Interceptions of Anthocoridae, Lasiochilidae, and Lyctocoridae at the Miami Plant Inspection Station (Hemiptera: Heteroptera)

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INTERCEPTIONS OF ANTHOCORIDAE, LASIOCHILIDAE, AND LYCTOCORIDAE AT THE MIAMI PLANT INSPECTION STATION (HEMIPTERA: HETEROPTERA)

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ABSTRACT

Specimens of Anthocoridae, Lyctocoridae, and Lasiochilidae (Hemiptera: Heteroptera) intercepted at various ports-of-entry and housed at the Animal and Plant Health Inspection Services (APHIS) Miami Plant Inspection Station (Miami, FL) were examined and identified to species or genus. The collection comprised 127 specimens intercepted primarily at the Miami Inspection Station. Specimens were distributed among 14 genera and 26 identified species in 3 families: Anthocoridae (99 specimens), Lyctocoridae (9 specimens), and Lasiochilidae (19 specimens). Seventy-eight of the 127 specimens could be identified to species. The remaining 49 specimens were identified to genus, except for 2 specimens that could not be identified below tribal level. For each identified species, we provide brief descriptions of habitat and prey preferences (where known), and a summary of currently known geographic range. Fifty-six of the 127 specimens were of a single genus: Orius Wolff, 1811 (Anthocoridae: Oriini). The specimens of Orius comprised at least 9 different species; 17 specimens could not be identified to species. The 127 specimens were intercepted on a variety of commodities, including ornamental plants, cut flowers, bouquets, agricultural produce, ceramic tiles, and wood products. Fourteen of the identified species do not currently occur in the continental U.S.; moreover, the 49 specimens that we could identify only to genus very likely also are of species not currently established in the continental U.S. The majority of intercepted specimens (93 of 127) arrived on shipments from the Neotropics and Europe. Specimens of Lasiochilidae and Scolopini (Anthocoridae) were entirely from shipments arriving from the Neotropical region. Specimens of Orius were intercepted on shipments from the Neotropics, Mexico, Europe, and Sub-Saharan Africa. Finally, 10 species were intercepted on shipments arriving from countries not previously listed as being part of their known geographic ranges. One Old World species, Cardiastethus affinis Poppius, 1909, known previously only from East Africa and India, was intercepted in 2 separate shipments arriving from Central America and the West Indies.

Key Words: minute pirate bugs, flower bugs, port interceptions, non-indigenous species, Anthocoridae

RESUMEN

Se examinaron e identificaron a nivel de especie o de género especímenes de Anthocoridae, Lyctocoridae y Lasiochilidae (Hemiptera: Heteroptera) interceptados en diversos puertos de entrada de los Estados Unidos y depositados en la Estación de Inspección de Plantas en Miami, Florida del Servicio de Inspección de Salud Animal y Vegetal (APHIS). La colección consiste de 127 especímenes interceptados principalmente en la Estación de Inspección de Miami. Las muestras fueron distribuidas entre 14 géneros y 26 especies identificadas en tres familias: Anthocoridae (99 especímenes), Lyctocoridae (9 especímenes) y Lasiochilidae (19 especímenes). Setenta y ocho de los 127 especímenes podrían ser identificados a especie. Se identificaron las otras 49 especímenes a nivel de género, excepto para 2 muestras que no pudieron ser identificados por debajo del nivel de tribu. Para cada especie identificada, proveemos una breve descripción de las preferencias de hábitat y presas (si se conoce) y un resumen del rango geográfico conocido actualmente. Cincuenta y seis de los 127 especímenes fueron de un solo género: Orius Wolff, 1811 (Anthocoridae: Oriini). Los
especies de Orius pertenecen al menos 9 especies diferentes; 17 especímenes de ellos no pudieron ser identificados a nivel de especie. Las 127 muestras fueron interceptadas en una variedad de productos, incluyendo plantas ornamentales, flores, ramos, productos agrícolas, losas cerámicas y productos de madera. Catorce de las especies identificadas no están presentes en el territorio de EE.UU actualmente y además, de los 49 especímenes que pudimos identificar solamente a nivel de género, es muy probable que también pertenecan a especies no establecidas en los EE.UU. La mayoría de los especímenes interceptados (93 de 127) llegaron en envíos procedentes de la región Neotropical y Europa. Todos los especímenes interceptados de Lasiochilidae y Scolopini (Anthocoridae) fueron de envíos procedentes de la región Neotropical. Los especímenes de Orius fueron interceptados en los envíos de la región Neotropical, México, Europa y África Sub-Sahariana. Finalmente, 10 especies fueron interceptados en los envíos procedentes de países no mencionados anteriormente como parte de su rango geográfico conocido. Una de las especies del Mundo Antiguo, Cardiastethus affinis Poppius, 1909, conocida anteriormente sólo de África Oriental y la India, fue interceptada en dos envíos separados que llegaron de América Central y las Antillas.

Palabras Clave: chinches minutos piratas, chinches de flores, intercepciones portuarias, especies no indígenas, Anthocoridae

Introductions of insect species into regions outside of their native ranges can have important effects on ecosystem health, agriculture, and human health (Liebhold et al. 1995; Vitousek et al. 1996; Mack et al. 2000). A primary means by which non-indigenous species become established is through unintentional introductions associated with international commerce (Haack 2001; McCullough et al. 2006). Insects are common stowaways on shipments of imported goods, and are regularly intercepted at U.S. ports-of-entry. Non-endemic species of insects may arrive on imports encompassing a variety of commodities, including agricultural produce, greenhouse and ornamental plants, nursery stock, cut flowers, wood products, stored products, or packing materials (Haack 2001; McCullough et al. 2006). Additionally, aircraft, ships, vehicles, or other means of conveyance may themselves harbor hitchhiking arthropods, and these possible sources of infestation also are examined at ports (Dobbs & Brodel 2004).

