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Population Densities of Myndus crudus Van Duzee (Homoptera: Cixiidae) in Relation to Coconut Lethal Yellowing Distribution in Florida[1]

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Abstract

The geographical distribution of lethal yellowing (LY) disease of coconut palms, *Cocos nucifera* L., in Florida is described. Based on paired sampling within and outside the LY-infected area of the mainland, *Myndus crudus* Van Duzee (Homoptera: Cixiidae), a planthopper suspected to be a vector of LY agent, was 40× more abundant in the infected area ($P < 0.01$). The coincidence in the distribution of LY disease with high population density of *M. crudus* increases this insect's status as a suspected vector.

A planthopper, *Myndus crudus* Van Duzee (Homoptera: Cixiidae) (Fig. 1), has been under scrutiny as a possible vector of lethal yellowing (LY) disease of coconut palms, *Cocos nucifera* L. in Jamaica (Eden-Green 1978, Eden-Green and Schuiling 1978) and Florida (Tsai 1975, 1977). *Myndus crudus* was referred to the genus *Haplaxius* Fowler in these reports. Kramer (1979) recently synonymized *Haplaxius* with *Myndus* Stål. Literature on LY disease has been reviewed by Sherman and Maramorosch (1977). A study was undertaken to determine whether high population densities of *M. crudus* coincide with the range of LY on the Florida mainland.

Distribution of LY in Florida

Coconut palms are grown in Florida primarily as landscape plants in the coastal areas and islands of the southern portions of the state. The distribution of coconut and of LY in Florida can be discussed in relation to four geographical areas described below, and illustrated in Figure 2. I arrived at estimates of numbers of palms and LY cases through inspections of the areas and through personal communication with Florida Department of Agriculture Plant Inspectors and Agricultural Extension Agents familiar with the areas in question.

The Florida Keys. This crescent of some 30 islands is about 200 km long (Fig. 2). There were perhaps about 50,000 coconut palms on the Keys before 1955. A severe epidemic that killed about 15,000 (i.e. 75%) of the coconut palms on the island of Key West occurred between 1955 and 1960 (Martinez and Roberts 1968). The disease persisted on this island until 1968 (Seymour 1976).

In 1969, LY was observed on Key Largo, about 160 km from Key West (Seymour 1976). Since then, LY has spread in a desultory pattern, appearing and in some cases recurring on some islands, including Key West, while other islands populated with coconut palms have remained free of the disease.

The Lower East Coast. This area is a band of about 25 km wide extending about 250 km along the southern por-

[1] Florida Agricultural Experiment Station Journal Series No. 2226.

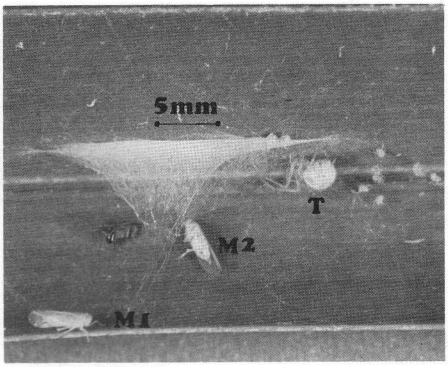
tion of the Florida east coast and includes offshore islands and the isolated coastal settlement of Flamingo at the southern tip of the mainland (Fig. 2). There were formerly perhaps 300,000 coconut palms in this largely urbanized area. The frequency of coconut palms dwindles north of Martin County to a thousand or fewer in Brevard County. The lower east coast area is bordered on the west by the interior areas, described below, which are largely devoid of coconut palms.

LY was first reported on the lower east coast in Miami in 1971, and had been reported as far north as northern Palm Beach County by 1973 (McCoy 1976). Since then, LY has continued to spread erratically within the lower east coast area and has extended its range north a few km into southern Martin County. About 100,000 coconut palms and thousands of other LY-susceptible species have been destroyed south of Martin County.

Areas north of the Palm Beach County line have been largely free of LY. There are about 30,000 coconut palms and thousands of palms of other LY-susceptible species in Martin County. As of January 1980, 50 cases or fewer have been observed in the county and these were within four km of the southern boundary.

