## Mymarommatidae

A family of wasps (order Hymenoptera).
► Wasps, Ants, Bees and Sawflies

## *Myndus crudus* Van Duzee (Hemiptera: Cixiidae)

*Myndus crudus* Van Duzee (Fig. 115) is a planthopper whose adults feed on the foliage of various species of palms. This insect species is the only known vector of lethal yellowing, a highly destructive disease of palms in various countries of the Caribbean Basin region.

This planthopper is distributed on the mainland of Tropical America from northern Brazil to northern Mexico, with its range extending to islands of the western Caribbean region (i.e., Cuba, Jamaica, and the Cayman Islands), but it has not been reported in Hispaniola, Puerto Rico, or other islands of the eastern Caribbean except Trinidad. This distribution pattern in the Caribbean reflects the invasion route of its fauna, i.e., mainland species invaded the westernmost islands from the Yucatan Peninsula, with diminishing numbers of species reaching the easternmost islands. From the south, species crossed the short span to Trinidad, with diminishing numbers reaching islands to the north. *Myndus crudus* is present in southern Florida and is probably present on at least some islands of the Bahamas, since these two political entities are highly similar in climate and other geographical considerations, and border and share flora and fauna with the Caribbean Basin region.

The adult female of *M. crudus* at rest with posteriorly extended wings is about 5 mm long from the vertex of the head to the tip of the wing. The head and body are straw colored. The wings are transparent, with brown veins that have numerous pustules bearing setae. The prominent ovipositor distinguishes the female. The male is slightly smaller and similarly straw-colored, but often paler, with a light green abdomen. Within the geographical range of these planthoppers, they are common on the foliage of many kinds of palms.

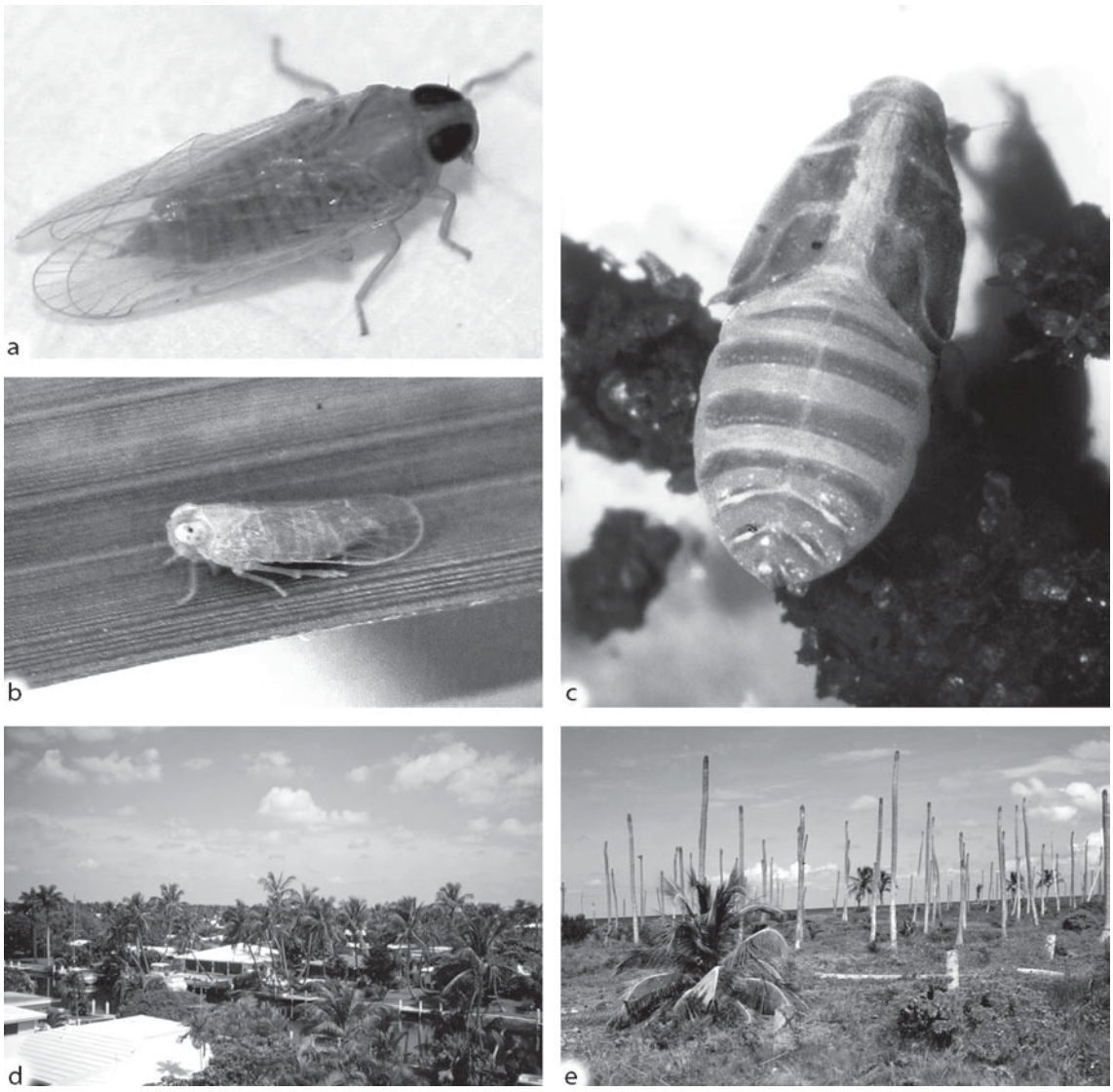
The nymphs feed on the roots of grasses, usually at or near the soil surface. They are tan to grey colored with a reddish blush on the head and legs. The nymphs are covered with a thin, waxy bloom produced by numerous wax glands in the cuticle. The tibiae of the forelegs are flattened, a possible adaptation for digging beneath the soil surface. Guinea grass (*Panicum maximum* Jacquin) and St. Augustine grass (*Stenotaphrum secundatum* (Walter) Kuntz) are two of several grass species that are highly favorable hosts of *M. crudus* nymphs, and both are very common in various localities within the insect's range.