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service, Plant Protection and Quarantine (APHIS-PPQ), has historically been responsible for inspecting imports of agricultural products arriving at U.S. ports, to ensure that the imported materials are free of exotic arthropods, plant pathogens, and weeds. In 2003, many of these inspectional duties were transferred to the newly created Department of Homeland Security, although identification of suspected quarantine pests remains the responsibility of APHIS-PPQ. Inspections are done at designated facilities located at or near major ports-of-entry (airports, seaports), and these efforts have led to the creation of large data bases summarizing types and numbers of non-indigenous arthropods arriving at U.S. ports (Haack 2001; McCullough et al. 2006).

The Anthocoridae (Hemiptera: Heteroptera) is a complex of 500-600 predatory true bug species distributed virtually worldwide (Ford 1979; Lattin 1999a). These insects are frequent interceptions at ports-of-entry (e.g., Hawaii Department of Agriculture 2009), as a consequence of their relatively small size, wide geographic distribution, and occurrence in a variety of habitats, often including cryptic habitats (Lattin 1999a). Unsurprisingly, these taxa are also common representatives of the non-indigenous true bug faunas in many geographic areas (Lattin 1999a; Rabitsch 2010). Even in fairly isolated geographic regions, such as oceanic island systems, non-indigenous Anthocoridae have become a noticeable part of the true bug fauna (Herring 1966, 1967; Walker & Deitz 1979; Yasunaga 2000; Aukema et al. 2006; Lattin 2005a, 2007a,b).

Specimens of Anthocoridae are commonly intercepted in Miami, Florida and other ports-of-entry, from cargo shipments or in passenger luggage. Over 100 intercepted specimens, now housed at the Miami Plant Inspection Station, had been mounted on points, labeled, and put into storage, but had not been identified to species. We have now examined and identified these specimens, and here summarize those identifications. Geographic sources of shipments and types of cargoes are also summarized. From checklists and catalogs of the North American anthocorid fauna, coupled with our familiarity with the North American fauna, we determined which intercepted specimens were of species not known to be currently established in the continental U.S. Lastly, the extensive literature on taxonomy and zoogeography of the Anthocoridae was examined to determine for each identified interception whether the species had arrived from a country outside of its known geographic distribution. Results of this final objective led to presumed new geographic records for several species.
MATERIALS AND METHODS

APHIS Protocols and History of Specimens

Interceptions of suspected quarantine pests are submitted to APHIS-PPQ identifiers located at designated facilities throughout the United States. Specimens are identified to the lowest level needed to determine whether the shipments involve required quarantine measures. Regulatory officials with APHIS-PPQ do not require quarantine treatments for predatory species such as members of the Anthocoridae, thus almost none of the specimens of these insects in the Miami collection had been identified beyond the family level. Once the regulatory status of an intercepted specimen is resolved, the specimen is placed in a port reference collection and the data associated with it are entered into a national database. One of us (TTD) served in Miami, FL as Plant Protection and Quarantine’s specialist in Heteroptera from 2001 to 2010, and in that capacity additionally acquired several specimens of Anthocoridae that had been intercepted at ports other than Miami.

Identification of Specimens

Insects were identified by use of published keys (including as needed examination of genitalia), by examination of descriptions in the primary literature, and by inspection of geographically relevant checklists or catalogs of the Heteroptera. Specimens were generally identified to species, although some specimens within difficult complexes such as Orius Wolff, 1811, and Lycocoris Hahn, 1835, were identified only to genus. Female specimens in difficult groups could often not be identified other than to genus because examination of the male genitalia is needed for full identification. Specimens of Xylocoris Dufour, 1831, and Orius that could not be identified to species are given subgeneric classifications when possible (Carayon 1972b; Péricart 1972). Label information with most specimens included geographic source and commodity of the shipment from which the specimen had been collected. Each specimen was categorized according to zoogeographic region from which the intercepted specimen had arrived (Darlington 1957): Neotropical (specimens arriving from South America/Central America/West Indies); Nearctic (Mexico); Ethiopian (Sub-Saharan Africa); Oriental (Asia); and Paleartic (Europe/Mediterranean).

Higher-level classification of the Anthocoridae is not completely settled. Beginning with Carayon (1972a), systematic treatments of the Anthocoridae have not always agreed on whether these insects belong in a single family (Anthocoridae) composed of 3 subfamilies (Anthocorinae, Lasiochilinae, Lycocorinae), or whether the subfamilies deserve family rank (Cassis & Gross 1995; Schuh & Slater 1995). We follow the treatment of Schuh & Slater (1995), and allocate genera among 3 families (Anthocoridae, Lycocoridae, Lasiochilidae) and 7 tribes within the family Anthocoridae.

RESULTS AND DISCUSSION

We examined 127 specimens from port interceptions (Tables 1 and 2). The specimens comprised 14 genera distributed among all 3 families, and included 6 of the 7 tribes within the Anthocoridae (Tables 1 and 2). The majority of the specimens had been intercepted at the Miami Inspection Station, but we also examined 24 specimens housed at the Miami site but known to have been intercepted elsewhere: airports in New York, New York (John F. Kennedy); Los Angeles, California; Savannah, Georgia; Jacksonville, Florida; San Francisco, California; San Diego, California; Dallas, Texas; Charleston, South Carolina; and New Orleans, Louisiana (Table 2). Over 40% (57 of 127) of the specimens were in the tribe Oriini (Anthocoridae), represented almost exclusively (56 of 57 specimens) by a single genus, Orius Wolff, 1811. The Cardiastethini (Anthocoridae) were represented by 16 specimens distributed

