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ARTHROPODS ASSOCIATED WITH ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA*, IN SOUTH FLORIDA, USA

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ABSTRACT

Melaleuca quinquenervia (Cav.) S. T. Blake, the broad-leaved paperbark tree, has invaded ca. 202,000 ha in Florida, including portions of the Everglades National Park. We performed prerelease surveys in south Florida to determine if native or accidentally introduced arthropods exploit this invasive plant species and assess the potential for higher trophic levels to interfere with the establishment and success of future biological control agents. Herein we quantify the abundance of arthropods present on the above-ground portions of saplings and small *M. quinquenervia* trees at four sites. Only eight of the 328 arthropods collected were observed feeding on *M. quinquenervia*. Among the arthropods collected in the plants adventive range, 19 species are agricultural or horticultural pests. The high percentage of rare species (72.0%), presumed to be transient or merely resting on the foliage, and the paucity of species observed feeding on the weed, suggests that future biological control agents will face little if any competition from pre-existing plant-feeding arthropods.

Key Words: Paperbark tree, arthropod abundance, *Oxyops vitiosa*, weed biological control

RESUMEN

Melaleuca quinquenervia (Cav.) S. T. Blake ha invadido ca. 202,000 ha en la Florida, incluyendo unas porciones del Parque Nacional de los Everglades. Nosotros realizamos sondeos preliminares en el sur de la Florida para determinar si los artópodos nativos o accidentalmente introducidos explotan esta especie de planta invasora y evaluar el potencial de los niveles tróficos superiores para interferir con el establecimento y éxito de futuros agentes de control biológico. En cuatro sitios, nosotros cuantificamos la abundancia de artópodos presentes en las porciones sobre el terreno de los renuevos y pequeños arboles de *M. quinquenervia*. Solamente ocho de los 328 artópodos recolectados fueron observados alimentandose en la *M. quinquenervia*. Entre los artópodos colectados en las áreas no nativas de la planta, 19 especies son plagas agrícolas ó de hortalizas. El alto percentaje de especies raras (72.0%), presumidos de ser transeúntes o meramente descansando en el follaje, y la escasez de especies observadas alimentandose de la maleza, sujiere que los futuros agentes de control biológico enfrentarán poca o ninguna competencia de los artópodos herbivoras ya presentes en la planta.

Melaleuca quinquenervia (Cav.) S.T. Blake, the broad-leaved paperbark tree, was introduced into south Florida during the late 1800s (Thayer & Bodle 1990). Although threatened in its native range along the east coast of Australia and a few nearby South Pacific islands, life history characteristics of *M. quinquenervia* (melaleuca) combine with favorable ecological characteristics of Everglades habitats to make this tree an explosive weed in south Florida (Meskimen 1962; Myers 1983; Balciunas & Center 1991; Hofstetter 1991). Currently, melaleuca occurs on about 202,000 ha of Florida wetlands (Bodle et al. 1994) and has historically spread at a rate of about 2,850 ha/yr (Center et al. 2000). The negative impacts of melaleuca on native flora and public health problems have been documented (Di Stefano & Fisher 1983; Myers 1983; Molnar et al. 1991; Bodle et al. 1994). Diamond et al. (1991), for instance, determined that if unchecked, potential losses to the Florida economy as a result of this invasive tree could reach $169 million annually.

Melaleuca infested areas can be restored through removal of existing trees, followed by measures to preempt reinvasion and subsequent recruitment. Conventional control tactics combine mechanical and chemical means to eliminate seedlings, saplings, entire stands of mature trees, or isolated plants in sensitive areas (Stocker & Sanders 1981; Bodle et al. 1994). However, biological attributes of this weed necessitate repeated mechanical and chemical treatments, which impose an accumulation of negative impacts on nontarget organisms, including endangered plants. These adverse impacts limit the frequent use of such methods. In contrast, classical weed biological control has been described as the most ecologically benign tactic for controlling exotic pests (McEvoy & Coombs 1999) and has been considered a desirable addition to conventional methods (Browder & Schroeder 1981; Bodle et al. 1994).

Development of a weed biological control program typically proceeds in a stepwise fashion, including: selection of a natural enemy, risk analysis, release, monitoring establishment, and finally assessing the effectiveness and ecological impact of the introduced biological control agent (Harris 1975; McEvoy & Coombs 1999). An often recommended initial phase in a classical weed biological control program includes surveys of herbivores associated with the invasive weed in the new (adventive) geographic range (Harris 1975; Olckers & Hulley 1995). Such surveys are intended to identify herbivores already exploiting the weed and to ascertain whether niche competition could influence agent establishment and impact (Harris 1971). Although surveys for natural enemies were performed in Australia during 1987 to 1991 (Balciunas et al. 1995), surveys of arthropods associated with melaleuca in its adventive range had never been done. Failure to perform such surveys could increase costs due to wasted effort associated with selecting, screening and releasing herbivores that may already be present, having accompanied the invasive weed upon introduction or thereafter. Therefore, specific objectives of this study were: 1) assess the current abundance of arthropods associated with melaleuca in south Florida, 2) determine if native herbivores are exploiting the invasive plant, 3) determine if co-evolved natural enemies from the native range inadvertently accompanied melaleuca into south Florida, and 4) inventory those higher trophic levels associated with the plant that could potentially interfere with the establishment or impact of introduced biological control agents.

Materials and Methods

Arthropod surveys were performed at four locations in south Florida. Site 1 was located near Ft. Lauderdale, Broward Co., FL (N26.05606 and W80.25168). The site was a 0.5 ha field consisting of 2 to 5 m tall trees occurring at a plant density of ca. 21,560 trees/ha. In general, melaleuca trees were growing in high organic soils typical of reclaimed 'glades' systems. Although melaleuca was the dominant species, other plants commonly occurring in the site included *Blechnum serrulatum* Rich., *Ampelopsis arborea* (L.) Koehne, *Vitis aestivalis* Michx., and *Ludwigia peruviana* (L.) H. Hara.

Site 2 was located under a power line right-of-way near Weston, Broward Co., FL (N26.035483 and W80.43495). Prior to 1997 land managers cut melaleuca trees near their bases, resulting in multi-stemmed branches re-growing from the stumps. The survey area was ca. 0.5 ha and trees were 2-5 m tall, occurring at a density of 2,517 trees/ha. The site was swale-like with common vegetation other than melaleuca including: *Sagittaria lancifolia* L., *Cladium jamaicensis* Crantz, and *Andropogon glomeratus* (Walt.) B.S.P. (Anonymous 1990).

Site 3 was located near Estero, Collier Co., FL (N26.4255 and W81.81033) and consisted of an 8 ha area of drained wetland converted to pasture. To suppress melaleuca growth, land managers mowed trees at ca. 6-month intervals, resulting in coppices 0.5-2 m in height. These coppicing clumps formed a dense, nearly continuous canopy of leaves with 4,406 clumps/ha. In contrast to the previous sites, the soil type was primarily sand, consistent with an invaded pine flatwoods habitat type (Anonymous 1990). Other than melaleuca, the subdominant vegetation included *Ludwigia* sp., *Centella asiatica* (L.) Urb., *Rhynchospora globularis* (Chapm.) Small, *Rhynchospora eximia* (Nees) Boeck., and *Rhynchospora filifolia* Gray.

