The Japanese beetle *Popillia japonica* Newman, 1838
(Coleoptera: Scarabaeidae) in the Azores islands

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Abstract: *Popillia japonica* Newman, 1838 (Coleoptera: Scarabaeidae) is recorded for the first time from Flores island of the Azores archipelago. Occasional introductions are made into other islands such as Terceira, Faial, Pico, and São Miguel, when the adult beetles or larvae are shipped in commerce. The original population was detected in Terceira in early 1970’s through Lajes, a North America Air Force Base. It has become one of the most important and destructive insect pest of agricultural and ornamental plants. This note emphasizes some advances in understanding the beetle’s dispersion and the approaches may provide more options for integrated management. Despite ongoing regulatory efforts, the Japanese beetle remains a threat as an invasive species in Azores.

Key words: Coleoptera, Scarabaeidae, *Popillia japonica*, Japanese beetle, Azores islands.

The Azores is a volcanic archipelago located in the Atlantic Ocean (39º 40’ - 43º N / 31º 5’ - 8º W) at approximately 1.500 km of the western coast of Portugal, Europe. The archipelago is composed of nine inhabited islands, which are divided in three groups: the western group of Corvo and Flores; the central group of Faial, Pico, Graciosa, São Jorge and Terceira; and the eastern group of São Miguel and Santa Maria. The largest island is São Miguel (745 km²) and the smallest is Corvo (17 km²). Santa Maria is the southern- and easternmost island (37° N, 25° W). Flores is the westernmost (31° W) and Corvo (39.7° N) is the northernmost island.

The Azores islands enjoy a distinctly oceanic climate. Mild temperatures, ranging from 13.9°C (February) to 22°C (August), an insignificant variation in the seasonal temperature and high humidity (above 74%) and precipitation (over 50 mm in driest month, August), provide an ideal environment for the establishment and quick dispersion of the agricultural pest species, such as the Japanese beetle *Popillia japonica*.

Different factors (e.g. climatic conditions, long distance to the mainland continents, and more than 500 years of human settlement) are expected to influence the abundance of beetles (Coleoptera) species and their habitats. According Borges et al. (2005), of the 2209 species and subspecies of terrestrial animals (Arthropoda) known to inhabit this archipelago 267 are endemics. Approximately 58% of the arthropods found in the Azores are exotic, being many of them invasive. The Coleoptera checklist of Azores include 528 species, 66 (12.5%) of which are endemics, whose presence in each island was published by Borges (2005).

In particular, the Japanese beetle *Popillia japonica* Newman, 1838 (Coleoptera: Scarabaeidae), named “Esarcalvho Japones” in portuguese, was introduced in Terceira island in early 1970’s through Lajes, a North America Air Force Base (Guimarães, 1972; Martins et al., 1977; Martins et al., 1988; Lopes et al., 2001). *P. japonica* is a mono-voltine species, native of the Japan islands, and it is widely distributed in China, Russia, Canada and the USA (CABI, 2004). In Macaronesian archipelagos, is only in the checklist of Azores, and had been recorded from Terceira, Faial (in 14.IX.1996, the first specimen was detected at Monte da Graça), Pico (in 10.VI.2007, at São Roque do Pico), São Miguel (in 19.IX.2006, at airport of Ponta Delgada) (Lopes et al., 2001; Borges, 2005; Anónimo, 2006; Lopes, 2007).

The present paper deals with Japanese beetle records obtained during a short visit to islands of Flores, Corvo (18-23.VII.07), and Graciosa (30.VII-01.IX.07).

In the port of Lajes (39º 22’ N, 31º 10’ W, Flores island) some males of *P. japonica* were captured alive in a Yellow Ellisco® trap, in 18.VII.07. They were also identified, photographed and then released into the trap by myself.

The widespread and destructive pest it is not found by me in Corvo and Graciosa islands during July and August 2007, respectively.

In the front of Baleia’s Restaurant (39º 27’ N, 31º 07’ W, Santa Cruz, Flores), two males of Japanese beetle were observed alive in the 49º Yellow Ellisco® trap, in 18.VII.07. They were also identified, photographed and then released into the trap by myself.

The beetle is slowly spreading across the different islands after being accidentally introduced. In fact, initially the infestation was restricted to the areas or fields surrounding the airports (Terceira, São Miguel) and the ports (Faial, Pico, and now Flores).