<table>
<thead>
<tr>
<th>Family/Tribe</th>
<th>Number of specimens</th>
<th>Genera</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anthocoridae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oriini</td>
<td>57</td>
<td>Orius, Caffrocoris</td>
</tr>
<tr>
<td>Cardiastethini</td>
<td>16</td>
<td>Amphiareus, Cardiastethus, Physopleurella, Alofa, Buchananiella</td>
</tr>
<tr>
<td>Scolopini</td>
<td>6</td>
<td>Callidos, unidentified</td>
</tr>
<tr>
<td>Xylocorini</td>
<td>10</td>
<td>Xylocoris</td>
</tr>
<tr>
<td>Anthocorini</td>
<td>9</td>
<td>Anthocoris, Dufouriellus</td>
</tr>
<tr>
<td>Blaptostethini</td>
<td>1</td>
<td>Blaptostethus</td>
</tr>
<tr>
<td><strong>Lycocoridae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Lycocoris</td>
</tr>
<tr>
<td><strong>Lasiochilidae</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Lasiochilus</td>
</tr>
</tbody>
</table>
Table 2. Species or genera intercepted, separated by family (Anthocoridae, Lyctocoridae, Lasiochilidae), tribe, and zoogeographic region. (*) species is not currently established in the continental U.S. Identification by T.M. Lewis unless otherwise stated.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Source of interception</th>
<th>Number and sex of specimens</th>
<th>Year of interception</th>
<th>Commodity (label: verbatim)</th>
<th>Interception point (label: verbatim)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANTHOCORIDAE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ORIINI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>South America/Central America/West Indies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orius insidiosus (Say, 1832)</td>
<td>Ecuador</td>
<td>7f</td>
<td>2001-08</td>
<td>Helianthus sp.</td>
<td>Miami PPQ + USDA</td>
</tr>
<tr>
<td>O. insidiosus</td>
<td>Ecuador</td>
<td>2f</td>
<td>2006-07</td>
<td>cut flowers</td>
<td>Miami</td>
</tr>
<tr>
<td>O. insidiosus</td>
<td>Peru</td>
<td>1f</td>
<td>2008</td>
<td>Lactuca sp.</td>
<td>Miami 367594</td>
</tr>
<tr>
<td>O. insidiosus</td>
<td>Colombia</td>
<td>1f</td>
<td>2001</td>
<td>Limonium</td>
<td>Miami USDA</td>
</tr>
<tr>
<td>O. insidiosus</td>
<td>Colombia</td>
<td>1f</td>
<td>2003</td>
<td>Chrysanthemum</td>
<td>—</td>
</tr>
<tr>
<td>O. insidiosus</td>
<td>Colombia</td>
<td>1f</td>
<td>2005</td>
<td>Helianthus</td>
<td>Miami PPQ</td>
</tr>
<tr>
<td>O. insidiosus</td>
<td>Costa Rica</td>
<td>1f</td>
<td>2005</td>
<td>Alpinia purpurata</td>
<td>Miami PPQ</td>
</tr>
<tr>
<td>O. insidiosus</td>
<td>Trinidad/Tobago</td>
<td>1f</td>
<td>2009</td>
<td>Eleocharis sp.</td>
<td>Miami USDA</td>
</tr>
<tr>
<td>O. insidiosus</td>
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<td>1f</td>
<td>2000</td>
<td>Ocimum purpurata</td>
<td>Miami (mail) PPQ</td>
</tr>
<tr>
<td>Orius florentiae Herring 1966 (*)</td>
<td>Ecuador</td>
<td>1m</td>
<td>2003</td>
<td>bouquets</td>
<td>Miami</td>
</tr>
<tr>
<td>O. florentiae</td>
<td>Ecuador</td>
<td>1f</td>
<td>2004</td>
<td>Phlox sp.</td>
<td>Miami</td>
</tr>
<tr>
<td>O. florentiae</td>
<td>Ecuador</td>
<td>3f</td>
<td>2007</td>
<td>cut flowers</td>
<td>Miami PPQ + USDA</td>
</tr>
<tr>
<td>Orius championi Herring 1966 (*)</td>
<td>Colombia</td>
<td>1m</td>
<td>2003</td>
<td>Dianthus</td>
<td>—</td>
</tr>
<tr>
<td>O. championi</td>
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<td>2009</td>
<td>Hydrangea sp.</td>
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<tr>
<td>Orius sp.</td>
<td>Ecuador</td>
<td>1f</td>
<td>2001</td>
<td>flower bouquets</td>
<td>—</td>
</tr>
<tr>
<td>Orius sp.</td>
<td>Peru</td>
<td>1f</td>
<td>2005</td>
<td>cut flowers</td>
<td>Miami</td>
</tr>
<tr>
<td>Orius sp.</td>
<td>Colombia</td>
<td>1f</td>
<td>2000</td>
<td>Aconitum sp.</td>
<td>Miami</td>
</tr>
<tr>
<td>Orius sp.</td>
<td>Colombia</td>
<td>1f</td>
<td>2003</td>
<td>Alstroemeria sp.</td>
<td>Miami</td>
</tr>
<tr>
<td>Orius sp.</td>
<td>Colombia</td>
<td>2f</td>
<td>2005</td>
<td>Helianthus sp.</td>
<td>Miami PPQ</td>
</tr>
<tr>
<td><strong>Mexico</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orius insidiosus</td>
<td>Mexico</td>
<td>1f</td>
<td>2001</td>
<td>Limonium sp.</td>
<td>208982</td>
</tr>
<tr>
<td>Orius sp.</td>
<td>Mexico</td>
<td>1f</td>
<td>2000</td>
<td>Limonium sp.</td>
<td>—</td>
</tr>
</tbody>
</table>

1 C/F or c/f indicates cut flowers
2 Missing data indicate information not provided on specimen label
3 Genus nr. Guayascoris Carpintero and Dellapé, 2012
4 Identified by T.J. Henry
5 Identified by T. Dobbs
Table 2. (Continued) Species or genera intercepted, separated by Family (Anthocoridae, Lyctocoridae, Lasiochilidae), tribe, and zoogeographic region. (*) Species is not currently established in the continental U.S. Identifications by T.M. Lewis unless otherwise stated.

