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ATTACKS OF RHYNCHOPHORUS FERRUGINEUS (OLIVIER) (Coleoptera Curculionidae) ON NATURAL SPECIMENS OF DWARF FAN PALM CHAMAEROPS HUMILIS L. (Arecaceae) IN SICILY

SUMMARY

The red palm weevil Rhynchophorus ferrugineus was recently introduced into Europe where it has destroyed many Phoenix canariensis palms. This weevil attacks different species of palms in different countries, mainly cultivated date palms (Phoenix dactylifera) in Egypt and cultivated Canary palms (Phoenix canariensis) in Europe. In Europe, sporadic attacks of the weevil to native dwarf fan palm (Chamaerops humilis) have been reported. The current paper reports attacks of R. ferrugineus on dwarf fan palms in natural environments of Sicily. This insect represents an important threat to dwarf palms and to the complex ecosystem where they live.

INTRODUCTION

The red palm weevil Rhynchophorus ferrugineus (Coleoptera Curculionidae) was first recorded in Sicily in 2005 (LONGO & TAMBURINO, 2005;
In Sicily, *R. ferrugineus* infests mainly the Canary palm *Phoenix canariensis* Chabaud. This palm, originated from the Canary Islands, is widespread in Sicily, where it is cultivated as an ornamental plant in both private gardens and public green areas. In Sicily, since 5 years from its accidental introduction, *R. ferrugineus* infested and killed more than 39,000 *P. canariensis* plants (GIOVINO et al., 2009; LO VERDE et al., 2011). In other regions of the world, *R. ferrugineus* infests different taxa of palms. Although a recent study (DEMBILIO et al., 2009) indicated that the palms *Whashingtonia filifera* (Lindl.) H.Wendl. and *Chamaerops humilis* were resistant to *R. ferrugineus* and remained uninfested. *R. ferrugineus* has been occasionally found on *Whashingtonia* spp., *C. humilis* and other ornamental palms (GIOVINO et al., 2009).

**The dwarf fan palm *Chamaerops humilis*** is only other palm species native to Europe, apart from the Cretan Date Palm *Phoenix teophrasti*. It grows in Mediterranean areas, from Portugal to Malta Island and from Morocco to Libya. In Italy, *C. humilis* is widely distributed along the coasts of the Tyrrhenian Sea in Sicily and Sardinia. This species is valued as the relict of Tertiary tropical vegetation, which was shifted to the current locations by the strong climate changes in the Quaternary. In addition, *C. humilis* plays an important role in the ecology of typical Mediterranean forest woodland and shrubland communities because it can grow in arid environments on rocky or otherwise poor soil and under the influence of salt and wind; it is also important because of its ability to proliferate after a fire event (GIOVINO et al., 2011a, 2011b).

Our recent observations in Sicily indicate that *R. ferrugineus* may attack the dwarf fan palm in natural conditions. The aim of this study is to determine the possibility that *R. ferrugineus* could move from ornamental to native palms, like *C. humilis*. This risk has been highlighted in the past (Sidoti, Giglione, s.d.) but now has a dramatic confirmation.

**Materials and Methods**

*R. ferrugineus* infestations on cultivated and spontaneous *C. humilis* plants were recorded in 2010 and 2011 in Sicily, including Lampedusa island (Fig. 1). Palms from private gardens were examined. Natural populations of *C. humilis* along the coastal path were also examined for *R. ferrugineus* symptoms or specimen presence. Stems were cut at different distances along their lengths, and, when possible, longitudinal sections were made to determine the presence of adult, larvae, and pupae of *R. ferrugineus*. Palms showing any other sign of damage were particularly considered. The following data were recorded for plants identification: location (determined by GPS), number of stems per specimen (each *C. humilis* specimen can be composed by many
stems), height, and stem diameter. Attack symptoms were noted and photographed.

RESULTS

On cultivated *C. humilis*, *R. ferrugineus* was detected at six locations from 2010 to 2011 (Table 1).

In the past, 7 attacks of *R. ferrugineus* on *C. humilis* were recorded (Longo et al., 2009): 3 and 1 respectively on private gardens on Catania and 4 on Palermo. During 2011 attacks of *R. ferrugineus* on cultivated dwarf fan palms were observed on Palermo (B. Massa, pers. comm.) and on Castellammare del Golfo (Trapani) (F. Fiordilino, pers. comm.). In natural *C. humilis* populations, *R. ferrugineus* was detected on five plants in the Zingaro Nature Reserve (Trapani) and on 1 plant in Menfi (Agrigento) (Table 1). These data indicate a low level of infestation.

*R. ferrugineus* did not show any clear preference for male vs. female plants but all infestations were recorded on adult palms (>50 years) over 1 m high (Table 1).
### Table 1.

