane
	In Several Planes

TABLE 6
DIAGNOSTIC FEATURES OF PALMS: INFLORESCENCE

Inflorescence Position:	Infrafoliar--Arise from Trunk Below the Leaves Interfoliar--Develops to Flowering Stage While Still Among the Leaves Terminal
Inflorescence Type:	Panicle--Branched Spike--Unbranched
Inflorescence Morphology:	Peduncle--Stalk of Inflorescence Rhachis--Central Stem of Inflorescence Rhachillae--Flower Bearing Branches
Types of Inflorescence Covering--Bracts (Modified Leaves):	Prophyll--Lowermost Bract That Covers Whole Inflorescence Peduncular Bracts--Bracts Which Cover Stalk of Inflorescence Fertile Bracts--Cover Rachillae
Bract Life:	Persistent Decidious

San Salvador Palm Habitats

There are seven main plant community types found on San Salvador (Smith, 1982). The San Salvador palms are found in three of these plant communities - Coastal Coppice, Freshwater Formations and Blackland.

Coastal Coppice Community

The Coastal Coppice is a small wood of undergrowth and small trees consisting of two subcommunities - Coastal Thicket and Coccothrinax-shrub. Palms are found in the Coccothrinax-shrub community. This subcommunity is characterized by a light, very sandy soil with traces of organic matter. Characteristically, an

TABLE 7
DIAGNOSTIC FEATURES OF PALMS: FLOWERS

Flower Postion On Rhachillae:	Stalked Sessile Embedded in Rhachilla
Flower Color:	Greenish--Creamy White Lilac--Mauve Bright Yellow Orange--Reddish
Flower Scent:	Strongly Fragrant Unpleasant Scent
Flower Pollination:	Wind Pollinated Insect Pollinated--Beetles, Flies, Bees
Flower Life:	Short-lived--1 Day or Less
Flower Type:	Unisexual Monoecious--Male and Female on Same Plant Unisexual Dioecious--Male and Female on Separate Plants Bisexual (Perfect, Hermaphrodite)- Both Male and Female Parts Present in Same Flower Polygamous--Unisexual and Bisexual Flowers on Same Plant
Flower Morphology	3 Sepals 3 Petals (Free or Fused) Stamens in Whorls (3--50+) Ovary Superior (1--3 Ovules)

TABLE 8
DIAGNOSTIC FEATURES OF PALMS: FRUITS

Fruit Type:	Drupe (Like a Cherry) Berry (Like a Tomato)
Fruit Size:	Large or Small 20K--A Few Grams
Fruit Color:	Blue Black Red white
Fruit Seed Number:	1--3 Seeds

abundance of Silver Thatch Palms (Table 2) grow here in open sandy areas void of vegetation (Smith, 1982). There are three main locations on San Salvador where this community may be found; the northwest section of the island, the Sandy Point area and at Sandy Hook.

Freshwater Formations

This community has two subcommunities - Palmetto Flatt and Typha Marshland. In these subcommunities water fluctuates seasonally and yearly. It has been observed that on occasion the areas have been almost dry, and other times there has been up to six or eight feet of water present (Smith, 1982). The sandy soil contains various amounts of organic matter while the water may be fresh or slightly brackish. The Sabal palm is found within the Palmetto Flatt subcommunity and on the margin of the Typha Marshland. The Palmetto Flatt is located southwest of Graham's Harbor and sporadically along the northwest side of the island. The Typha Marshland is found on the west side of the island (Smith, 1982).

Blackland

The Blackland Community is composed of four subcommunities: Agricultural Areas, Blacklands (Coppice), Open Thicket and Sinkholes. The substrate is exposed limestone with many depressions of various depths in which soil accumulates. The soil is usually either a red or a fertile dark loam. Palms are found in the Agricultural Areas, Open Thicket and Sinkhole subcommunities. The Agricultural Area is a Coppice type area that has been cleared for farming. The Coconut palm may be found

Figure 1: Silver Thatch Palm (Coccothrinax argentata). This palm has palmate leaves spirally arranged on a solitary stem.

Figure 2: Silver Thatch Palm. Persistent leaf petiole base is expanded into a fibrous leaf sheath that clasps the trunk and does not split at the base.

Figure 3: Small Fruited Thatch Palm (Thrinax morrissii). This species was found growing inland, near the west side of Little Lake.