Japanese beetle larvae feed on the roots in the pasture grasses which cover most of the Azorean islands, while the adults feed on the leaves and floral parts of some hundred different species of agricultural and ornamental plants. Odor and location in direct sun seem to be very important factors in plant selection. The beetles usually feed in groups, starting at the top of a plant and working downward. The following are some of the better-known hosts: *Medicago sativa* (alfalfa), *Acer* (maples), *Phaseolus vulgaris* (pea), *Populus spp.* (poplar), *Asparagus officinalis* (asparagus), *Glycine max* (soybean), *Malus spp.* (ornamental species apple), *Prunus spp.* (stone fruit including plums, peaches, etc.), *Rosa spp.* (roses), *Rubus spp.* (blackberry, raspberry), *Tilia spp.* (limes), *Quercus spp.* (oak), *Ulmus procera* (English elm), *Vitis spp.* (grapes), *Zea mays* (maize) (see also Martins & Simões, 1988).

Since this pest is important in agriculture and commerce, considerable effort has been placed on developing control options. The eradication measures were undertaken in Terceira (chlor dane spraying plus traps baited with female sex pheromone japonilure added with food attractants), but those methods proved to be insufficient to prevent the dispersion of this pest (Martins et al., 1988).

Recently, soil sampling is being carried out to study the development of the immature stages. The integrated pest management involve both chemical and biological insecticides acting on larvae and adults. *P. japonica* can be infected by some parasitoids, bacteria, nematodes, and fungi (Martins & Simões, 1988). According Martin’s & Simões (1988) and Lopes et al. (2001) extensive field sampling and experiments under semi-natural conditions show that some larvae, pupae and adults could be controlled by the green muscardine fungus *Metharhizium anisopliae* (Metsch.) Sorok; the rocky mildy disease bacteria Bacillus *popilliae* Dutky; the insect parasitic nematodes, Steinernematidae (*Neapectanata* spp.) and preparations containing Heterorhabditidae (*Heterorhabditis* sp.); the white muscardine fungus *Beauveria bassiana* (Bals.) Vuill.; and the adaptation to local conditions of the parasitic exotic wasps (*Istocheta aldrichi* Mesnil and *Tiphia venalis* Rohwer) can be helpfully an biological control program in near future.

In the Azores, population densities are almost always very low, with an average of 10 individuals per hectare (Lopes et al., 2001). The beetles seem not to be a serious pest. They are generally not noticed, even when they are abundant, and they do not seem to harm the plants directly. The beetles usually feed in groups, starting at the top of a plant and working downward. The following are some of the better-known hosts: *Medicago sativa* (alfalfa), *Acer* (maples), *Phaseolus vulgaris* (pea), *Populus spp.* (poplar), *Asparagus officinalis* (asparagus), *Glycine max* (soybean), *Malus spp.* (ornamental species apple), *Prunus spp.* (stone fruit including plums, peaches, etc.), *Rosa spp.* (roses), *Rubus spp.* (blackberry, raspberry), *Tilia spp.* (limes), *Quercus spp.* (oak), *Ulmus procera* (English elm), *Vitis spp.* (grapes), *Zea mays* (maize) (see also Martins & Simões, 1988).

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However, all the Azorean islands are connected daily by plane. Regular flights link some islands to Lisbon (Faial, Pico, Santa Maria, Terceira, São Miguel), Boston or Toronto (Terceira, São Miguel). A ferry boat also connects the islands between May and October, while Faial, Pico and São Jorge have ferry during all year.

In other hand, for example, Faial and São Miguel have a port of call for a ship that carries passengers and cargo between Portugal mainland and the islands.

Popillia japonica is known from Terceira, Faial (Borges, 2005), Pico, São Miguel (Lopes, 2007), and now Flores. More specific fieldwork will be needed to determine whether a population exists in these islands, and how its introduction and dispersion can be prevented in other Azorean islands, Macaronesia, and Europe or Africa.

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**Primera cita de Phoracantha recurva Newman, 1880 (Coleoptera, Cerambycidae) en Extremadura**

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Muchas especies animales se valen de sus plantas nutricias para colonizar nuevos territorios. Los insectos, por ejemplo, ya sea en su forma adulta, de pupa, larva o huevo utilizan esta vía para establecerse como especies invasoras en regiones muy lejanas, incluso, colonizar nuevos territorios. Los insectos, por ejemplo, ya sea en su forma adulta, de pupa, larva o huevo utilizan esta vía para establecerse como especies invasoras en regiones muy lejanas, incluso, colonizar nuevos territorios.


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