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<tr>
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<th>Source of interception</th>
<th>Number and sex of specimens</th>
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<th>Commodity (label: verbatim)</th>
<th>Interception point (label: verbatim)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe/Mediterranean</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Orius vicinus (Ribaut, 1923)</td>
<td>The Netherlands</td>
<td>1m</td>
<td>2002</td>
<td>Amaranthus</td>
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</tr>
<tr>
<td>Orius majusculus (Reuter, 1879) (*)</td>
<td>The Netherlands</td>
<td>1f</td>
<td>2002</td>
<td>Amaranthus</td>
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</tr>
<tr>
<td>O. majusculus</td>
<td>Turkey</td>
<td>1f</td>
<td>2006</td>
<td>cut flowers</td>
<td>Miami</td>
</tr>
<tr>
<td>Orius majusculus</td>
<td></td>
<td>1f</td>
<td>2008</td>
<td>cut flowers</td>
<td>Miami</td>
</tr>
<tr>
<td>Orius niger Wolff, 1811 (*)</td>
<td>The Netherlands</td>
<td>2f</td>
<td>2006</td>
<td>cut flowers</td>
<td>Miami PPQ</td>
</tr>
<tr>
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<td></td>
<td>1f</td>
<td>2005</td>
<td>Leucospermum</td>
<td>L.A. 200242</td>
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<tr>
<td>O. niger</td>
<td>The Netherlands</td>
<td>1f</td>
<td>2005</td>
<td>Astilbe sp.</td>
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</tr>
<tr>
<td>O. niger</td>
<td>Israel</td>
<td>1f</td>
<td>2003</td>
<td>Anemone</td>
<td>Miami</td>
</tr>
<tr>
<td>O. niger</td>
<td>Israel</td>
<td>2f</td>
<td>2006</td>
<td>Helianthus</td>
<td>JFK 67354</td>
</tr>
<tr>
<td>Orius albidipennis (Reuter, 1884) (*)</td>
<td>Israel</td>
<td>1f</td>
<td>2005</td>
<td>Helianthus</td>
<td>JFK 161891</td>
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<tr>
<td>Orius minutus (Linnaeus, 1758) (*)</td>
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<td>1f</td>
<td>2008</td>
<td>cut flowers</td>
<td>Miami</td>
</tr>
<tr>
<td>Orius (Dimorphella) sp.</td>
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<td>1f</td>
<td>2005</td>
<td>Ornithogallum sp.</td>
<td>Miami</td>
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<tr>
<td>Orius (Heterorius) sp.</td>
<td>Italy</td>
<td>1f</td>
<td>2006</td>
<td>tile</td>
<td>Miami USDA</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orius peri Carayon, 1976 (*)</td>
<td>South Africa</td>
<td>1m</td>
<td>2004</td>
<td>cut flowers</td>
<td>Miami PPQ</td>
</tr>
<tr>
<td>Orius (Orius) sp.</td>
<td>South Africa</td>
<td>1f</td>
<td>2000</td>
<td>Erica sp.</td>
<td>Miami USDA</td>
</tr>
<tr>
<td>Orius (Orius) sp.</td>
<td>South Africa</td>
<td>1f</td>
<td>2003</td>
<td>Lactuca sativa</td>
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<td>1f</td>
<td>2006</td>
<td>unk. host</td>
<td>JFK 161976</td>
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<tr>
<td>Orius (Orius) sp. 2</td>
<td>Kenya</td>
<td>1f</td>
<td>2005</td>
<td>Eryngium</td>
<td>Miami PPQ</td>
</tr>
<tr>
<td>Orius (Orius) sp. 3</td>
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<td>3f</td>
<td>2005</td>
<td>Eryngium</td>
<td>Miami PPQ</td>
</tr>
<tr>
<td>Orius (Orius) sp. 3</td>
<td>Kenya</td>
<td>1f</td>
<td>2005</td>
<td>Veronica</td>
<td>Miami PPQ</td>
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<tr>
<td>Caffrocoris brincki Carayon, 1961 (*)</td>
<td>South Africa</td>
<td>1f</td>
<td>(no data)</td>
<td>cut flowers</td>
<td>140528</td>
</tr>
</tbody>
</table>

1 C/F or c/f indicates cut flowers
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3 Genus nr. Guayascoris Carpintero and Dellapé, 2012
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</tr>
</thead>
<tbody>
<tr>
<td><strong>CARDIASTETHINI</strong></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>South America/Central America/West Indies</strong></td>
<td></td>
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<tr>
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<tr>
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<td>1f</td>
<td>2004</td>
<td>cut flowers</td>
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<tr>
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<td>2002</td>
<td><em>Momordica</em> sp. (fruit)</td>
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<td><em>Cardiastethus affinis</em> Poppius, 1909 (*)</td>
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<td>1m</td>
<td>2006</td>
<td>ornamental plants</td>
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<td>1f</td>
<td>2005</td>
<td>C/F</td>
<td>Miami PPQ</td>
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<td>1(?)</td>
<td>1990</td>
<td>flowers</td>
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<td>Haiti</td>
<td>1f</td>
<td>2003</td>
<td>palmetto leaves in baggage</td>
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<td><em>Alofa sodalis</em> (White, 1878)</td>
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<td>1m</td>
<td>2001</td>
<td>in mail package</td>
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<td>Trinidad/Tobago</td>
<td>1f</td>
<td>2003</td>
<td><em>Capsicum</em> sp.</td>
<td>Miami</td>
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<td>2009</td>
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<td><em>A. constrictus</em></td>
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<td>1m</td>
<td>2002</td>
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<td><em>Physopleurella flavus</em> Carayon, 1956 (*)</td>
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<td>1f</td>
<td>2006</td>
<td>basketware</td>
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<td><em>Cardiastethus affinis</em></td>
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<td>1990</td>
<td>orchid</td>
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<td><em>Cardiastethus minutissimus</em> Usinger, 1946 (*)</td>
<td>Thailand</td>
<td>1f</td>
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<td>baggage</td>
<td>Dallas PPQ</td>
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<td></td>
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<td><em>Buchananiella continua</em> (White, 1879)</td>
<td>Luxemburg</td>
<td>1f</td>
<td>2005</td>
<td><em>Hydrangea</em></td>
<td>Miami PPQ</td>
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<td><strong>SCOLOPINI</strong></td>
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</tr>
<tr>
<td><strong>South America/Central America/West Indies</strong></td>
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<tr>
<td><em>Calliodis pallescens</em> (Reuter, 1884) (*)</td>
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<td>1m</td>
<td>2005</td>
<td><em>Celosia</em> sp.</td>
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<tr>
<td><em>C. pallescens</em></td>
<td>Honduras</td>
<td>1f</td>
<td>2002</td>
<td>passenger baggage</td>
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<td><em>C. pallescens</em></td>
<td>Jamaica</td>
<td>1f</td>
<td>2006</td>
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<td><em>Hydrangea</em> sp.</td>
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<td>1991</td>
<td><em>Musa</em> (banana)</td>
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</table>