Site 4 consisted of a 1 ha area within historically mesic flatwoods in the Picayune Forest, Collier Co., FL (N26.10478 and W81.63392) (Anonymous 1990). A fire burned much of the melaleuca dominated areas during June 1998, resulting in recruitment of 129,393 trees/ha composed of primarily small 1-2 m tall saplings, interspersed with an occasional large, mature tree. *Pinus elliottii* Engelm. and a parasitic (dodder-like) species growing on the melaleuca were the only other common vegetation.

Surveys were conducted monthly at each site from November 2000 through June 2001. Sites were surveyed between 10 a.m. and 2 p.m. on days without precipitation. To survey arthropods associated with melaleuca canopies, we swept foliage, and occasionally trunks, with a 90-cm-diameter sweep net. One sample consisted of 100 sweeps in a 180° sweeping motion spaced ca. 1.0 m apart along a randomly selected 100 m transect. Four samples along separate transects were collected each month. The contents of the net after 100 sweeps were emptied into a 3.78 liter sealable plastic bag and frozen at -19 (±1) °C until processed. Arthropods were then separated from plant material, sorted by morphological types, and stored in 70% ethanol.

One limitation of our sweep sampling method included collecting arthropods that were not closely associated with melaleuca, but were transients, merely resting on the plant foliage or disturbed from understory vegetation while sampling. Additionally, this method was biased towards those species that are poor fliers or slow to disperse from a disturbance and, unlike previous Australian surveys, endophages were not included. Therefore, caution should be used when drawing inferences from these data due to the unknown relationships between some of these arthropods and melaleuca. For this reason, a minimum of two observers searched for direct herbivory on the above ground portions of melaleuca trees for 30 min./month at each site. Arthropods observed feeding on melaleuca are reported independently from those collected in sweep samples.

For each species collected, species abundance per site was calculated for the entire survey period by first averaging the number of specimens from the four monthly samples and then averaging among all sample dates. Average species abundance among all sites was determined by total specimens collected throughout the entire survey (rare = 1-5 specimens, occasional = 6-10 specimens, common = >10 specimens). Occasionally, arthropods were collected by hand to facilitate identification. Where possible, arthropods were identified to species. Identifications that could not be confirmed are indicated by "poss." (possibly) before the scientific name. Some Diptera were not sent for identification because specialists were not available or specimens were damaged and lacked key identifying features. Such specimens were combined into an "unidentified spp." group and the number of morphological types is denoted in parentheses. All morphological types, except for immatures that could be associated with their adult forms, were included in the total species count.

All specimens, except formicids, were submitted to and deposited at the Florida State Collection of Arthropods (FSCA, Division of Plant Industry (DPI), Gainesville, FL) for identification and incorporated into their taxonomic database. Most formicids were identified and retained by L. Davis at the Fire Ant Unit, Agricultural Research Service, USDA, Gainesville, FL. A few formicids were identified by M. Deyrup at the Archbold Biological Station, Lake Placid, FL. Several dipteran specimens were identified at the Systematic Entomology Laboratory, Agricultural Research Service, USDA, Beltsville, MD.

RESULTS AND DISCUSSION

Surveys of herbivores associated with an invasive plant in its adventive range are often recommended as a prelude to a weed biological control project (Harris 1975). Historically, scientists have ignored this recommendation, possibly due to the supposition that native herbivores are already suppressing the weed to the greatest level possible. In contrast, native arthropods can cause considerable damage to non-indigenous weeds (Newman et al. 1998). The native weevil, *Euhrychiopsis lecontei* Deitz, for instance, shows promise for control of Eurasian watermilfoil, *Myriophyllum spiacata* (L.) (Newman & Beisoer 2000). In addition to natives, co-evolved herbivores and diseases may also be accidentally introduced from the plant's native range. The biological control agents *Megastigmus aculeatus* (chalcid wasp) and *Phyllocoptes fructiphilus* (an eriophyoid mite), for example, were collected in West Virginia during surveys of arthropods associated with the exotic weed *Rosa multifloria* (Thunb.). The eriophyoid mite, and the virus it transmits, is considered the most effective agent for the suppression of *R. multiflora* (Amrine 1996).

In its adventive range, however, it appears that melaleuca has not acquired native herbivores at sufficient densities to cause appreciable damage to trees in south Florida. For instance, of the 18 orders, 117 families, and 328 species collected in this study, only 54 species were classified as common and 33 species were classified as occasional (Tables 1 and 2). Of the most commonly occurring species, 33 (66.7%) were predators or detritivores (Table 2), and 11 (20.4%) were herbivores (Table 1). Both adult and immature stages of *H. coagulata*, the glassy-winged sharpshooter, were observed on melaleuca, suggesting that melaleuca may serve as an alternative host for this insect. However, during the sampling period none of these arthropods were directly observed feeding on melaleuca. Furthermore, out of 409 herbivorous arthropods found attacking melaleuca in Australia, none were found on melaleuca in south Florida indicating that no co-evolved natural enemies accompanied melaleuca into south Florida upon introduction or thereafter (Balciunas et al. 1995). The most intuitive explanation for these findings is probably due to the fact that all known importations of the invasive tree were in the form of seed (F. A. Dray, pers. comm.).

In contrast, we have observed several arthropod species feeding on melaleuca that were never recovered in the sweep samples. Both early and late instars of the polyphagous saddleback caterpillar, *Sibile stimulea* (Clem.), were observed feeding on mature melaleuca leaves at Site 3. Larvae of the caterpillar were concentrated on a single sapling, defoliated much of the tree, and were only present during late winter. After inspection of a single damaged sapling (5 cm diam), larvae of the generalist cerambycid *Neoclytus cordifer* (Klug) were also collected, allowed to pupate and successfully emerged as adults (2 males and 1 female). Two phytophagous mites, *Oligonychus coffeae* (Nietner) and *Brevipalpus obovatus* Donnadieu, were observed feeding and developing large (>100 individuals), although isolated populations. Populations of these generalist mites occurred on mature leaves and were only observed once. The Florida red scale, *Chrysomphalus aonidum* L., the stellate scale, *Vinsonis stellifera*, and an unidentified *Coccus* sp. often co-occurred on mature Melaleuca leaves. Although the scale occurred in surprisingly high densities (>10 per leaf), no apparent foliar damage was visible. Two polyphagous aphids, *Aphis gossypii* Glover and *Toxoptera aurantii* (Boyer de Fonscolombe), were observed feeding on stems of developing branches. Infestations of both polyphagous aphids were slight (<50 individuals per plant). Although these arthropod species were observed feeding on melaleuca, no damage was visible. These observational findings suggest that, unlike some invasive plants that can be stressed by native arthropods in the adventive range, the arthropod community currently associated with melaleuca provides little if any suppressive effect on the exotic tree. The pau-