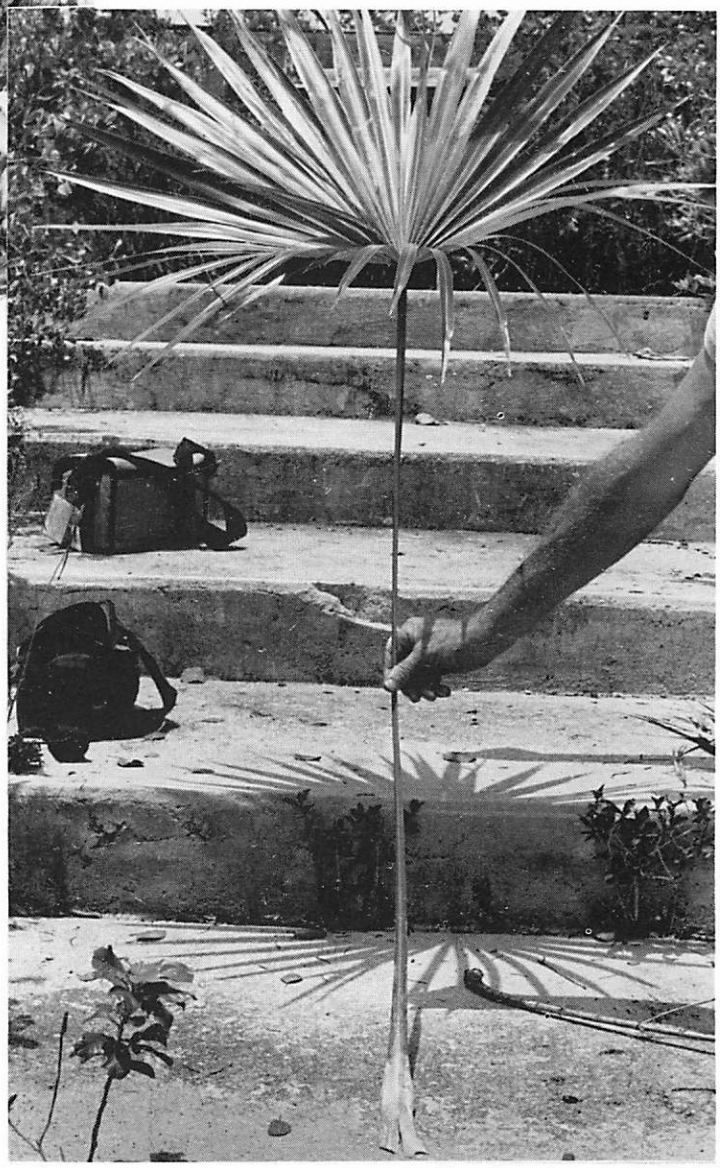

Figure 4: Small Fruited Thatch Palm (Thrinax morrissii). Palmate leaf nearly circular in outline with split leaf base. Compare with Figure 2.

in this area. The Open Thicket area is seasonally wet and exhibits large, low, exposed rock which gives it a very open appearance. The Thatch palm is found in this subcommunity. The Sinkhole subcommunity contains many sinkholes of various sizes. Some sinkholes support several feet of fresh water. Sabal palms can be found lining the margin of the sink.

San Salvador Palm Species

Coccothrinax argentata (Silver Thatch, Fig. 1)

Description: This palm is a tree that has been described to reach 10m tall (Correll and Correll, 1984), however on San Salvador it is only found to reach 3-5m. The leaves are palmate, circular in shape, and are spirally arranged on the trunk. These fan shaped leaves are dark green, shiny above and silvery white, densely hairy below. The petiole base is expanded into persistent fibrous sheaths (Fig. 2) that do not split at the base. This palm is commonly fertile when young. The panicle of the inflorescence is generally shorter than the petioles of the leaves. The flowers are small, whitish or yellowish and are bisexual. The ovary is one celled and contains a single ovule. The fruit is 1.0-1.5cm in diameter and is black in color.

Ecology: C. argentata is very slow growing. It can tolerate sun when quite small and needs an open sunny position in very well drained soil. This palm will withstand almost as much coastal exposure as the Coconut Palm (see below). C. Agentata is usually restricted to limestone rocks, in dry and often exposed areas. The seeds of this palm take 2-3 months to germinate.

Economic Importance: Many species of fan palms are used

to produce light fiber hats that provide excellent protection in the tropics. Coccothrinax can be used for this purpose. On San Salvador this palm is used for weaving hats as well as for thatching. The leaves are collected, soaked in boiling water, and the fibrous leaf segments are separated and dried before folding into hats.

C. inaguensis

Reed (1966) indicates that the major feature distinguishing this species from that of C. argentata is the leaf color. The upper surface of the leaves are described as a dull light-green and the lower surface is light-green, without hairs. Many of the other seemingly distinguishing features of this species overlap with that of C. argentata . Dr. Robert Smith and this author have observed intermediate forms between these two species leading us to believe that this species as described by Reed may be a varietal form of C. argentata .