¹C/F or c/f indicates cut flowers
²Missing data indicate information not provided on specimen label
³Genus nr. *Guayascoris* Carpintero and Dellapé, 2012
⁴Identified by T.J. Henry
⁵Identified by T. Dobbs
TABLE 2. (CONTINUED) SPECIES OR GENERA INTERCEPTED, SEPARATED BY FAMILY (ANTHOCORIDAE, LYCTOCORIDAE, LASIOCHILIDAE), TRIBE, AND ZOOGEOGRAPHIC REGION. (*) SPECIES IS NOT CURRENTLY ESTABLISHED IN THE CONTINENTAL U.S. IDENTIFICATIONS BY T.M. LEWIS UNLESS OTHERWISE STATED.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Source of interception</th>
<th>Number and sex of specimens</th>
<th>Year of interception</th>
<th>Commodity (label: verbatim)</th>
<th>Interception point (label: verbatim)</th>
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<td>XYLOCORINI</td>
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<td>Xylocoris afer (Reuter, 1884)</td>
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<td>X. afer</td>
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<td>2004</td>
<td>tiles</td>
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<td>tiles</td>
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<td>Xylocoris flavipes (Reuter, 1875)</td>
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<td>Xylocoris (Proxylocoris) sp.</td>
<td></td>
<td>1f</td>
<td>2007</td>
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<td>Miami PPQ</td>
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<tr>
<td>ANTHOCORINI</td>
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<td></td>
<td></td>
<td></td>
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<td>Mexico</td>
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<td>Anthocoris albiger Reuter 1884</td>
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<td>1f</td>
<td>(no data)</td>
<td>Prosopsis (sic)</td>
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<td>rosemary</td>
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<td>1m</td>
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<td>2f</td>
<td>2002</td>
<td>Grevillea c/f</td>
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<td>1m</td>
<td>2004</td>
<td>Crocosmia sp.</td>
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<td>A. nemorum</td>
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<td>1f</td>
<td>2004</td>
<td>Brassica pekinensis</td>
<td>New Orleans 050680</td>
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<td>BLAPTOSTETHINI</td>
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<td>Sub-Saharan Africa</td>
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<td>1f</td>
<td>2001</td>
<td>assoc. w/ wood</td>
<td>L.A. 160298</td>
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</tbody>
</table>

1C/F or c/f indicates cut flowers
2Missing data indicate information not provided on specimen label
3Genus nr. Guayascoris Carpintero and Dellapé, 2012
4Identified by T.J. Henry
5Identified by T. Dobbs
**Table 2.** (Continued) Species or genera intercepted, separated by family (Anthocoridae, Lyctocoridae, Lasiochilidae), tribe, and zoogeographic region. (*) species is not currently established in the continental U.S. Identifications by T.M. Lewis unless otherwise stated.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Source of interception</th>
<th>Number and sex of specimens</th>
<th>Year of interception</th>
<th>Commodity (label: verbatim)¹</th>
<th>Interception point (label: verbatim)²</th>
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<td><strong>LYCTOCORIDAE</strong></td>
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</tr>
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<td>Delphinium sp.</td>
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<td>1990</td>
<td>Dianthus</td>
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<td>Lytocoris sp.</td>
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<td>2004</td>
<td>Limonium sp.</td>
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<td></td>
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<td>Lasiochilus sp.⁵</td>
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<td>13f 3m</td>
<td>1999</td>
<td>cargo aircraft</td>
<td>—</td>
</tr>
</tbody>
</table>

¹C/F or c/f indicates cut flowers  
²Missing data indicate information not provided on specimen label  
³Genus nr. Guayascoris Carpintero and Dellapé, 2012  
⁴Identified by T.J. Henry  
⁵Identified by T. Dobbs
among 5 genera. The Lasiochilidae included 19 specimens in a single genus (Table 2). Less frequently intercepted were 4 other tribes of the Anthocoridae (Scolopini, Xylocorini, Anthocorini, Blaptostethininae), and specimens from the family Lyctocoridae (Tables 1 and 2). Fourteen of the identified species are not currently known to be established in the continental U.S. (Table 2: species with asterisks).

Anthocoridae: Oriini

The Oriini is composed of 16 genera (Carayon 1972a; Péricart 1996) including the widespread Orius with 75-80 described species (Ford 1979; Yasunaga 1997; Jung et al. 2011). Interceptions included 2 genera: Orius; and a single specimen of Caffrocoris brincki Carayon, 1961, known only from South Africa (Carayon 1961; Ford 1979). The interceptions of Orius comprised 56 specimens from 9 identified species distributed among 4 zoogeographic regions (Table 2). Seventeen specimens could be identified only to genus, due either to lack of suitable keys, or because no male specimens (needed for examination of genitalia) were available in the interceptions. Members of this genus are commonly associated with flowers and other produce, and are regular interceptions at ports on cut flowers, ornamental plants, and agricultural produce (Herring 1967). Virtually all intercepted specimens were associated with cut flowers, bouquets, or ornamental plants (Table 2). Orius commonly occurs in flowers and bloom clusters under field conditions (Miliczky & Horton 2011). Cut flowers are known important sources of arthropod interceptions in general (Work et al. 2005; McCullough et al. 2006).

Intercepted specimens of Orius that we were able to identify to species included both Old and New World taxa. Orius niger (Wolff, 1811), O. minutus (Linnaeus, 1758), O. majusculus (Reuter, 1879), and O. vicinus (Ribaut, 1923) are Old World species distributed throughout Europe and parts of Asia (Péricart 1996), and were intercepted on shipments from The Netherlands, Israel, and Turkey (Table 2). A fourth Old World species, O. albidipennis (Reuter, 1884) is found throughout North Africa and Asia (Péricart 1996), and was intercepted on Helianthus arriving from Israel (Table 2). Orius peri Carayon, 1976, apparently has been collected only from South Africa (Hernández & Stonedahl 1999), and was intercepted on a shipment of cut flowers from South Africa (Table 2). Two South American species, O. florentiae Herring, 1966, and O. championi Herring, 1966, were intercepted on shipments from Ecuador and Colombia (Table 2). Orius insidiosus (Say, 1832) was intercepted in shipments from Mexico, Central America, the West Indies, and South America. This species is native to the Nearctic/Neotropical Regions, and is geographically widespread in eastern North America and southwards into Central/South America and the West Indies (Henry 1988; Carpentero 2002).