TABLE 1. HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Coleoptera												
Aderidae												
Ganascus ventricosus LeConte	0.03 (0.09)	—	—	0.03 (0.09)	R	5	—	—	12	H	N	
Anthicidae												
Vacusus vicinus (LaFerte-Senecteere)	0.03 (0.09)	—	—	—	R	5	—	—	—	H	N	
Anthribidae												
Trignorohinus sp.	0.03 (0.09)	—	—	—	R	11	—	—	—	H	N	
Bruchidae												
Sennius fallax (Boheman)	—	0.03 (0.09)	—	—	R	—	3	—	—	H	N	
Buprestidae												
Taphrocerus puncticollis Schwarz	0.19 (0.26)	—	—	—	O	3-6	—	—	—	H	N	
Cantharidae												
Chauliognathus marginatus (Fabricius)	—	0.03 (0.09)	—	—	R	—	6	—	—	H	N	
Chrysomelidae												
Altica sp. A	—	—	0.03 (0.09)	0.03 (0.09)	R	—	—	11	12	H	N	
Altica sp. B	—	0.03 (0.09)	—	—	R	—	6	—	—	H	N	
Bassareus brunnipes (Olivier)	0.44 (0.90)	—	—	—	C	5,6	—	—	—	H	N	
Chrysomela scripta Fabricius	—	—	0.03 (0.09)	—	R	—	—	3	—	H	N	
Graphopus curtipennis Blake	—	—	—	0.03 (0.09)	R	—	—	—	1	H	N	
Lexiphanes saponatus (Fabricius)	—	0.03 (0.09)	—	—	R	—	6	—	—	H	N	
Ophraella notulata (Fabricius)	0.09 (0.19)	—	—	—	R	4,6	—	—	—	H	N	
Paria sp.	—	—	—	0.03 (0.09)	R	—	—	—	6	H	N	
Curculionidae												
Auleutes sp.	—	0.06 (0.18)	—	—	R	—	6	—	—	H	N	
Diaprepes abbreviatus (L.)	0.03 (0.09)	—	—	—	R	4	—	—	—	H	E	*
Listronotus cryptops (Dietz)	0.03 (0.09)	—	—	—	R	5	—	—	—	H	N	
Pheloconus hispidus (LeConte)	—	0.06 (0.18)	0.06 (0.12)	—	R	—	11	11, 12	—	H	N	
Trichodirabius longulus (LeConte)	—	—	0.06 (0.12)	—	R	—	—	4, 11	—	H	N	
Elateridae												
Drapetes rubricollis LeConte	—	—	—	0.03 (0.09)	R	—	—	—	3	H	N	
Languriidae												
Loberus sp.	—	0.06 (0.12)	—	—	R	—	4, 12	—	—	H	N	
Lycidae												
Plateros sp.	—	—	—	0.03 (0.09)	R	—	—	—	2	D/H[11]	N	

TABLE 1. (CONTINUED) HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Scarabaeidae												
Trigonopeltastes delta (Forster)	0.09 (0.27)	—	—	—	R	5	—	—	—	D/H	N	
Collembola												
Sminthuridae												
Sminthurus sp.	0.03 (0.09)	—	—	—	R	11	—	—	—	H		
Sminthurinus sp.	0.03 (0.09)	—	—	—	R	11	—	—	—	H		
Dermaptera												
Forficulidae												
poss.[12] *Doru taeniatum* Dohrn	—	0.03 (0.09)	—	—	R	—	11	—	—	H		
Diptera												
Agromyzidae												
Melangromyza sp.	0.09 (0.27)	0.09 (0.19)	—	—	O	11	4, 11	—	—	H/H		
Unidentified sp.	0.03 (0.09)	0.03 (0.09)	—	—	R	12	11	—	—	H/H		
Bibionidae												
Unidentified sp.	—	—	0.03 (0.09)	—	R	—	—	3	—	H/H		
Otitidae												
Chaetopsis massyla (Walker)	0.03 (0.09)	0.03 (0.09)	—	—	R	12	12	—	—	H/H		
Euxesta juncta Coquiller	0.03 (0.09)	—	—	—	R	3	—	—	—	H/H		
Sarcophagidae												
Ravinia derelicta Walker	0.03 (0.09)	0.03 (0.09)	0.38 (1.06)	0.03 (0.09)	C	4	5	5	12	D/H		
Sciaridae												
Unidentified sp.	0.03 (0.09)	—	0.16 (0.30)	—	O	5	—	11, 12	—	D/H		
Syrphidae												
Toxomerus boscii (Macquart)	—	0.13 (0.13)	—	—	R	—	3, 6, 11, 12	—	—	P/H		
Toxomerus politus (Say)	—	0.09 (0.19)	0.03 (0.09)	—	R	—	11, 12	1	—	P/H		
Tephritidae												
Acinia pictura (Snow)	0.06 (0.12)	0.28 (0.53)	—	—	C	5, 11	1, 3, 12	—	—	H/U		
Dioxyna picciola (Bigot)	0.69 (0.86)	0.22 (0.43)	0.22 (0.41)	0.06 (0.18)	C	1-5, 11, 12	4, 11, 12	11, 12	11, 12	H/U		
Euaresta bella (Loew)	—	0.03 (0.09)	—	—	R	—	11	—	—	H/U		
Trupanea actinobola (Loew)	0.03 (0.09)	—	0.13 (0.35)	—	O	12	—	11	—	H/U		
Xanthaciura insecta (Loew)	0.50 (0.97)	—	—	—	C	1, 11, 12	—	—	—	H/U		

TABLE 1. (CONTINUED) HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Therevidae												
Cyclotelus picitipennis (Wiedmann)	—	0.03 (0.09)	—	—	R	—	6	—	—	P/H		
Tipulidae												
Unidentified spp. (2 morphotypes)	0.06 (0.18)	—	—	—	R	11	—	—	—	D/H		
Hemiptera												
Alydidae												
Hyalymenus sp. A	0.03 (0.09)	0.38 (0.35)	—	—	C	4	1, 2, 4-6	—	—	H	N	
Hyalymenus sp. B	0.06 (0.12)	0.03 (0.09)	—	—	R	5, 11	12	—	—	H	N	
Imm. sp.	—	—	0.03 (0.09)	—	R	—	—	11	—	H		
Coreidae												
Leptoglossus phyllopus (L.)	0.03 (0.09)	0.09 (0.13)	—	—	R	11	1, 4, 12	—	—	H	N	*
Issidae												
Acanalonia servillei Spinola	0.03 (0.09)	—	—	—	R	6	—	—	—	H		
Largidae												
Largus davisi Barber	—	0.03 (0.09)	—	—	R	—	5	—	—	H	N	
Lygaeidae												
Neortholomus koreshanus (Van Duzee)	0.03 (0.09)	—	—	006 (0.12)	R	2	—	—	2, 12	H		
Neopamera bilobata (Say)	0.03 (0.09)	0.06 (0.12)	—	—	R	5	1, 12	—	—	H		*
poss. *Nysius* sp.	—	0.13 (0.27)	—	—	R	—	6, 12	—	—	H		
Oedancala crassimana (Fabricius)	0.41 (0.60)	0.06 (0.12)	0.25 (0.52)	—	C	5, 6, 11	3, 6	1, 4, 12	—	H		
Oncopeltus fasciatus (Dallas)	0.03 (0.09)	—	—	—	R	1	—	—	—	H		
Paromius longulus (Dallas)	0.22 (0.41)	0.13 (0.35)	0.03 (0.09)	—	C	11, 12	12	12	—	H		*
Imm. spp.	0.25 (0.44)	0.41 (0.65)	0.03 (0.09)	—	C	1, 11, 12	2, 11, 12	4	—	H		
Miridae												
Creontiades sp.	—	0.03 (0.09)	0.03 (0.09)	—	R	—	1	4	—	H		*
Dagbertus semipictus (Blatchley)	—	—	0.03 (0.09)	—	R	—	—	2	—	H		
Reuteroscopus ornatus (Reuter)	—	—	0.03 (0.09)	—	R	—	—	6	—	H		
Taylorilygus pallidulus (Blanchard)	0.06 (0.12)	0.06 (0.18)	0.13 (0.27)	—	O	1, 2	4, 11	6, 11	—	H		*
Unidentified sp. A	0.03 (0.09)	—	—	—	R	12	—	—	—			
Unidentified sp. B	0.03 (0.09)	—	—	—	R	12	—	—	—			
Pentatomidae												
Loxa sp.	—	0.03 (0.09)	—	—	R	—	1	—	—	H		
Thyanta custator (Fabricius)	—	—	0.06 (0.18)	—	R	—	—	2	—	H	N	*
Thyanta perditor (Fabricius)	—	0.03 (0.09)	—	—	R	—	12	—	—	H	N	*

