nia, and forwarded in November, 1960, by Nat J. DeLeon of Miami, Florida. Flowers were pollinated by hand in November, 1965, with fruit reaching maturity in May, 1966. One to three fruits developed from each flower so pollinated. The plants are now about 6 dm. high (2 ft.) and have been flowering for three years. Apart from the collection of Cook, no specimens of this plant collected in the wild have been located in herbaria, and it is obvious that it is not common, probably inhabiting a very restricted range in the state of Veracruz, Mexico.*

*Mr. Anderson has recently written to the effect that *Chamaedorea metallica* grows near large outcroppings of rock on rather steep hillsides near the town of Tezenapa on the rail line about 80 kilometers south of Córdoba very near the border of Oaxaca just north of Tierra Blanca.

Parasitic and Free-living Nematodes Collected from the Soil and Roots Of Sabal Palmetto

R. P. Esser and W. T. Walsh*

Cabbage palms (*Sabal Palmetto*) are among those plants largely disregarded by scientists in their investigation of pathological problems and search for plant pests. They are left, in fact, for the most part in Florida, to Darwin's "survival of the fittest" law, in short to their own devices. The reason for this disregard is that attention to and support for investigations of pathological problems tends to be restricted to plants of economic importance such as corn, tobacco, cotton and, among palms, the coconut when it is grown as a crop not as an ornamental. The chief edible product of the cabbage palms, swamp cabbage, is not of great economic importance and is obtained by botanical butchery, destroying the plant to obtain the relatively small heart, or terminal bud, rather than the more customary means of harvesting a product. The more important aesthetic value of cabbage palms, as can be expected, also fails to draw interest in the palm's existence by pest investigators.

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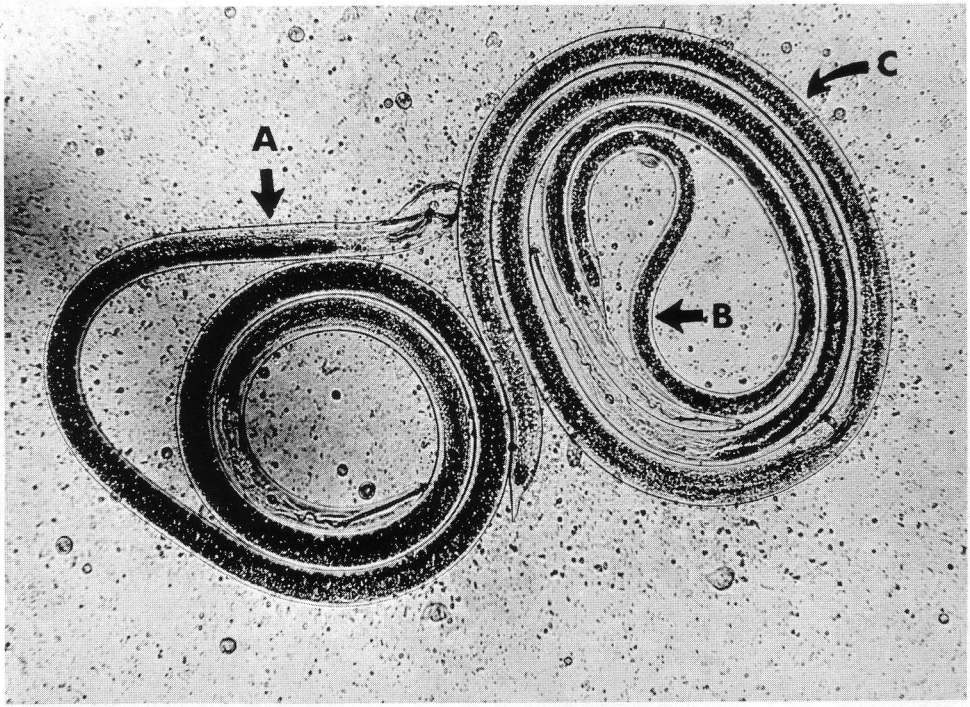
A search of available literature failed to reveal a single record of nematodes associated with *Sabal Palmetto*. The lack of published data indicates that few or no investigations have been made on nematodes of this plant. The first Division of Plant Industry, Florida Department of Agriculture record of a cabbage palm examination was in March 1955 when Dr. B. G. Chitwood identified root-knot nematode (*Meloidogyne incognita acrita*) from a cabbage palm sample taken near Plant City. Four collections were made in 1956 from various parts of Florida and the following parasitic nematodes were detected: sheath nematode (*Hemicycliophora* sp.) and dagger nematode (*Xiphinema* sp.). Free-living nematodes found included *Aglenchus* sp., *Cryptonchus* sp., *Aphelenchus* sp., *Dorylaimus* sp. and *Enchodelus* sp. In 1962, the first cabbage palm sample from a Florida ornamental nursery was examined. At this and subsequent dates, nematode processing techniques had improved considerably and many more nematodes were consequently found. In addition to the sheath, root-knot and dagger nematodes detected previously,

1. A tree island in the Everglades. Nematode samples were taken from a number of such islands. The large trees on the left are slash pines.

the nursery sample yielded the following nematode parasitic on plants: spiral nematode (*Helicotylenchus* sp.), sheathoid nematode (*Hemicrionemoides* sp.), lance nematode (*Hoplolaimus* sp.), stubby root nematode (*Trichodorus* sp.), stunt nematode (*Tylenchorhynchus* sp.) and spine nematode (*Criconema* sp.). Root-knot nematodes were most abundant in the sample.