The Interior. Between the east and west coasts is a vast area about 180 km at its widest point consisting mostly of wetlands and pine flats. Native palm species, none of which are known to be susceptible to LY, are present. The cabbage palmetto, *Sabal palmetto* (Walt.) Lodd., is particularly common, forming extensive stands in parts of the interior. The human population is sparse, and the few coconut palms in the interior are around habitations. A few cases of LY have been observed among these isolated coconut palms.

The West Coast. The west coast is



1. Palm leaflet with *Myndus crudus* resting (M1), and *M. crudus* (M2) caught in web of a spider, *Theridion* sp. (T).

less urbanized than the east coast. There are about 25,000 'Jamaica Tall' coconut palms in coastal areas of Collier County. A few cases of LY were reported there in 1974 and fewer than five cases since then. The next county to the north, Lee County, has at least 30,000 coconut palms. North of Lee County, coconut palms dwindle to a few hundred in Manatee County. As of January 1980, LY has not been observed north of Collier County.

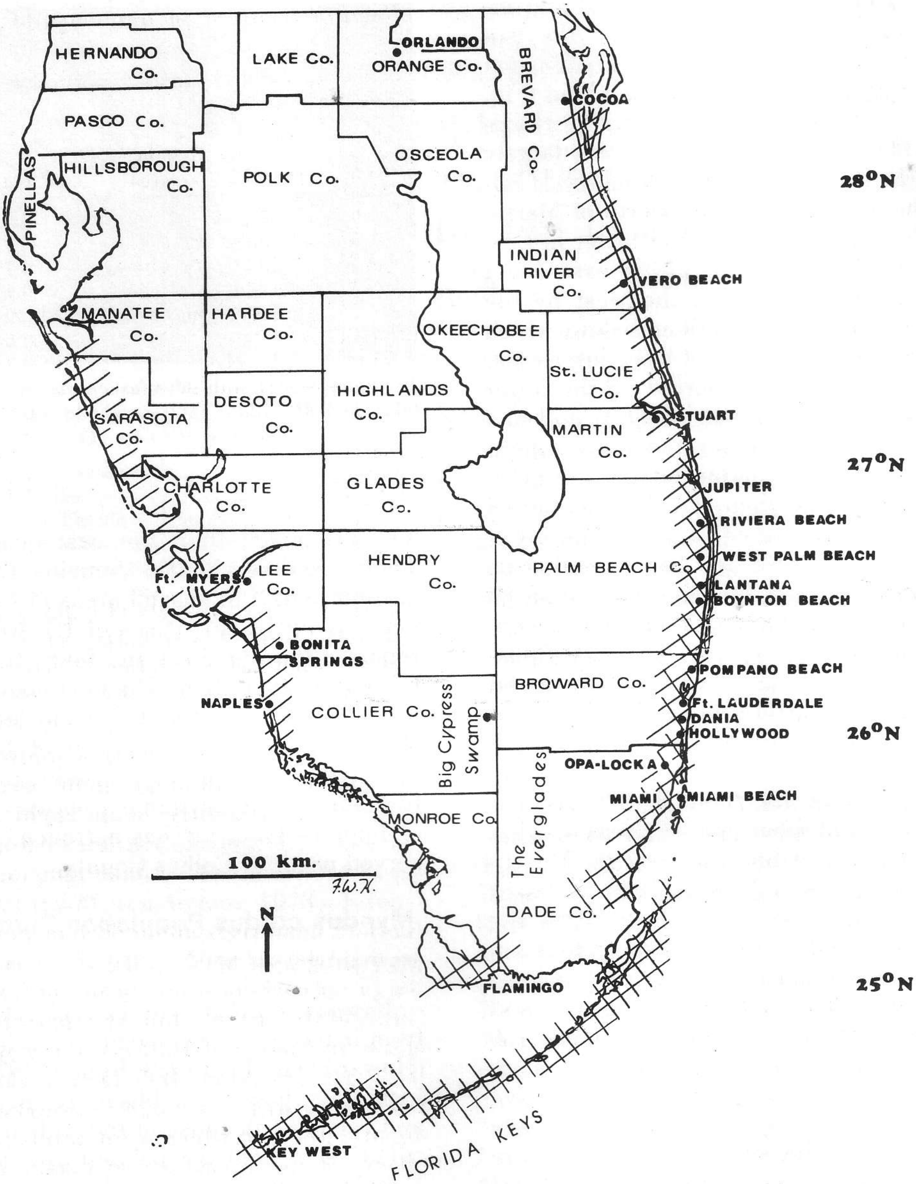
Myndus crudus Population Study

Methods and Materials

Myndus crudus can be collected from leaves of many species of palms (Howard and Mead 1980, Reinert 1977) including those of cabbage palmetto and coconut. Because of the wide distribution of cabbage palmetto on the Florida mainland, this palm was selected as the host for sampling *M. crudus*.