TABLE 1. (CONTINUED) HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Rhopalidae												
Liorrhysus hydlinus (Fabricius)	—	—	0.03 (0.09)	—	R	—	—	11	—	H		*
Homoptera												
Aphididae												
Aphis spiraecola Patch	0.13 (0.27)	0.03 (0.09)	0.03 (0.09)	—	O	1, 2	3	11	—	H	E	*
Aphis sp.	—	—	0.03 (0.09)	—	R	—	—	11	—	H		
Eulachnus rileyi (Williams)	—	—	0.03 (0.09)	—	R	—	—	1	—	H	E	
Hysteroneura setariae (Thomas)	0.03 (0.09)	—	0.03 (0.09)	—	R	5	—	11	—	H	N	*
Schizaphis sp.	—	—	0.03 (0.09)	—	R	—	—	11	—	H		
Tetraneura nigriabdominalis (Sasaki)	—	—	0.03 (0.09)	—	R	—	—	11	—	H	E	
Toxoptera aurantii (Boyer de Fonscolombe)	0.06 (0.18)	0.03 (0.09)	—	—	R	11	2	—	—	H	E	*
Cercopidae												
Clastoptera xantocephala Germar	—	0.03 (0.09)	0.03 (0.09)	—	R	—	11	4	—	H		*
Lepyronia sp.	0.06 (0.12)	—	—	—	R	2, 12	—	—	—	H		
Cicadellidae												
Balclutha sp.	—	—	0.03 (0.09)	0.03 (0.09)	R	—	—	4	11	H		
Cuerna costalis (Fabricius)	—	—	0.13 (0.19)	—	R	—	—	4, 6, 12	—	H	N	
Draeculacephala sp. A	0.13 (0.19)	—	—	—	R	1, 11, 12	—	—	—	H		
Draeculacephala sp. B	—	—	0.59 (0.80)	0.03 (0.09)	C	—	—	2, 4, 11, 12	12	H		
poss. *Empoasca* sp.	0.06 (0.12)	0.13 (0.13)	—	—	O	1, 4	1, 2, 4, 12	—	—	H		
Graminella nigrifrons (Forbes)	—	—	0.16 (0.27)	0.03 (0.09)	O	—	—	4, 6, 12	—	H	N	
Graphocephala versuta (Say)	—	0.19 (0.22)	—	—	O	—	1, 4, 6, 11	—	—	H	N	
Gypona sp.	0.19 (0.22)	0.06 (0.18)	0.09 (0.18)	—	C	2, 4, 11, 12	2	11, 12	—	H		
Homalodisca coagulata (Say)	0.94 (0.74)	0.41 (0.33)	—	0.03 (0.09)	C	1-6, 11, 12	1, 4-6, 11, 12	—	11	H	N	*
Hortensia similis (Walker)	—	—	0.03 (0.09)	—	R	—	—	12	—	H	N	
Oncometopia nigricans (Walker)	0.03 (0.09)	—	—	—	R	1	—	—	—	H	N	*
Paraulacizes irrorata (Fabricius)	—	0.03 (0.09)	—	—	R	—	1	—	—	H		
Stragania sp.	0.03 (0.09)	0.09 (0.19)	0.25 (0.48)	—	C	1	11, 12	11, 12	—	H		
Tropicanus costamaculatus (Van Duzee)	0.06 (0.12)	—	—	—	R	3, 12	—	—	—	H		
Imm. spp.	2.19 (1.47)	1.94 (1.84)	0.72 (1.11)	0.13 (0.27)	C	1-6, 11, 12	1-6, 11, 12	3, 4, 11, 12	1, 12	H		

TABLE 1. (CONTINUED) HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Cixiidae												
Bothriocera sp.	—	0.19 (0.44)	—	—	O	—	5, 6	—	—	H	N	
Myndus crudus Van Duzee	0.03 (0.09)	0.06 (0.12)	—	—	R	11	4, 5	—	—	H	N	*
Delphacidae												
Delphacodes puella (Van Duzee)	—	0.06 (0.12)	—	—	R	—	1, 11	—	—	H		
Delphacodes sp. A	—	—	0.03 (0.09)	0.03 (0.09)	R	—	—	12	1	H		
Delphacodes sp. B	0.03 (0.09)	—	—	—	R	3	—	—	—	H		
Imm. sp.	—	—	0.03 (0.09)	0.03 (0.09)	R	—	—	12	12	H		
Flatidae												
Imm. spp.	0.47 (0.59)	0.03 (0.09)	—	0.16 (0.44)	C	3-6, 11	3	—	5	H		
Membracidae												
Spissistilus festinus (Say)	—	—	0.22 (0.53)	—	O	—	—	1, 12	—	H	N	*
Stictocephala lutea (Walker)	—	—	0.16 (0.19)	—	O	—	—	3, 4, 11, 12	—	H	N	
Psyllidae												
Diaphorina citri Kuwayama	—	—	0.03 (0.09)	—	R	—	—	3	—	H	E	*
Hymenoptera												
Agaonidae												
Unidentified sp.	0.03 (0.09)	—	—	—	R	11	—	—	—	H		
Anthophoridae												
Exomalopsis sp.	—	0.03 (0.09)	—	—	R	—	5	—	—	H	N	
Halictidae												
Agapostemon splendens (Lepeletier)	—	0.06 (0.12)	—	—	R	—	5, 12	—	—	H	N	
Augochlora sp.	—	0.03 (0.09)	—	—	R	—	5	—	—	H	N	
Lasioglossum sp.	—	—	—	0.03 (0.09)	R	—	—	—	6	H	N	
Lepidoptera												
Heliconiidae												
Heliconius charitonius Tuckeri	0.03 (0.09)	—	—	—	R	12	—	—	—	H		
Geometridae												
Unidentified sp. A	0.03 (0.09)	—	—	—	R	11	—	—	—	H		
Unidentified sp. B	—	—	—	0.03 (0.09)	R	—	—	—	11	H		
Unidentified sp. C	—	—	0.03 (0.09)	—	R	—	—	11	—	H		
Gracillariidae												
Phyllocnistis sp.	0.03 (0.09)	—	—	—	R	4	—	—	—	H		