Thrinax morrissii (Small Fruited Palm, Fig. 3)

Description: Although this palm has been described to reach a height of 12m (Correll and Correll, 1984) the average height of the San Salvador species is 2-2.5m. The leaves are palmate and nearly circular in outline (Fig. 4). The leaf sheaths are split at the base of the petiole insertion (Fig. 4), a distinguishing characteristic that separates Thrinax from Coccothrinax (sheath not split). The inflorescences of Thrinax are equal to or exceed the leaf in length and extend well out from the crown. The flowers are white, stalked, and become yellowish-orange with age. Flowers are bisexual and may be found

Figure 5: Sabal Palm (Sabal palmetto) found growing in a colony southwest of Grahams Harbor.

Figure 6: Sabal Palm. Costapalmate leaf-note petiole continuing through leaf blade as midrib.

Figure 7: Sabal Palm. Note midrib and blade curved downward near the middle.

Figure 8: Sabal Palm. Young plant with persistent leaf bases and inflorescence, spreading and drooping from the trunk, with globose fruit.

throughout the year. The fruit is a white drupe containing a mahagony brown seed.

Ecology: Thrinax is found in sandy and rocky soil and will grow only on alkaline soils above pH 7.7. Species of Thrinax have not been found naturally in areas lacking limestone or alkaline sand. Thrinax prefers soils derived from coral and is often found near coastal conditions. T. morrissii is fairly tolerant of salt, however, it is often found farther inland beyond the worst effects of salt spray (Reed, 1975).

Economic Importance: The fan shaped leaves of this palm may be used for thatching huts.

Sabal palmetto (Sabal Palm, Hat Palmetto, Fig. 5)

Description: On San Salvador the Sabal Palm can get to be 6m tall. This palm is the only one on San Salvador that has a petiole which continues through the leaf blade as a midrib (costapalmate leaf, Fig. 6). In addition, the midrib and leaf blade are curved downward near the middle (Fig. 7). This palm is often found with persistent leaf bases, especially when young (Fig. 8). The leaves are spirally arranged and the petioles are often as long as the blade. The panicles of the inflorescence, which may be found spreading and drooping from the trunk (Fig. 8), are as long as the leaves or may be shorter. Flowers may be found throughout the year. The fruit is a globose black drupe (Fig. 8).

Ecology: Sabal is found on the edge of and in marshy areas in addition to growing on rocky soils. On San Salvador, this palm is predominantly found growing in two Freshwater subcommunities- The Palmetto Flatt and the Typa Marshland.

Economic Importance: The Sabal palmetto has been used in the past for making brooms and is often used as a source of thatch on San Salvador. This palm may also be used for hat weaving as described for Coccothrinax . The Sabal palm provides a source of nourishment in two ways. The sap of this palm can be fermented and used to make wine and the apical bud can provide a source of palm cabbage or palm hearts. The apical bud of a palm is central in the upper part of the trunk and is surrounded by the undeveloped leaf bases and leaves. This apical bud together with the very young leaf sheaths and leaves that immediately surround it are edible. This apical portion of the plant, called the cabbage, may be cooked or eaten raw in salads. It has been described as having a nutty flavor. Unfortunately, in order to collect palm cabbage the trees must be destroyed. The trees are usually felled and all of the surrounding tissue removed in order to reach the heart.

Pseudophoenix sargentii (Hog Palmetto, Fig. 9)

Description: This palm grows only to about 3-4 m on San Salvador. Pseudophoenix possesses leaves which are featherlike with the segments divided on a straight continuous midrib. The leaf segments are in several planes. The panicles of the inflorescence are about one half as long as the leaves and its branches are widely spreading (Fig. 10). The flowers are yellowish green and are found in small clusters on the ends of branches. The flowers, which may be found throughout the year, are either bisexual or unisexual. The male flower is slightly larger than the female flower. The ovary is trilocular (divided into three parts). The fruit is an orange red drupe that is 1-2

Figure 9: Hog Palmetto (Pseudophoenix sargentii). This palm has feather like leaves with the leaf segments divided in several planes on a straight continuous midrib.

Figure 10: Hog Palmetto. Young leaf emerging as a spear to reduce water loss by transpiration.

Figure 11: Coconut Palm, (Cosos nucifera). This is the only palm growing on San Salvador Island that has a somewhat curved trunk.

cm thick and is 2 to 3 lobed.

Ecology: Pseudophoenix is tolerant of considerable coastal exposure. It is found on well drained, alkaline or saline soils in areas of low and erratic rainfall. This palm is not only tolerant of salt laden winds but also salt water saturated soil. Pseudophoenix is usually found in sandy and rocky soil in coppices and thickets. However, on San Salvador, it is found in open scrub land (Smith, 1982), and may also often be found cultivated as an ornamental along beach side property (Columbus Monument at Fernandez Bay). It also has been planted as an ornamental at the San Salvador Airport. The fruits of P. sargentii become buoyant when dry and may be adapted for dispersal by sea water. The seeds of Pseudophoenix are long lived for palms. They may germinate after as much as 2 years in storage.