Rhynchophorus ferrugineus *infestations on Chamaerops humilis in cultivated plantings and in natural populations in Sicily*

<table>
<thead>
<tr>
<th>Site/Plant code</th>
<th>Date (day.month.year)</th>
<th>Number of infested stems***</th>
<th>Sex of plant</th>
<th>Stem height (m)</th>
<th>Stem diameter (cm)</th>
<th>Resin emission</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acireale (CT)*</td>
<td>10.07.2010</td>
<td>9</td>
<td>female</td>
<td>1.20</td>
<td>12-16</td>
<td>No</td>
<td>Paysandisia archon (10-12 larvae/stem)</td>
</tr>
<tr>
<td>Menfi (AG)*</td>
<td>10.10.2010</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Lampedusa Is. (AG)*</td>
<td>20.10.2010</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Catania*</td>
<td>18.05.2011</td>
<td>1</td>
<td>male</td>
<td>1.80</td>
<td>12</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Bagheria (c.da Montagnola) (PA)*</td>
<td>02.10.2011</td>
<td>1</td>
<td>female</td>
<td>1.80</td>
<td>13</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Bagheria (PA)</td>
<td>October 2010</td>
<td>1</td>
<td>female</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>S. Vito lo Capo (TP)*</td>
<td>15.10.2011</td>
<td>1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Zingaro Reserve/1**</td>
<td>14.09.2011</td>
<td>1</td>
<td>male</td>
<td>3.70</td>
<td>13</td>
<td>Yes</td>
<td>Dead larvae embedded in resin</td>
</tr>
<tr>
<td>Zingaro Reserve/2**</td>
<td>14.09.2011</td>
<td>1</td>
<td>female</td>
<td>1.8</td>
<td>20</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Zingaro Reserve/3**</td>
<td>14.09.2011</td>
<td>2</td>
<td>male</td>
<td>3.15</td>
<td>17.5</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Zingaro Reserve/4**</td>
<td>20.09.2011</td>
<td>2</td>
<td>male</td>
<td>3.3</td>
<td>20</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Zingaro Reserve/5**</td>
<td>20.09.2011</td>
<td>1</td>
<td>male</td>
<td>2.9</td>
<td>20</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Menfi (AG)**</td>
<td>20.10.2011</td>
<td>5</td>
<td>male/female</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

*: cultivated; **: natural populations; ***: each row provides data for one plant, which can have many stems.
All infested plants showed typical symptoms on the crown (wilting and bending down of leaf) (Fig. 2). Symptoms on infested plants changes from slight wilting to total plant collapse and death within a few months. Larval galleries and pupal chambers typical of *R. ferrugineus* were detected in stem sections of all plants listed as infested. Live larvae and pupae within their galleries and pupal chambers were also found in most of the dissected palm stems, while some adults that were flying around the plant or close to the stem apex were captured. Resin was sometimes emitted from the plants near the location of recently hatched larvae.

**DISCUSSION**

Our observations have established the presence in which *R. ferrugineus* infestations in natural ecosystems of the Mediterranean in which the dwarf fan palm is native. In Sicily and throughout the Mediterranean basin, an invasion of natural populations of the Mediterranean dwarf fan palm by the red palm weevil could seriously threaten ecosystems where these palms live. Recently DEMBILIO & JACAS (2012) have highlighted this aspect: “Although *Chamaerops humilis* and

*Fig. 2 — One of the dwarf fan palms attacked in Zingaro Nature Reserve.*
Phoenix theophrasti show antixenotic and antibiotic mechanisms of resistance, respectively, they cannot be considered as resistant against R. ferrugineus”.

The presence of resin emitted by infested palms indicates that the palms have an antixenotic resistance mechanism, as stated also by DEMBILIO et al. (2009). Our observations show, however, that weevil larvae are able to develop within the stem and that this led to serious damage and then to plant death. Even when the attack was considered to be moderate, the infested palms died within a few months.

Control of R. ferrugineus is difficult because safe and effective control methods are unavailable. Many cultivated infested Phoenix canariensis palms located near the Zingaro Nature Reserve were detected during this study. These infested plants represent a source of the insect and a threat to the natural palm populations living in the Reserve; they should be removed immediately just at the first attack of the weevil. The detection of R. ferrugineus on Lampedusa Is. shows the potential dispersion power of the weevil; in fact the island is located in the middle of the Mediterranean Sea and is quite distant from other locations with infested palms. Thus, natural C. humilis populations in North Africa might be threatened. We point out the need for future investigations concerning the spread and control of R. ferrugineus.

CONCLUSIONS

Currently, the R. ferrugineus attack involves only a small number of mature dwarf fan palms that, considering the environment and recurrent wildfire are probably highly stressed and have reduced ability to resist insect colonization. Another study (LONGO et al., 2011) reported that cultivated dwarf fan palms previously damaged by the palm borer Paysandisia archon (Burmeister, 1880) (Lepidoptera Castniidae) became less resistant to R. ferrugineus attack. The results of the current study show, however, that R. ferrugineus may damage and kill C. humilis in natural ecosystems and highlight the need for tools that can be used to detect early infestations over wide areas, such as natural ecosystems. In addition, other than threatened by R. ferrugineus, C. humilis and its ecosystem may be severely damaged by introduced wild pigs, that are now increasing in number in the Zingaro Nature Reserve (LA MANTIA et al., 2010). Additional studies are required to increase our understanding of the interaction between C. humilis and R. ferrugineus with the aim of reduce the threat to natural palm populations.

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