TABLE 1. (CONTINUED) HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

Species	Abundance per site[1]					Months collected[2]				Trophic[3] level	Native/[4] Exotic	Pest[5] status
	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D			
Noctuidae												
Unidentified sp.	—	—	—	0.03 (0.09)	R	—	—	—	12	H		
Pyralidae												
Unidentified sp. A	—	—	0.13 (0.19)	—	R	—	—	6, 11, 12	—	H		
Unidentified sp. B	—	—	0.03 (0.09)	—	R	—	—	11	—	H		
Unidentified sp. C	—	—	0.03 (0.09)	—	R	—	—	11	—	H		
Unidentified sp. D	—	—	0.03 (0.09)	—	R	—	—	11	—	H		
Unidentified sp. E	0.03 (0.09)	—	—	—	R	12	—	—	—	H		
Unidentified sp. F	—	—	0.06 (0.12)	—	R	—	—	3, 4	—	H		
Unidentified sp. G	—	0.16 (0.44)	—	—	O	—	4	—	—	H		
Unidentified sp. H	0.09 (0.27)	—	—	—	R	4	—	—	—	H		
Unidentified sp. I	—	—	0.03 (0.09)	—	R	—	—	6	—	H		
Orthoptera												
Acrididae												
Leptysma marginicollis (Serville)	0.06 (0.18)	—	—	0.03 (0.09)	R	1	—	—	11	H	N	
Schistocerca damnifica (Saussure)	0.06 (0.12)	—	—	0.03 (0.09)	R	5, 12	—	—	4	H	N	
Orphulella pelidna (Burmeister)	—	—	0.03 (0.09)	—	R	—	—	6	—	H	N	
Paroxya atlantica Scudder	0.03 (0.09)	—	—	0.03 (0.09)	R	5	—	—	6	H	N	
Imm. spp.	0.31 (0.48)	—	0.25 (0.40)	0.50 (0.64)	C	4, 5, 6	—	3, 4, 6	2-6	H		
Gryllidae												
Cyroxipha poss. *columbiana* Caudell	0.03 (0.09)	—	—	0.06 (0.12)	R	1	—	—	11, 12	H	N	
Oecanthus quadripunctatus Beutenmuller	—	—	0.09 (0.19)	—	R	—	—	3, 12	—	H	N	
Tetrigidae												
Tettrigidea lateralis (Say)	—	0.03 (0.09)	—	0.03 (0.09)	R	—	12	—	11	H	N	
Tettrigidea sp.	—	—	0.09 (0.19)	—	R	—	—	2, 3	—	H	N	
Tettigoniidae												
Conocephalus sp.	—	0.53 (0.59)	0.72 (0.86)	0.03 (0.09)	C	—	1, 2, 6, 11, 12	3, 4, 6, 11, 12	12	H	N	
Imm. sp.	—	—	0.03 (0.09)	—	R	—	—	1	—	H		
Phasmatodea												
Pseudophasmatidae												
Anisomorpha buprestoides (Stoll)	—	—	0.22 (0.41)	0.06 (0.12)	O	—	—	2, 4	3, 4	H	N	
Psocoptera												
Peripsocidae												
Peripsocus madescens (Walsh)	—	—	—	1.84 (2.15)	C	—	—	—	1, 3-6	H	N	

TABLE 1. (CONTINUED) HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Psocidae												
Indiopsocus ceterus Mockford	—	—	—	0.03 (0.09)	R	—	—	—	4	H	N	
gen. sp.	—	—	—	0.03 (0.09)	R	—	—	—	5	H		
Thysanoptera												
Phlaeothripidae												
Haplothrips gowdeyi (Franklin)	—	—	0.03 (0.09)	—	R	—	—	11	—	H	N	

[1]Abundance per transect for each site averaged over 8 months. Each transect equals 100 sweeps with a 90-cm diameter sweep net. One sweep consists of an 180° sweeping motion.
[2]Samples were taken from November (month 11) through June (month 6)..
[3]D = Detritivore (including scavengers), H=Herbivore (including pollen and nectar feeders), P = Predator, U = Undetermined.
[4]N = Native, E = Exotic, Blank space = Undetermined.
[5]An * indicates that the species is a known economic pest.
[6]Weston, FL, Broward Co., N26.035483 and W80.43495, *M. quinquenervia* stand under a power line.
[7]University Rd. and Griffin Rd., Fort Lauderdale, FL, Broward Co., N 26.05605 and W -80.25168, vacant lot occupied by *M. quinquenervia*.
[8]Tamiami Tr. and Corkscrew Rd., Estero, FL, Collier Co., N 26.4255 and W -81.81033, Cow pasture occupied with small *M. quinquenervia* stumps.
[9]Belle Meade, FL, Collier Co., N 26.10478 and W -81.63392, *M. quinquenervia* stand in the Picayune Forest.
[10]Average abundance among all sites includes total number of specimens collected. R = Rare, 1-5 specimens; O = Occasional, 6-10 specimens; C = Common, >10 specimens.
[11]/ indicates a difference in trophic level of larvae stage and adult stage. Trophic level data include larval then adult trophic level.
[12]poss. indicates a possible identification that could not be confirmed.

TABLE 2. NON-HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Acari												
Anystidae												
Anystis agilis Banks	0.03 (0.09)	0.06 (0.12)	—	—	R	2	2,3	—	—	P	N	
Microtrombidiidae												
Trichotrombidum muscarum (Riley)	—	0.09 (0.27)	—	—	R	—	5	—	—	Pa/P[11]	N	
Araneae												
Anyphaenidae												
Hibana sp.	0.13 (0.27)	0.03 (0.09)	0.03 (0.09)	0.34 (0.52)	C	1, 4	6	12	1, 3 11, 12	P	N	
Lupettiana mordax (O. P.-Cambridge)	—	0.06 (0.12)	—	0.06 (0.12)	R	—	3, 11	—	2, 5	P	N	
Wulfila alba (Hentz)	—	0.03 (0.09)	—	—	R	—	6	—	—	P	N	
Araneidae												
Acacesia hamata (Hentz)	0.47 (0.34)	0.44 (0.44)	0.06 (0.12)	0.06 (0.12)	C	2-6, 11, 12	1, 3, 6, 11, 12	6, 11	2, 11	P	N	
Cyclosa turbinata (Walckenaer)	0.03 (0.09)	0.13 (0.27)	—	—	O	4	5, 6	—	—	P	N	
Eriophora ravilla (C.L. Koch)	0.16 (0.23)	0.03 (0.09)	—	0.03 (0.09)	O	5, 6, 11	3	—	11	P	N	
Gasteracantha cancriformis (L.)	—	0.03 (0.09)	—	—	R	—	1	—	—	P	N	
Kaira alba (Hentz)	—	0.03 (0.09)	—	—	R	—	3	—	—	P	N	
Mangora spiculata (Hentz)	—	—	—	0.06 (0.18)	R	—	—	—	12	P	N	
Mangora imm. sp.	—	—	—	0.03 (0.09)	R	—	—	—	6	P	N	
Neoscona arabesca (Walckenaer)	0.19 (0.18)	—	—	—	O	1, 3-6	—	—	—	P	N	
Neoscona imm. sp.	0.97 (1.26)	0.47 (0.77)	0.09 (0.19)	—	C	1-4, 11, 12	1-3, 11	1, 4	—	P	N	
Wagneriana tauricornis (O. P.-Cambridge)	—	—	0.06 (0.18)	0.03 (0.09)	R	—	—	4	12	P	N	
Imm. spp.	0.66 (0.63)	0.06 (0.12)	0.03 (0.09)	0.13 (0.13)	C	1, 2, 4, 6, 11, 12	3, 6	4	1, 6, 11, 12	P	N	
Clubionidae												
Clubiona sp.	—	0.19 (0.44)	—	0.16 (0.35)	C	—	5, 11	—	11, 12	P	N	
Corinnidae												
Castianeira sp.	0.03 (0.09)	—	—	—	R	5	—	—	—	P	N	
Trachelas volutus Gertsch	0.06 (0.12)	—	—	—	R	5, 12	—	—	—	P	N	
Linyphiidae												
Eperigone bryantae Ivie & Barrows	—	—	0.03 (0.09)	—	R	—	—	12	—	P	N	
Meioneta sp.	0.03 (0.09)	—	0.03 (0.09)	—	R	1	—	3	—	P	N	
Unidentified sp. A	0.13 (0.27)	—	—	—	R	1, 11	—	—	—	P	N	