Species of Orius frequently become established in geographic regions outside of their native ranges (Herring 1967; Yasunaga 2000; Lattin 2007ab; Herring 2008; Lewis & Lattin 2010) following accidental introduction into those regions. Two of the Old World species detected in our interceptions, O. albidipennis and O. niger, are currently established in several geographic regions outside of their respective native ranges (Péricart 1996). Orius vicinus, another Old World species intercepted on shipments from Europe (Table 2), is known to be established in North America, apparently since at least the 1930s (Lewis & Lattin 2010). It is also an established introduction in New Zealand, where it is found feeding on pest arthropods in apple orchards (Larivière & Wearing 1994). Orius insidiosus has become established in Hawaii, although possibly as a consequence of intentional introduction (Lattin 2007b). The European/Asian species, O. minutus, was at one time thought to be an established introduction in North America (Lattin et al. 1989), but has since been removed from the North American faunal list (Lewis & Lattin 2010). North American records of this species are actually mistakes in identifications of the non-indigenous O. vicinus (Lewis & Lattin 2010).

Anthocoridae: Cardiastethini

The Cardiastethini presently includes 16 genera of often uncertain systematic affinities distributed extensively in the Old and New World tropics (Ford 1979; Schuh & Slater 1995; Carpentero 2002; Carpentero & Dellapé 2008). Five genera within the Cardiastethini were identified in interceptions from 3 zoogeographic regions (Tables 1 and 2). Specimens were collected from plants, cut flowers, basketware, and luggage (Table 2). Amphiareus constrictus (Stål, 1860) was intercepted in shipments from the Neotropics (South America/Central America/West Indies) and Asia (Table 2). This species is geographically widespread, particularly in the Old and New World tropics (Herring 1967; Ford 1979; Yamada 2008b), and is established as an introduction in many parts of the world, including on a number of oceanic islands (Hawaii – Lattin 2007b; the Galápagos – Herring 1966, Lattin 2007a; Micronesia – Herring 1967; and the Cook Islands – Walker & Deitz 1979). The species apparently is established in western North America, probably through accidental introduction (Lattin & Lewis 2001; Lattin 2007c). As occurs with other members of the Cardiastethini, species of Amphiareus Distant, 1904, are commonly associated with dead leaf clusters, dead trees, decaying fungi, or stacked logs, where they presumably feed on small soft-bodied ar-
Anthocoridae: Scolopini

The Scolopini is composed of approximately 18 genera of wide geographic distribution and with heavy representation in the Neotropics (Ford 1979; Schuh & Slater 1995; Carpintero 2002; Carpintero & Dellapé 2012). Calliodis Reuter, 1871, includes at least 12 species distributed almost exclusively in the New World tropics (Carpintero & Dellapé 2012). Biology of this group is relatively poorly known, although members of the genus have been collected beneath bark, in dead or dying trees, and in dead leaf habitats, where they are likely to be predaceous on small soft-bodied arthropods (Kelton 1978; Lattin 1999b; Ulyshen et al. 2012). Calliodis pallescens (Reuter, 1884) is distributed throughout Central America, South America, and the West Indies (Champion 1900; Ford 1979; Carpintero 2002; Carpintero & Dellapé 2012), and was intercepted on 3 separate shipments from these regions (Table 2). There is no evidence that this species currently occurs in the United States (Lattin 2001).

Anthocoridae: Xylocorini

The Xylocorini includes only a single genus, Xylocoris Dufour, 1831, of cosmopolitan distribution...
and comprising about 50 described species (Ford 1979). Species of *Xylocoris* occur in stored products, in granaries, in manure heaps, beneath the bark of trees, and in nests of birds (Carayon 1958; Kelton 1978; Lattin 2000; Yamada et al. 2006), and are commonly introduced into new geographic regions through transport of food products or other commodities (Southwood & Leston 1959; Carayon 1961; Herring 1967; Palta 2012). Ten specimens of 2 identified species and one unidentified species were found in interceptions (Table 2). Specimens were found in association with unidentified plants, personal effects, and “tiles”, from 2 zoogeographic regions (Table 2); marble and ceramic tiles are a common source of insect interceptions at U.S. seaports (Work et al. 2005; McCullough et al. 2006). *Xylocoris flavipes* (Reuter, 1875) is a common predator of stored grain insects (Lattin 2000). This species is a common interception at ports, and apparently has been widely spread by commerce (Carayon 1961; Lattin 2007b,c). *Xylocoris flavipes* is apparently established in Hawaii (Lattin 2005a, 2007b) and North America (Ford 1979). A single specimen was intercepted in a shipment from Italy, associated with “tile” (Table 2).

**Anthocoridae: Anthocorini**

The **Anthocorini** is composed of at least 10 genera, with strong representation in the Palearctic (Carayon 1972a; Ford 1979; Carpintero 2002). The largest genus is **Anthocoris** Fallén, 1814, with over 50 described species (Ford 1979). Members of this genus occur often on trees and shrubs, and are important sources of biological control in orchards (Lattin 1999a, 2000). Interceptions included 2 genera, **Anthocoris** (8 specimens) and a single specimen of **Dufouriellus ater** (Dufour, 1833). The specimens of **Anthocoris** comprised 4 identified species and one unidentified specimen, from 2 geographic regions intercepted on plant material (Table 2). **Anthocoris albiger** Reuter, 1884, is a New World species found in Central America, Mexico, and the southwestern U.S. (Carpintero 2002; Lewis et al. 2005). The insect often occurs on *Prospis* (Ward et al. 1977; Lewis et al. 2005), and this plant species was the source of the single interception (Table 2). **Anthocoris variipes** Champion, 1901, is known from South America, Central America, and Mexico, but has yet to be reported from the U.S. **Anthocoris nemoralis** (Fabricius, 1794) and **Anthocoris nemorum** (Linnaeus, 1761) are common and widespread species in Europe, and are important sources of biological control in agriculture (Lattin 1999a, 2000). **Anthocoris nemoralis** was intentionally released into North America to control a psyllid pest of pears, and is now established throughout the western U.S. (Horton et al. 2004).