### Damage and Economic Importance

*Myndus crudus* is a vector of lethal yellowing disease of palms. As the name implies, "lethal yellowing" is lethal to nearly all of the palms it infects. The disease is caused by a kind of plant-inhabiting bacterium called a phytoplasma. It is one of the most devastating diseases of palms and has caused serious impacts on the landscape and the agricultural economies of regions that it has invaded.

Lethal yellowing has been known in Cuba, Jamaica, and the Cayman Islands since the 1800s. In the mid-1900s it was first observed in Hispaniola, the Bahamas, and Florida. Florida was the only locality on the mainland of the Americas affected by lethal yellowing until the early 1980s, when it was reported on the Yucatan Peninsula of Mexico. It has since practically eliminated coconut palms from the Caribbean coast of most of southern Mexico and much of Central America. More recently, it has been reported on Nevis in the eastern Caribbean (Fig. 116).

Although it is sometimes suggested that additional species of insects may transmit lethal




***Myndus Crudus* Van Duzee (Hemiptera: Cixiidae), Figure 115** ***Myndus crudus*** **and damage: (a) female, (b) male, (c) nymph (photo by J.V. DeFilippis), (d) view of Fort Lauderdale, Florida, with initial case of lethal yellowing (center), (e) dead palm trunks in former coconut plantation that was totally destroyed by lethal yellowing, Yucatan State, Mexico.**

yellowing, researchers have found no evidence that any species other than *M. crudus* is a vector of this disease. Transmission experiments have successfully shown this insect to be a vector in Florida, where conditions for conducting this type of experiment were especially favorable, but *M. crudus* is most probably a vector in all countries of Tropical America where lethal yellowing is present. It is also recognized, however, that insect diversity tends to increase relative to decreasing latitude, and indeed there are more species of auchenorrhynchous insects on palms in the tropics than in Florida. Little is known concerning the biology and vector potential of most of these species.