TABLE 2. (CONTINUED) NON-HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Lycosidae												
Pardosa littoralis Banks	—	—	0.06 (0.18)	—	R	—	—	12	—	P	N	
Pardosa imm. sp.	0.03 (0.09)	—	0.50 (1.41)	—	C	11	—	12	—	P	N	
Pirata sp.	0.56 (1.12)	0.06 (0.12)	0.84 (2.39)	0.69 (1.56)	C	1, 11	3, 12	12	1, 11, 12	P	N	
Mimetidae												
Mimetus sp.	0.03 (0.09)	—	0.06 (0.18)	0.50 (0.53)	C	3	—	12	1-4, 11	P	N	
Miturgidae												
Cheiracanthium inclusum (Hentz)	3.00 (2.10)	4.38 (4.89)	0.31 (0.35)	0.50 (0.44)	C	1-6, 12	1-6, 12	1, 2, 4, 6, 12	3, 5, 6, 11, 12	P	N	
Oxyopidae												
Peucetia viridans (Hentz)	4.28 (2.87)	0.28 (0.39)	0.34 (0.42)	0.13 (0.13)	C	1-6, 12	1, 3, 5, 12	2-4, 6, 12	1, 2, 6, 12	P	N	
Pisauridae												
Pisaurina mira (Walckenaer)	—	—	—	0.03 (0.09)	R	—	—	—	6	P	N	
Pisaurina undulata (Keyserling)	0.03 (0.09)	—	—	—	R	6	—	—	—	P	N	
Pisaurina imm. spp.	0.41 (0.77)	0.16 (0.27)	—	0.06 (0.12)	C	1, 2, 5, 11	1, 4, 11	—	1, 4	P	N	
Imm. sp.	0.09 (0.19)	0.03 (0.09)	—	—	R	1, 12	2	—	—	P	N	
Salticidae												
Eris flava (Peckham & Peckham)	0.13 (0.23)	0.16 (0.30)	0.50 (0.92)	0.28 (0.62)	C	2, 12	2, 12	1, 11, 12	1, 12	P	N	
Eris imm. sp.	0.03 (0.09)	0.03 (0.09)	—	—	R	11	12	—	—	P	N	
Habronattus sp.	—	0.03 (0.09)	0.06 (0.12)	—	R	—	2	12, 4	—	P	N	
Hentzia palmarum (Hentz)	2.25 (0.90)	1.41 (0.57)	0.31 (0.42)	1.72 (1.86)	C	1-6, 11, 12	1-6, 11, 12	1, 3, 6, 11, 12	1, 2, 4-6, 11, 12	P	N	
Lyssomanes viridis (Walckenaer)	—	0.13 (0.19)	—	—	R	—	3-5	—	—	P	N	
Pelegrina galathea (Walckenaer)	0.38 (0.48)	0.16 (0.19)	0.44 (0.37)	—	C	1-4, 11, 12	12, 1, 2, 6	1-4, 11, 12	—	P	N	
Pelegrina sp.	—	—	—	0.03 (0.09)	R	—	—	—	5	P	N	
Phidippus clarus Keyserling	—	—	0.06 (0.18)	—	R	—	—	4	—	P	N	
Phidippus regius C.L. Koch	—	—	0.03 (0.09)	—	R	—	—	12	—	P	N	
Phidippus sp.	—	0.03 (0.09)	—	0.16 (0.35)	O	—	5	—	12, 5	P	N	
Thiodina peurpera (Hentz)	—	0.59 (1.68)	—	—	C	—	6	—	—	P	N	
Zygoballus sexpunctatus (Hentz)	—	—	0.03 (0.09)	—	R	—	—	4	—	P	N	
Zygoballus sp.	—	—	—	0.03 (0.09)	R	—	—	—	2	P	N	

TABLE 2. (CONTINUED) NON-HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

Species	Abundance per site[1]					Months collected[2]				Trophic[3] level	Native/[4] Exotic	Pest[5] status
	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D			
Tetragnathidae												
Glenognatna foxi (McCook)	—	—	0.13 (0.35)	—	R	—	—	12	—	P	N	
Glenognatha sp.	—	—	—	0.06 (0.18)	R	—	—	—	11	P	N	
Leucauge argyra (Walckenaer)	—	0.03 (0.09)	—	—	R	—	12	—	—	P	N	
Tetragnatha sp.	1.19 (0.61)	0.28 (0.28)	0.16 (0.35)	0.03 (0.09)	C	1-6, 11, 12	12, 2-4, 6	11, 12	11	P	N	
Theridiidae												
Anelosimus studiosus (Hentz)	2.09 (1.41)	—	0.09 (0.27)	—	C	1-6, 11, 12	—	12	—	P	N	
Chrysso pulcherrima (Mello-Leitao)	0.03 (0.09)	—	0.03 (0.09)	0.13 (0.35)	O	11	—	11	11	P	N	
Dipoena nigra (Emerton)	—	—	—	0.03 (0.09)	R	—	—	—	5	P	N	
Latrodectus geometricus C.L. Koch	—	—	0.03 (0.09)	—	R	—	—	4	—	P	N	
Theridion flavonotatum Becker	0.75 (0.69)	—	—	0.06 (0.12)	C	11, 1-3, 3, 5, 6	—	—	11, 2	P	N	
Theridion glaucescens Becker	0.38 (0.57)	—	—	0.03 (0.09)	C	11, 3, 4	—	—	11	P	N	
Theridion imm. sp.	0.13 (0.27)	0.03 (0.09)	0.03 (0.09)	—	O	2, 5	5	2	—	P	N	
Thymoites sp.	0.06 (0.18)	—	—	—	R	12	—	—	—	P	N	
Thomisidae												
Misumenoides formosipes (Walckenaer)	—	0.03 (0.09)	—	—	R	—	11	—	—	P	N	
Misumenops bellulus (Banks)	0.81 (0.53)	1.16 (1.14)	0.84 (0.67)	0.47 (0.39)	C	1-5, 11, 12	1-6, 11, 12	1-4, 6, 11, 12	11, 1, 2, 4-6	P	N	
Misumenops oblongus (Keyserling)	—	—	0.06 (0.18)	0.03 (0.09)	R	—	—	4	1	P	N	
Misumenops imm. spp.	0.50 (0.40)	0.13 (0.19)	1.09 (1.13)	0.19 (0.44)	C	1-4, 6, 11, 12	2, 11, 12	1-4, 11, 12	5, 11	P	N	
Tmarus sp.	0.06 (0.12)	—	0.03 (0.09)	1.63 (0.86)	C	11, 6	—	1	1-6, 11, 12	P	N	
Coleoptera												
Coccinellidae												
Brachiacantha decora Casey	—	0.06 (0.18)	—	—	R	—	6	—	—	P	N	
Coelophora inaequalis (Fabricius)	—	0.03 (0.09)	—	—	R	—	12	—	—	P	N	
Cycloneda sanguinea (L.)	0.03 (0.09)	0.06 (0.12)	0.09 (0.13)	—	O	12	1, 3	1, 3, 6, 11	—	P	N	
Exochomus marginipennis (LeConte)	—	—	0.06 (0.12)	—	R	—	—	11, 12	—	P	N	
Psyllobora parvinotata Casey	0.03 (0.09)	0.03 (0.09)	—	—	R	3	12	—	—	P	N	
Scymnus securus J. Chapin	—	—	0.03 (0.09)	—	R	—	—	12	—	P	N	
Scymnus sp.	0.03 (0.09)	0.09 (0.13)	—	—	R	4	2, 3, 5	—	—	P	N	