Economic Importance: This palm is used mainly as an ornamental in areas where less salt tolerant species cannot survive.

Cocos nucifera (Coconut Palm, Fig. 11)

Description: This is the tallest palm that is on San Salvador. Cocos has the ability to grow to 25m but on the island one finds that Cocos may reach a maximum height of 15m. Cocos is the only palm growing on San Salvador that has a somewhat curved trunk (Fig. 11). The leaves are spirally arranged on the trunk with petioles to about 7m long. Cocos also has leaves that are pinnately divided, however, the leaf segments are all in one plane. The inflorescences are found among the leaves and are usually more than 1m long. They are sparcely branched or,

rarely, unbranched. The flowers are found in clusters of 3, with 2 male flowers and 1 female flower. The male flowers are fragrant and contain 6 stamens and a reduced or degenerate pistil. The female flowers are much longer than the male. The pistil is 3 celled, however the fruit is usually only one seeded. The female flowers also possess degenerate stamens united in a low ring. The flowers, which are found throughout the year, are pollinated by honey bees. The fruits are the largest of all extant palms.

Ecology: Cocos is not indigenous to San Salvador but is cultivated widely on the island. The ability of Cocos to withstand severe coastal conditions is unparalled in the palms. The natural habitat of the Coconut Palm is lining tropical sandy beaches, however it will also grow in warm inland areas and near tablelands. Cocos likes a warm climate with access to underground water.

Economic Importance: The Coconut Palm is a multipurpose plant of extreme value to tropical people. The seed contains a liquid endosperm called coconut milk which is free from bacteria and other organisms that may cause disease. This liquid is a valuable source of moisture and nutrition in areas where natural water supplies are scarce or may be contaminated, as on islands like San Salvador. The solid portion of the endosperm may be eaten directly or, as is done in other areas of the world, may be dried to produce Copra. Coconut oil can be extracted from the dried copra.

The husks of the Coconut fruit are useful as containers (bowls, scoops or cups) and also are used as fire fuel. The

middle layer of the fruit wall consists of fiberous material called coir which can be made into rope and matting. Fibers may be up to 30cm long. Rope made from coir fiber is resistant to sea water and bacterial action. In western cultures coir has been used to produce a peat substitute in potting mixtures for growing plants.

On San Salvador and elsewhere the leaves from the trees are used in thatching cottages. The fibers from the leaflets are used for weaving and the fibers from the petioles can be twisted into strong string. The trunks of the Coconut Palm are often used for building purposes. Lumber for supporting posts and main structural timbers can be supplied from trunks that have been sawn into sections or split lengthwise. Minor structural support can be obtained from the petioles. Floors can be formed from split and polished trunks. Leaves thatched on the roof form an excellent covering. Wall partitions can be woven from the palm leaflets.

In western cultures, Coconut wood has been used as a source for making walking sticks. The trunk is split and suitable pieces are turned or sanded and polished.

Other nutritional products that can be obtained from Coconut Palms are sugar, alcohols and honey. Sap from the stem may be tapped by cutting the large sheathing leaf surrounding the opening flowers. This sap when evaporated provides a sugar or if fermented can be made into an alcoholic drink. The bees which pollinate the Coconut Palm also produce a honey that is highly esteemed.

The Coconut fruit is well adapted for dispersal by sea

currents. Because of the air trapped between the coir fibers in the fruit wall coconuts float easily and sea water never comes in contact with the seed.

Conclusion

Of the seven genera of the Palm Family that grow in The Bahama Islands, five of these are found growing on San Salvador Island. These five genera represent three of the fifteen major groups of palms as described by Moore (1973). The Coryphoid Palm group is represented on San Salvador by Thrinax, Coccothrinax and Sabal; Cocos represents the Cocosoid Palms; and Pseudophenix represents the monotypic genus of the Pseudophoenicoid Palms. Although there are only five species of Palms on San Salvador Island, they comprise a dominant part of the total vegetation. These species are found in three of the seven main plant communities described for the island.

Economically these species provide a source of food, building materials, fuel, and salt tolerant ornamentals for the inhabitants of the island.

Acknowledgements

I wish to thank the following people for their help and support during this project. Dr. Don Gerace for a CCFL grant, enabling me to study on San Salvador; Dr. Leonard Grant for the Faculty Stein Award, enabling me to purchase research supplies and for faculty travel funds which paid, in part, for travel to and from the Symposium; Dr. Robert Smith for help and encouragement during this project on San Salvador and during visits to the Hartwick College Herbarium; Ms. Jan Kather for

printing the photographs; Dr. Josiah Meyer for the use of photographic and word processing equipment; and Mr. Anthony Kowalski for help with photography.

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