In 1964, an intensive nematode survey of cabbage palms was conducted in the Florida Everglades. Cabbage palms had been dug indiscriminately in the Florida Everglades and other wild habitats for a number of years and transplanted to towns and cities about Florida as ornamental plants.

In 1963 and 1964, digging and transplanting palms from more or less virgin habitats had become quite a business, and it became necessary to survey the habitat to see if the burrowing nematode (*Radopholus similis*), a nematode subject to quarantine regulations, was present in the wild habitat. Since the area selected for survey is covered with water much of the year and consequently inaccessible to nematode sampling or palm removal, it was necessary to select a dry period in the early part of 1964 to make the survey. The survey area was located in the Florida Everglades near Copeland, Collier County, Florida. The land in the area is under water about six months out of the year with the exception of some of the tree islands

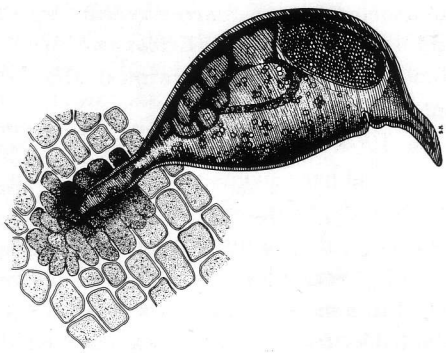


2. Awl nematodes associated with cabbage palms in the Everglades area. A. Male; B. Larva (coiled inside a female coil); and C. female awl nematode.

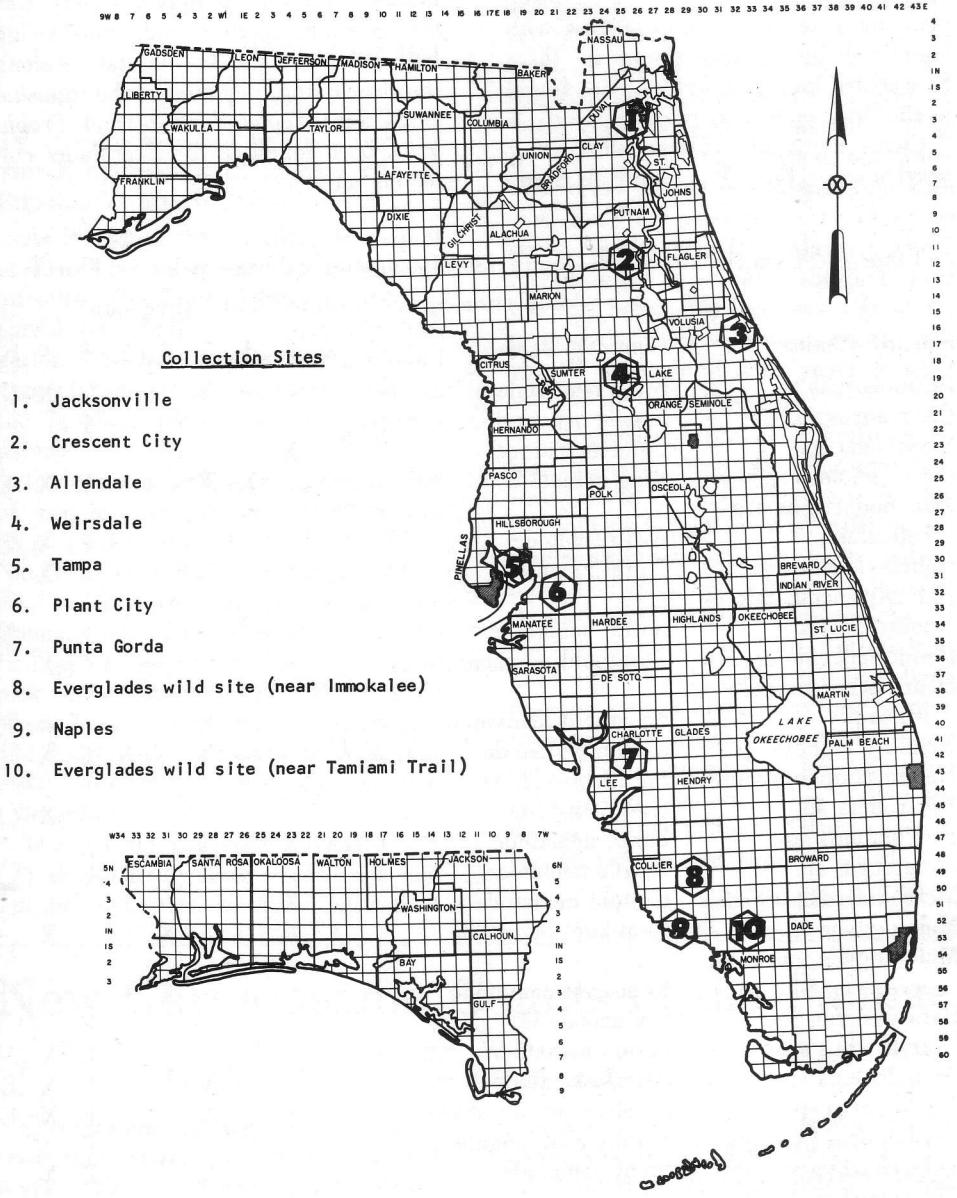
(Fig. 1), which become flooded only occasionally.