TABLE 2. (CONTINUED) NON-HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

Species	Abundance per site[1]					Months collected[2]				Trophic[3] level	Native/[4] Exotic	Pest[5] status
	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D			
Lampyridae												
Pyropyga minuta LeConte	0.03 (0.09)	—	—	—	R	3	—	—	—	P	N	
Scirtidae												
Cyphon sp.	0.25 (0.53)	—	—	—	O	4, 6	—	—	—	D	N	
Diplopoda												
Spirobolidae												
Chicobolus spinigerus (Wood)	0.06 (0.18)	—	—	—	R	12	—	—	—	D	N	
Dictyoptera												
Blattellidae												
Chorisoneura parishi Rehn	0.19 (0.22)	0.28 (0.60)	—	—	C	1, 5, 11, 12	3, 5, 12	—	—	D	E	
Imm. sp.	—	—	0.03 (0.09)	—	R	—	—	2	—			
Mantidae										D		
Gonatista grisea (Fabricius)	—	0.06 (0.12)	—	—	R	—	11, 12	—	—	P	N	
Stagmomantis sp.	0.03 (0.09)	—	—	—	R	6	—	—	—	P	N	
Thesprotia graminis (Scudder)	—	0.03 (0.09)	—	—	R	—	12	—	—	P	N	
Imm. spp.	—	0.09 (0.19)	—	0.16 (0.30)	O	—	5, 12	—	3, 4	P		
Diptera												
Ceratopogonidae												
Atrichopogon sp.	0.06 (0.12)	0.63 (1.13)	—	0.03 (0.09)	C	2, 11	1, 11, 12	—	12	D/Pa		
Unidentified sp. A	0.03 (0.09)	0.25 (0.48)	0.38 (1.06)	—	C	2	1, 11	11	—	D/Pa		
Unidentified sp. B	—	0.03 (0.09)	—	0.50 (1.41)	C	—	11	—	11	D/Pa		
Unidentified sp. C	—	—	—	0.03 (0.09)	R	—	—	—	1	D/Pa		
Chironomidae												
Unidentified spp. (11 morphotypes)	0.53 (0.36)	1.28 (2.07)	0.84 (1.08)	0.03 (0.09)	C	1, 2, 4-6, 11, 12	1, 2, 11, 12	1, 3, 4, 11, 12	11	U/U		
Chloropidae												
Apallates dissidens Tucker	—	0.13 (0.19)	0.34 (0.97)	0.06 (0.18)	C	—	1, 11, 12	11	12	U/U		
Apallates neocoxendrix Sabrosky	0.03 (0.09)	0.06 (0.18)	—	0.19 (0.53)	O	5	1	—	11	U/U		
Coniscinella sp.	0.19 (0.29)	0.03 (0.09)	0.03 (0.09)	0.06 (0.08)	C	1, 2, 11	2	4	11	U/U		
Chlorops sp.	—	—	0.22 (0.41)	—	O	—	—	4, 11	—	U/U		
Ectecephala unicolor (Loew)	—	0.03 (0.09)	—	—	R	—	1	—	—	U/U		
Hippelates plebejus Loew	—	—	0.06 (0.18)	—	R	—	—	6	—	D/Pa		
Liohippelates pusio Loew	—	0.03 (0.09)	0.59 (1.29)	—	C	—	3	1, 3, 6, 11	—	U/U		

TABLE 2. (CONTINUED) NON-HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Unidentified sp. A	0.03 (0.09)	—	—	—	R	12	—	—	—	U/U		
Unidentified sp. B	0.06 (0.18)	—	—	—	R	1	—	—	—	U/U		
Unidentified sp. C	0.03 (0.09)	0.03 (0.09)	—	—	R	12	1	—	—	U/U		
Unidentified sp. D	—	0.06 (0.18)	—	—	R	—	1	—	—	U/U		
Unidentified sp. E	—	0.03 (0.09)	—	—	R	—	6	—	—	U/U		
Clusiidae												
Unidentified sp.	—	0.03 (0.09)	—	—	R	—	12	—	—	D/U		
Culicidae												
Unidentified spp. (2 morphotypes)	—	—	—	0.13 (0.23)	R	—	—	—	6, 11	D/Pa		
Dolichopodidae												
Chrysotus sp.	1.34 (1.56)	1.69 (1.99)	0.72 (1.47)	0.06 (0.12)	C	1-6, 11	1-6, 11	4, 11, 12	4, 11	P/P		
Chrysotus picticornis Loew	0.13 (0.35)	—	0.22 (0.62)	—	C	5	—	11	—	P/P		
Condylostylus sp.	0.03 (0.09)	—	0.03 (0.09)	—	R	5	—	11	—	P/P		
Condylostylus tonsus Aldrich	—	0.38 (0.46)	0.16 (0.44)	—	C	—	2, 4, 12	4	—	P/P		
Empididae												
Euhybus poss. *stramaticus* Melander	0.13 (0.27)	0.09 (0.19)	—	0.03 (0.09)	O	2, 5	2, 3	—	4	P/P		
Euhybus sp.	0.03 (0.09)	—	—	—	R	6	—	—	—	P/P		
Syneches simplex Walker	—	0.06 (0.12)	0.03 (0.09)	0.06 (0.18)	O	—	1, 12	12	12	P/P		
Unidentified sp.	—	0.03 (0.09)	—	—	R	—	4	—	—	P/P		
Ephydridae												
Unidentified sp. A	—	0.09 (0.19)	—	—	R	—	11, 12	—	—	U/U		
Unidentified sp. B	—	0.03 (0.09)	0.09 (0.27)	0.03 (0.09)	O	—	11	11	12	U/U		
Unidentified sp. C	—	—	0.06 (0.18)	—	R	—	—	3, 11	—	U/U		
Unidentified sp. D	0.03 (0.09)	—	—	—	R	3	—	—	—	U/U		
Unidentified sp. E	0.13 (0.27)	—	—	—	R	3, 5	—	—	—	U/U		
Lauxaniidae												
Unidentified sp. A	0.03 (0.09)	0.16 (0.30)	—	—	O	2	1, 2	—	—	D/U		
Unidentified sp. B	—	—	0.03 (0.09)	—	R	—	—	6	—	D/U		
Milichiidae												
Desmometopa sp.	—	0.06 (0.18)	—	—	R	—	2	—	—	D/U		
Muscidae												
Stomoxys calcitrans (L.)	—	—	0.03 (0.09)	—	R	—	—	6	—	Pa/D		
Unidentified spp. (8 morphotypes)	0.13 (0.27)	0.28 (0.28)	0.59 (0.86)	0.19 (0.44)	C	4, 5	1, 2, 4, 5, 12	3, 4, 6, 11, 12	11, 12	U/U		