**Dufouriellus ater** is the sole representative of *Dufouriellus*. This genus has historically been included within the Cardiastethini, but was moved to the Anthocorini by Carpintero and Dellapé (2008). **Dufouriellus ater** has been found under bark in association with bark beetles or other soft-bodied prey, in stored products, and in bee hives (Southwood & Leston 1959; Kelton 1978; Arbogast 1984; Lattin 2000). The species is an established introduction in Hawaii (Lattin 2005a, 2007b) and North America (Ford 1979). A single specimen was intercepted in a shipment from Italy, associated with “tile” (Table 2).

**Anthocoridae: Blaptostethini**

The Blaptostethini is a poorly known group of 2 genera occurring in the Old World tropics (Ford 1979). **Blaptostethus** Fieber, 1860, includes 6 described species of relatively poorly known biology from the Asian/African tropics (Ford 1979; Yamada 2008a). Members of this genus have been found in dead plant habitats, in nests of birds, in stored grains, on living plants, and in agricultural fields (Carayon 1958; Tawfiq & El-Husseini 1971; Rajasekhar 1973; Yamada 2008a; Kaur & Virk 2011). Interceptions included 1 unidentified species from Ghana associated with “wood” (Table 2).

**Lycocoridae**

The **Lycocoridae** is composed of 2 genera (Ford 1979), including the geographically widespread *Lycocoris* Hahn, 1836. These insects are often found in stored products, beneath bark, in manure piles and chicken houses, in nests of birds and small mammals, and in dead vegetation (Southwood & Leston 1959; Lattin 2000, 2007b). One species, *Lycocoris campestris* (Fabricius, 1794), known as the “debris bug”, appears to be almost cosmopolitan in distribution, apparently because of unintentional introductions (Lattin 2007b; Rabitsch 2010). Port interceptions included 9 specimens of unidentified species from 2 zoogeographic regions associated with plants and cut flowers (Table 2).

**Lasiochilidae**

The Lasiochilidae is a poorly studied group of 10 genera with a strong presence in the Neotropical region (Carayon 1972a; Ford 1979; Carpintero 2002). **Lasiochilus** Reuter, 1871, includes nearly 50 described species associated primarily with the Neotropics and Pacific Islands (Herring 1967; Ford 1961; 1901, is known from South America, Central America, and Mexico, but has yet to be reported from the U.S. **Anthocoris nemoralis** (Fabricius, 1794) and **Anthocoris nemorum** (Linnaeus, 1761) are common and widespread species in Europe, and are important sources of biological control in agriculture (Lattin 1999a, 2000). **Anthocoris nemoralis** was intentionally released into North America to control a psyllid pest of pears, and is now established throughout the western U.S. (Horton et al. 2004).

**Dufouriellus ater** is the sole representative of *Dufouriellus*. This genus has historically been included within the Cardiastethini, but was moved to the Anthocorini by Carpintero and Dellapé (2008). **Dufouriellus ater** has been found under bark in association with bark beetles or other soft-bodied prey, in stored products, and in bee hives (Southwood & Leston 1959; Kelton 1978; Arbogast 1984; Lattin 2000). The species is an established introduction in Hawaii (Lattin 2005a, 2007b) and North America (Ford 1979). A single specimen was intercepted in a shipment from Italy, associated with “tile” (Table 2).

**Anthocoridae: Blaptostethini**

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1979; Carpintero 2002; Yamada & Hirowatari 2005). Members of this genus are collected from dead plant material, rotting logs, and decaying fruit (Blatchley 1926; Usinger 1946; Herring 1967; Yamada & Hirowatari 2005; Jung & Lee 2007). Nineteen specimens of (mostly unidentified) *Lasiochilus* were intercepted on shipments from Ecuador and Panama. Two specimens intercepted from Ecuador could be identified to species: *Lasiochilus pallidulus* Reuter, 1871 (Table 2). *Lasiochilus pallidulus* is widely distributed in Central America, South America, the West Indies, and the southern U.S. (Ford 1979; Henry 1988; Carpintero 2002), and is a relatively common part of the true bug fauna in south Florida (Blatchley 1926). Lattin (2007a) included it in his list of species introduced into the Galápagos. Herring (1966) reported its presence on Cook Island and the Galápagos.

Sources of Interceptions

We observed differences among geographic regions in numbers and taxonomic composition of interceptions (Table 3), probably because of the combined effects of zoogeography, types of products being shipped and tendency of those products to host these insects in the country of origin, and numbers of shipments arriving from each region. Interceptions arriving from South and Central America included several taxa not encountered in shipments from other regions, notably Scolopini (Anthocoridae) and Lasiochilidae (Table 3). Both of these groups are common in the New World tropics (Ford 1979; Carpintero 2002). Oriini (Anthocoridae) were intercepted from all regions except Asia. Nine of 10 intercepted specimens of *Xylocoris* (Anthocoridae: Xylocorini) arrived on shipments from Asia (Table 3). Interceptions arriving from South America and Central America were taxonomically the most diverse, with 9 genera identified in the interceptions (Table 3). The Anthocorini (Anthocoridae) are most heavily represented in the Palearctic and western Nearctic regions (Ford 1979). Nine specimens of Anthocorini were intercepted; the specimens were intercepted in shipments arriving from Europe and Mexico (Table 3).