The palms grow in a shallow sandy soil underlaid by Tamiami formation consisting of calcareous sandstones and sandy limestones with frequent outcroppings. This shallow soil makes them relatively easy to remove with a minimum of root damage. They are dug using straight shovels with lead-filled pipes for handles. The heavy handles facilitate cutting through the tough root system to shape the root ball. After the ball is formed, the palm is lifted out by a winch truck. It was interesting to note the nearly perfectly compacted basal portion in the ball of roots possessed by trees after removal. This was result of the natural rocky pockets that did not allow downward root growth. If one were not aware of the conditions under which these plants grow it would appear that the trees had been grown in a man-made container. A comprehensive list of plant parasitic nematodes found in soil and roots associated with *Sabal Palmetto* in Florida since 1955 is shown in Table 1. Collection sites in Table 1 are shown on the Florida map (Fig. 4).

Several interesting points were indi-



3. Citrus nematode showing head and neck embedded in plant cells. (After Gutierrez).



4. Location of collecting sites in Florida.

cated by the Table. Of 27 genera of nematodes commonly found parasitic on plants in Florida, 21 were found associated with cabbage palm. This is an unusually high number of genera to be associated with a single plant species, particularly on such a limited survey basis. None of the genera of nematodes were consistently associated with cabbage palm in the ten localities. Ring nematode was found in six of the ten localities. Awl nematode (*Dolichodorus*

heterocephalus), (Fig. 2), a devastating plant parasite normally associated with aquatic habitats, was found in three Everglades localities, but was not found in the drier collection sites.

Citrus nematode (*Tylenchulus semipenetrans*), (Fig. 3), found in large numbers in three Everglades sites, was the most unexpected find, considering both the plant and the habitat. Among the free-living nematodes the unusual finds were *Ecphyodophora* and *Trophurus*, both found in the Everglades collecting sites.

Table 1. Parastic nematodes found associated with cabbage palm in Florida

		Collection Sites (North to South) (See map)									
Scientific Name	Common Name	1	2	3	4	5	6	7	8	9	10
Belonolaimus sp.	Sting nematode					X				X	
Cacopaurus sp.	Sessile nematode								E		
Criconema sp.	Spine nematode			X							
Criconemoides sp.	Ring nematode				X	X		X	E	X	E
Dolichodorus heterocephalus	Awl nematode								E	X	E
Helicotylenchus sp.	Spiral nematode			X		X			E	X	
Helicotylenchus microlobus	Spiral nematode								E		E
Hemicriconemoides sp.	Sheathoid nematode			X					E	X	
Hemicriconemoides wessoni	Sheathoid nematode					X					E
Hemicycliophora sp.	Sheath nematode	X				X		X	E	X	
Hemicycliophora similis	Sheath nematode								E		
Heterodera sp.	Cyst nematode								E	X	
Hoplolaimus sp.	Lance nematode		X	X		X					
Longidorus sp.	Needle nematode					X		X	E		
Meloidodera floridensis	Cystoid nematode			X							
Meloidogyne sp.	Root-knot nematode		X	X		X	X			X	
Meloidogyne incognita acrita	Root-knot nematode						X				
Paratylenchus sp.	Pin nematode								E		
Pratylenchus sp.	Lesion nematode				X	X			E	X	
Scutellonema sp.	Spiral nematode					X			E	X	E
Trichodorus sp.	Stubby-root nematode			X		X			E	X	E
Trichodorus proximus	Stubby-root nematode								E		
Tylenchorhynchus sp.	Stunt nematode			X		X			E	X	
Tylenchorhynchus trilineatus	Stunt nematode								E		
Tylenchulus semipenetrans	Citrus nematode				X	X			E	X	E
Xiphinema sp.	Dagger nematode			X		X		X			E
Peltamigratus christiei	Spiral nematode								E		

X — Denotes occurrence on a non Everglade site.
E — Denotes occurence on an Everglade site.