# MEALYBUGS (HEMIPTERA: PSEUDOCOCCIDAE) AND ARGENTINE ANTS (HYMENOPTERA: FORMICIDAE) IN 19th CENTURY MADEIRA

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*ABSTRACT*. The Argentine ant (*Linepithema humile*) arrived on the Atlantic islands of Madeira sometime before 1858. More than thirty years later, in the 1890s, Madeira experienced a plague of *L. humile*. We propose that this delayed population explosion of *L. humile* may have been triggered by the arrival of a new exotic species of mutualistic Hemiptera. Alternatively, a new crop variety that was better suited as a host for a mutualistic Hemiptera already resident in Madeira may have been responsible for the sudden outbreak of *L. humile*.

Key words: *Linepithema humile*, Argentine ant, mealybugs, Madeira.

*RESUMO*. Na década de 90 do século 19, a formiga Argentina, que tinha sido introduzida na Madeira cerca de trinta anos antes, sofreu um tremendo aumento da sua população na ilha. Neste trabalho os autores exploram a possibilidade deste facto ter sido despoletado pela chegada de uma nova espécie exótica de um Hemíptero mutualista ou da introdução de uma nova variedade de cultura, a qual poderia ter constituído um melhor hospedeiro para um Hemíptero mutualista já residente na ilha.

Palavras-chave: *Linepithema humile*, formiga Argentina, cochonilhas algodão, Madeira.

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In 1890s, the Argentine ant, *Linepithema humile* (Mayr), underwent a tremendous population explosion in Madeira (Forel, 1895; Schmitz 1896; Grabham, 1919, 1924). Forel (1895) first reported *L. humile* in Madeira based on specimens sent to him by Ernst Schmitz, who thought the ant was the big-headed ant, *Pheidole megacephala* (Fabricius), a pest ant first reported in Madeira by Heer (1852). Schmitz (1896) described the *L. humile* outbreak in Madeira: "In Funchal and its outskirts, ants have become, in the past few years, a true plague and public calamity... They were ants that in recent years were introduced from Demerara [now Guyana], or before that Brazil". Subsequent reports of this plague of *L. humile* in Madeira also presumed that *L. humile* was a very recent arrival in Madeira. For example, Grabham (1919) asserted that *L. humile* arrived in Madeira about 1892. Recently, however, we found a specimen of *L. humile* dating from before 1858 in the Natural History Museum in London (Wetterer *et al*., 2006). We wondered why *L. humile* apparently remained uncommon in Madeira from 1858 until the 1890s, but then suddenly greatly increased in population.

Large populations of *L. humile* invariably depend heavily on honeydew produced by large populations of phloem-feeding Hemiptera, such as mealybugs, aphids, and scale insects. Therefore, the population explosion of *L. humile* in Madeira may have been triggered by a population explosion of a newly arrived exotic Hemiptera that acted as a mutualist (see Wilson, 2005). Alternatively, a mutualist Hemiptera already present may have increased greatly due to the arrival of a new strain of crop plant.

In the 19th century, the dominant cash crop of Madeira alternated between grapevine and sugarcane. Grabham (1924) wrote that "from time to time a blight or other cause would obliterate the vine, and sugar-cane would become predominant: and again in like manner the cane would periodically fail. Thus in regard to the vine, the vineyards were completely destroyed in 1852 by the fungoid Oilium [now *Oidium tuckeri*], and again in 1877 by the underground apterous Aphis *Phylloxera vastatrix* [now *Viteus vitifolii*]". From 1884-1886, all sugarcane in Madeira failed due to fungus attack (da Silva & Meneses, 1946). Grabham (1924) speculated that the pink sugarcane mealybug *Saccharicoccus sacchari* (formerly *Pseudococcus sacchari*; sometimes called the gray sugarcane mealybug) "was largely responsible for the introduction of the fungus through its many punctures into the substance of the sugar-cane". Grabham (1924) reported "no attempt was made to replant sugar-cane after that dire destruction and the ground was occupied for several years by the vine, sweet potato and general food produce". Soon after this, however, Madeira was replanted with new strains of sugarcane, including the "Yuba" variety. Grabham (1924) wrote "The Argentine ant found its way to Madeira 30 years ago when the Yuba cane was already well-established, and the response of the *Pseudococcus* to the fostering influence of the new pest became at once manifest in the startling increase and activity of the new cane parasite. The ground was honeycombed with formicaries among the cane roots, and during the fortnightly irrigation of the cane the legs of my men were black with myriads of ants seeking

shelter from the running stream of water among their nests". GRABHAM (1924) reported "The *Pseudococcus* is now found abundantly in every cane plantation in Madeira... The *Pseudococcus sacchari* has no restraining enemy in Madeira. It is jealously protected and fostered by the Argentine ant".

GREEN (1923) listed 46 species of scale insects from Madeira, including the pink sugarcane mealybug *S. sacchari* from sugar-cane, and described a new species, *Pseudococcus heterospinus* Green, from the roots of grasses. BALACHOWSKY (1938) reported only one species of mealybug on sugarcane in Madeira, the gray sugarcane mealybug, *Dysmicoccus boninsis* (Kuwana), and determined *P. heterospinus* to be a junior synonym of this species. BALACHOWSKY (1938) dismissed earlier records of *S. sacchari* in Madeira as misidentifications; both species feed on the stalk under leaf sheaths and, though not closely related (DOWNIE & GULLAN, 2004), they are superficially similar in appearance. VIEIRA *et al*. (1983) confirmed that *D. boninsis* was the most common mealybug on sugar-cane in Madeira, but retained *S. sacchari* in the list of mealybugs of Madeira as very rare.

The reports that in 19th century Madeira *S. sacchari* was an important pest, but later reports indicating that it was rare or absent suggest the intriguing possibility that *D. boninsis* replaced the previously common *S. sacchari* and perhaps this replacement was related to the *L. humile* population explosion.

We have been searching for 19th century mealybug specimens from Madeira to test our hypothesis. We also have been looking for 19th century herbarium specimens of sugarcane. Because *P. sacchari* and *D. boninsis* both feed on the sugarcane stalk under leaf sheaths, intact dried sugarcane specimens may have mealybugs present.

Unfortunately, we have so far been unable to test this hypothesis. We found no 19th century specimens of mealybugs nor sugarcane in Madeira. Jon Martin at the Natural History Museum in London, reported "we seem to have no material of *Saccharicoccus* from Madeira. We do have a small series of *Dysmicoccus boninsis*, under the name *Pseudococcus heterospinus cockerell* (now a junior synonym), part of the type series of that species. The data are "roots of grasses" and "sugar cane", and the former have the date "i. 1921". No localities given".

ACKNOWLEDGEMENTS

We thank A. Wetterer and M. Wetterer for comments on this manuscript; the National Geographic Society, the Laboratório de Qualidade Agrícola, and Florida Atlantic University for financial support.

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Date received: 11-08-2006.