Specimens representing 10 species arrived on shipments from countries outside of the species' listed geographic distributions (Table 4), suggesting that we identified several new country records in the interceptions. The assumption underlying this conclusion is that the commodity from which a given specimen was recovered (column 5 in Table 2) actually originated in the source country listed in column 2 of the table. This assumption is probably true for the majority of records in Table 2, with the most likely exceptions being specimens that were intercepted in passenger luggage or baggage. The majority of new records listed in Table 4 comprise geographic regions (countries)
<table>
<thead>
<tr>
<th>Species intercepted</th>
<th>Origin of shipment</th>
<th>Known distribution of species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orius insidiosus</td>
<td>(1) Ecuador</td>
<td>Eastern North America, Central America, South America, West Indies (Champion 1900; Henry 1988; Carpintero 2002)</td>
</tr>
<tr>
<td></td>
<td>(2) Trinidad/Tobago</td>
<td></td>
</tr>
<tr>
<td>Amphiareus constrictus</td>
<td>(1) Haiti</td>
<td>Nearly cosmopolitan, including many oceanic islands – Micronesia, Hawaii, the Cook Islands, and the Galápagos (Champion 1900; Herring 1967; Ford 1979; Walker &amp; Deitz 1979, Cassis &amp; Gross 1995; Péricart 1996; Lattin &amp; Lewis 2001; Carpintero 2002; Yamada &amp; Hirowatari 2003; Lattin 2007ab; Yamada 2008b)</td>
</tr>
<tr>
<td></td>
<td>(2) Dominican Republic</td>
<td></td>
</tr>
<tr>
<td>Physopleurella mundula</td>
<td>Haiti</td>
<td>Hawaii, Guam, Micronesia, Florida (Usinger 1946; Herring 1967; Ford 1979; Lattin 2005b)</td>
</tr>
<tr>
<td>Physopleurella flav a</td>
<td>Philippines</td>
<td>Thailand, Malaysia, Mauritius, Madagascar, Congo, Benin, Côte-d’Ivoire (Yamada &amp; Hirowatari 2007b)</td>
</tr>
<tr>
<td>Alofa sodalis</td>
<td>(1) Brazil</td>
<td>Cosmopolitan (except Australia), including many oceanic islands – Hawaii, the Galápagos, Micronesia, and Easter Island (Usinger 1946; Herring 1967; Ford 1979, Carpintero 2002; Lattin 2007ab)</td>
</tr>
<tr>
<td></td>
<td>(2) Trinidad</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Costa Rica</td>
<td></td>
</tr>
<tr>
<td>Cardiastethus affinis</td>
<td>(1) Thailand</td>
<td>East Africa, India (Ford 1979; Yamada et al. 2008)</td>
</tr>
<tr>
<td></td>
<td>(2) Haiti</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Costa Rica</td>
<td></td>
</tr>
<tr>
<td>Cardiastethus minutissimus</td>
<td>Thailand</td>
<td>Guam, Micronesia, Hawaii, Ogasawara Islands - Japan (Herring 1967; Lattin 2007b; Yamada &amp; Hirowatari 2007a)</td>
</tr>
<tr>
<td>Buchananiella continua</td>
<td>Luxemburg</td>
<td>Europe, North Africa, Asia, tropical Africa, Reunion, North America, South America, Madeira, Azores (Carayon 1958; Ford 1979; Péricart 1996; Lattin et al. 2001; Carpintero 2002; Aukema 2007)</td>
</tr>
<tr>
<td>Calliodis pallescens</td>
<td>(1) Colombia</td>
<td>South America, Central America, Grenada (Champion 1900; Ford 1979; Carpintero 2002)</td>
</tr>
<tr>
<td></td>
<td>(2) Honduras</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Jamaica</td>
<td></td>
</tr>
<tr>
<td>Xylocoris afer</td>
<td>(1) Costa Rica</td>
<td>Sub-Saharan Africa, Turkey, South America, Central America, Australia, Israel, Great Britain, United States (Southwood &amp; Leston 1959; Ford 1979; Péricart &amp; Halperin 1989; Cassis &amp; Gross 1995; Péricart 1996; Carpintero 2002; United States records from TML and TTD collections)</td>
</tr>
<tr>
<td></td>
<td>(2) India</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) China</td>
<td></td>
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</tbody>
</table>
that neighbor the known geographic range of the species. More interesting are interceptions of species from countries well outside of the species’ known geographic range. The most striking geographic anomalies in the interceptions were for 2 species of Cardiastethus. The first of these, Cardiastethus affinis, was intercepted in shipments from Thailand, Haiti, and Costa Rica (Table 4). Previous records for this species include only India and East Africa. Secondly, a specimen of Cardiastethus minutissimus was intercepted in baggage on a flight from Thailand. Previous records for C. minutissimus are limited to a number of Pacific Islands (Table 4).

Conclusions

The Anthocoridae and related taxa are common elements in the non-indigenous insect faunas of many geographic regions (Lattin 1999a; Rabitsch 2010), including in the faunas of isolated oceanic islands (Lattin 2007ab; Herring 1967; Yasunaga 2000; Carpentero 2002; Aukema et al. 2006). Although some of these introduced species have become established as a consequence of classical biological control programs (e.g., Horton et al. 2004), the majority of established introductions of Anthocoridae has almost certainly been accidental, likely as stowaways on international shipments of goods. Indeed, specimens of Anthocoridae, Lyctocoridae, and Lasiochilidae may be particularly effective at dispersing in this manner. These taxa occupy a variety of different habitats, often including cryptic habitats (Lattin 1999), and were intercepted on a number of different products: cut flowers, ornamental plants, agricultural produce, tile, and wood products (Table 2). The insects are small in body size and often flattened in shape, and may thus occupy microsites easily overlooked by inspectors. Many of the specimens that we were able to fully identify were of species not currently established in the continental United States (the species marked with asterisks in Table 2). These 33 specimens comprised 14 identified species scattered among several zoogeographic regions. Moreover, in addition to the 33 specimens that could be identified to species, another 49 specimens distributed among 7 genera (Orius, Callidasis, Xylocoris, Blaptostethus, Lyctocoris, Lasiochilus) were new enough to us that we were not able to identify them (Table 2). Given our familiarity with the North American fauna of the Anthocoridae, our lack of success in identifying these 49 specimens probably is an indication that these unidentified species are not part of the true bug fauna in the continental U.S. In sum, 82 of the 127 total specimens that were examined in this study are very likely to be species that are not part of the current U.S. fauna.

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References Cited