An adhesive material (Stikem[2]) was applied to an area of about 300 cm^2 on

[2] Michel & Pelton Co., 5743 Landiegan St., Emeryville, California 94608. Mention of a trademark or proprietary product does not constitute a guarantee or warrant of the product by



2. Range of coconut palms (hatching), distribution of lethal yellowing disease (cross-hatching), and localities (dots) where *Myndus crudus* populations were sampled in southern Florida.

the lower surface of a randomly chosen frond of each cabbage palmetto sampled. Specimens of *M. crudus* captured in the adhesive were collected 20–45 days after application of the adhesive.

The localities sampled were on the

the University of Florida, and does not imply its approval to the exclusion of other products that may be suitable.

Table 1. Means of Myndus crudus *per collecting location in and outside the lethal yellowing-infected area of Florida*

Collecting period (Number of days, season, year)	Location in LY-infected area	*M. crudus*	Location in LY-free area	*M. crudus*
(30) Summer 1978	Ft. Lauderdale	55.6	Naples	0
(20) Summer 1978	Hollywood	44.5	Stuart	4.7
(20) Summer 1978	Dania	19.4	Big Cypress Swamp	0.1
(30) Winter 1979	Lantana	6.0	Naples	0.4
(30) Winter 1979	Pompano Beach	34.2	Bonita Springs	0.2
(34) Winter 1979	Riviera Beach	7.4	Stuart	0.2
(34) Spring 1979	Boynton Beach	21.0	Ft. Myers	0.3
(45) Spring 1979	West Palm Beach	25.9	Vero Beach-Cocoa	0
(45) Summer 1979	Opa-locka-Miami Beach	25.7	Orlando	0.2
(45) Summer 1979	Ft. Lauderdale	4.3	Naples	0.2
$\bar{x}$ ----------	LY-infected area	24.4[a]	LY-free area	0.6[a]
SD --------		16.8		1.4

[a] Statistically significant ($P < 0.01$) using a paired t-test.

Florida mainland (Fig. 2). In each locality, 10 palms, each at least one km from another, were randomly selected. Localities inside the LY-infected area were paired with localities outside it. For each pair of localities, the sampling was simultaneous; i.e., the adhesive was applied in both localities on the same day and collections were made in both localities on a later day. Sampling periods were in the summer of 1978, and the winter, spring and summer of 1979. The significance of the difference in the mean of *M. crudus* from inside and outside the LY-infected area on the mainland was tested by a paired t-test.

Results and Discussion

There were about 40× as many *M. crudus* in samples from the LY-infected portion of the lower east coast as in samples from elsewhere on the mainland ($P < 0.01$) (Table 1). This enhances the insect's status as a suspected vector of LY. Although population densities are higher in the LY-infected area, the insect is distributed in southern Florida at least as far north as Orlando (Table 1).

The range of LY has been fairly stable for five years. The spread of the disease has been almost entirely within the generally infected area south of Martin County, although about 25–30 cases have recently been reported within four km of the southern boundary of the county. St. Augustine grass, *Stenotaphrum secundatum* (Walt.) O. Kuntze, comprises about 80% or more of the turfgrass used in urban lawns in the lower east coast area south of Martin County. In all but the extreme southern portion of Martin County and in the west counties, Bahia grass, *Paspalum notatum* Flugge comprises about 70% of turfgrass (unpublished observations supported by communication with county agricultural extension agents). This may be significant, since nymphs of *M. crudus* develop on roots of grasses, St. Augustine grass being a particularly favorable host (Eden-Green 1978, Reinert 1977, 1980).

I conclude from this study that on the Florida mainland the population density of *M. crudus* is higher in the area that is generally infected with LY than elsewhere. This supports our previous conclusions (Howard and Mead 1980) that *M. crudus* is the most suspect vector of LY agent.

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