Lethal yellowing has been most intensely studied as a disease of coconut palm because of that species' economic importance. In fact, the coconut palm is considered one of the 20 most important


***Myndus Crudus* Van Duzee (Hemiptera: Cixiidae), Figure 116** **Map showing the distribution of lethal yellowing, 2007. Several cases were also reported on the island of Nevis in the Lesser Antilles (not shown on map).**

crop plants in the world, and is a basic element in the agricultural economies of many tropical countries, as well as a source of important products in the world economy. However, lethal yellowing infects and is lethal to at least 35 additional species of palms, including the economically important date palm (*Phoenix dactylifera* L.), as well as many palms that are important as ornamentals or as local sources of food or fiber in tropical countries (Fig. 116).

There are several other diseases of coconut palm in various countries that were formerly thought to be identical to lethal yellowing of the Caribbean, and thus were referred to as lethal yellowing. But as knowledge of phytoplasmas increased in recent decades, lethal yellowing was recognized as a distinct disease of palms in the Caribbean region. Similar diseases of palms, most of which are present in various parts of Africa and Asia, are currently known by other names.

## Management

Once *M. crudus* was implicated as a vector of lethal yellowing, interest turned to the possibilities of managing this insect to achieve a corresponding reduction in the spread of lethal yellowing. The prospects for controlling lethal yellowing via biological control of the vector are not promising. As an insect native to the Americas, it is attacked by several natural enemies, but at least in lethal yellowing-affected areas, these do not reduce the populations of this insect sufficiently to significantly reduce the spread of the disease.

*Myndus crudus* populations can be suppressed by treating palms with insecticides, and there is a slight reduction in the spread of lethal yellowing. But chemical control is not a feasible method of reducing the spread of lethal yellowing over large areas for long periods. Insecticide treatments of palms and grasses have been used as quarantine treatments to attempt to prevent *M. crudus* from being transported to new localities.

Populations of *M. crudus* can be reduced by planting ground covers that do not support development of the immature stages, including various grass species, or legumes such as tropical-kudzu, *Pueraria phaseoloides* (Roxburgh) Bentham, or perennial peanut, *Arachis pintoi* Krapov and W.C. Gregory. The latter legume species are used as ground cover in coconut plantations for soil improvement and erosion control. Where lethal yellowing-resistant palms are planted, the use of leguminous ground covers would

reduce the vector population and indirectly the disease pressure on the palms, thus delaying the development of a strain of the pathogen that can overcome the defenses of the resistant palm. This prospective method of managing lethal yellowing has been investigated in experiments in small research systems, but not on farms or other large areas.

Although managing LY indirectly by controlling *M. crudus* has been investigated as mentioned above, virtually all management efforts are focused directly on the disease. A therapeutic treatment involving trunk injections of antibiotics active against phytoplasmas was developed in the 1970s. Although costly, it has been used effectively in preventing the disease in palms in some relatively affluent areas, such as Palm Beach, Florida.

By far the most common management method is the use of resistant palms. Varieties of coconut differ in susceptibility to lethal yellowing, and those that are relatively resistant have been established in large planting programs in lethal yellowing-affected areas. In the remaining 35 susceptible species, distinct varieties have not been distinguished. However, the degree of susceptibility of many species of palms is roughly known from observations in lethal yellowing-affected urban areas, particularly in Florida, where there is an exceptionally high diversity of palms used in landscaping. For example, in urban areas in Florida where lethal yellowing has killed numerous coconut palms, it has also killed many *Adonidia merrillii* (Beccari), while in the same areas a similar palm, *Ptychosperma elegans* (R. Brown) Blume, has not been affected. Landscapers in lethal yellowing-affected areas can select palms that have shown apparent resistance or immunity based on such observations.

## References

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## Myofibrils

The fibers that collectively comprise muscles.

## Myopsocidae

A family of psocids (order Psocoptera).
► Bark-Lice, Book-Lice or Psocids

## Myriapods

Classes of Phylum Arthropoda, subphylum Atelocerata (formerly subphylum Myriapoda, the basis for this name) that are insect relatives but possessing many legs. The myriapods consist of the centipedes, millipedes, pauropods and symphylans. There is some question whether this is a natural group.
► Phylum

## Myrmecodomatia

Structures found in higher plants that appear to have evolved to serve as dwelling places for ants.

## Myrmecolacidae

A family of insects in the order Strepsiptera.
► Stylopids

## Myrmecology

The scientific study of ants.