TABLE 2. (CONTINUED) NON-HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Otitidae												
Herina narytia (Walker)	2.00 (1.57)	—	—	—	C	1-6, 11, 12	—	—	—	U/U		
Sciomyzidae												
Dictya sp.	0.03 (0.09)	—	—	—	R	4	—	—	—	U/U		
Sepsidae												
Palaeosepsis insularis (Williston)	—	0.03 (0.09)	0.03 (0.09)	—	R	—	11	11	—	D/U		
Stratiomyidae												
Nemotelus glaber Loew	0.13 (0.23)	—	—	—	R	4, 5	—	—	—	U/U		
Tabanidae												
Chrysops sp.	0.06 (0.18)	—	0.03 (0.09)	—	R	4	—	6	—	D/Pa		
Hemiptera												
Pentatomidae												
Euthyrhynchus floridanus (Pointer)	0.03 (0.09)	—	—	—	R	4	—	—	—	P	N	
Podisus mucronatus Uhler	0.19 (0.18)	0.03 (0.09)	3.06 (5.29)	0.13 (0.35)	C	2, 3, 5, 11, 12	2	1, 3, 4, 11, 12	12	P	N	
Podisus sagitta (Fabricius)	0.06 (0.18)	0.03 (0.09)	—	—	R	11	5	—	—	P	N	
Sphyrocoris obliquus (Germar)	0.03 (0.09)	0.13 (0.27)	—	—	O	12	11, 12	—	—	P	N	
Stiretrus anchorago (Fabricius)	0.03 (0.09)	—	0.03 (0.09)	—	R	11	—	1	—			
Imm. spp.	—	—	0.09 (0.27)	—	R	—	—	4	—	P		
Phymatidae												
Unidentified sp.	0.03 (0.09)	—	—	—	R	11	—	—	—	P		
Reduviidae												
Zelus longipes (L.)	0.78 (0.73)	—	—	0.03 (0.09)	C	1-3, 5, 6, 11, 12	—	—	—	P	N	
Homoptera												
Derbidae												
Cedusa sp.	0.13 (0.19)	1.22 (1.28)	—	—	C	3, 11, 12	2-6, 11, 12	—	—	D		
Hymenoptera												
Aphidiidae												
Lysiphebus testaceipes (Cresson)	—	—	0.03 (0.09)	—	R	—	—	11	—	Pa		
Braconidae												
Apantales sp.	0.06 (0.18)	—	0.03 (0.09)	—	R	1	—	3	—	Pa	N	
Bassus sp.	—	0.03 (0.09)	0.03 (0.09)	—	R	—	11	11	—	Pa	N	

TABLE 2. (CONTINUED) NON-HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

Species	Abundance per site[1]					Months collected[2]				Trophic[3] level	Native/[4] Exotic	Pest[5] status
	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D			
Cotesia sp.	—	0.06 (0.12)	—	—	R	—	3, 11	—	—	Pa	N	
Unidentified sp. A	—	—	0.06 (0.12)	—	R	—	—	3, 12	—	Pa		
Unidentified sp. B	0.03 (0.09)	—	—	—	R	12	—	—	—	Pa		
Unidentified sp. C	—	0.03 (0.09)	—	—	R	—	—	12	—	Pa		
Unidentified sp. D	—	0.03 (0.09)	—	—	R	—	3	—	—	Pa		
Unidentified sp. E	—	0.03 (0.09)	—	—	R	—	6	—	—	Pa		
Bethylidae												
Unidentified sp. A	—	—	0.03 (0.09)	—	R	—	—	12	—	Pa		
Chrysididae												
Chrysis sp.	0.03 (0.09)	0.13 (0.23)	—	—	O	2	5, 12	—	—	Pa	N	
Encyrtidae												
poss. *Aenasioidea* sp.	0.03 (0.09)	—	—	—	R	3	—	—	—	Pa		
Anagyrus sp. A	0.03 (0.09)	0.03 (0.09)	—	—	R	4	3	—	—	Pa		
Anagyrus sp. B	0.03 (0.09)	—	—	—	R	11	—	—	—	Pa		
poss. *Cercobelus* sp.	0.03 (0.09)	—	—	—	R	1	—	—	—	Pa		
poss. *Syrphophagus* sp.	—	—	0.03 (0.09)	—	R	—	—	12	—	Pa		
Eucoilidae												
Eucoila sp.	—	0.03 (0.09)	—	—	R	—	1	—	—	Pa		
Unidentified sp.	—	—	0.03 (0.09)	—	R	—	—	11	—	Pa		
Eulophidae												
Cirrospilus poss. *pictus* (Nees)	—	0.03 (0.09)	—	—	R	—	1	—	—	Pa	E	
Unidentified sp.	0.03 (0.09)	0.03 (0.09)	—	—	R	11	11	—	—	Pa		
Eumenidae												
Zethus slossonae (Zethusculus)	0.03 (0.09)	—	—	—	R	12	—	—	—	P	N	
Eupelmidae												
Anastatus sp.	—	0.03 (0.09)	—	—	R	—	12	—	—	Pa		
Eupelmus sp.	—	0.03 (0.09)	—	—	R	—	1	—	—	Pa		
Eurytomidae												
Eurytoma sp.	—	0.03 (0.09)	—	—	R	—	6	—	—	Pa		
Formicidae												
Brachymyrmex obscurior Forel	0.09 (0.13)	0.03 (0.09)	—	—	R	1, 5, 11	5	—	—	P		
Camponotus floridanus (Buckley)	0.44 (0.55)	—	—	0.06 (0.12)	C	3, 5, 6, 11, 12	—	—	1, 5	P	N	
Camponotus planatus Roger	2.34 (1.08)	1.44 (1.23)	0.06 (0.12)	—	C	1-6, 11, 12	1-6, 11, 12	12, 3	—	P	E	

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	Abundance per site[1]					Months collected[2]						
Species	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D	Trophic[3] level	Native/[4] Exotic	Pest[5] status
Camponotus sexguttatus (Fabricius)	0.03 (0.09)	—	—	—	R	5	—	—	—	P	E	
Cardiocondyla wroughtoni obscurior Wheeler	0.03 (0.09)	—	—	—	R	11	—	—	—	P	E	
Crematogaster ashmeadi Mayr	—	—	0.03 (0.09)	—	R	—	—	12	—	P	N	
Crematogaster atkinsoni Wheeler	0.06 (0.12)	—	—	—	R	1, 11	—	—	—	P	N	
Cyphomyrmex rimosus (Spinola)	—	—	0.03 (0.09)	—	R	—	—	4	—	P	E	
Dolichoderus pustulatus Mayr	0.19 (0.44)	—	—	—	O	6, 12	—	—	—	P	N	
Dorymyrmex bureni (Trager)	—	0.03 (0.09)	—	—	R	—	2	—	—	P	N	
Gnamptogenys aculeaticoxae (Santschi)	0.03 (0.09)	—	—	—	R	5	—	—	—	P	E	
Odontomachus ruginodus Smith	0.03 (0.09)	—	—	—	R	11	—	—	—	P	E	
Paratrechina guatemalensis (Forel)	0.50 (0.94)	0.06 (0.18)	—	0.19 (0.53)	C	3, 4, 11, 12	1	—	12	P	E	
Paratrechina longicornis (Latreille)	2.66 (4.86)	3.19 (5.37)	—	0.13 (0.27)	C	1-4, 11, 12	3, 5, 6, 11, 12	—	2, 11	P	E	
Platythyrea punctata (Smith)	0.03 (0.09)	—	—	—	R	12	—	—	—	P		
Pseudomyrmex ejectus (Smith)	0.03 (0.09)	0.03 (0.09)	—	—	R	5	6	—	—	P	N	
Pseudomyrmex gracilis (Fabricius)	0.06 (0.12)	0.03 (0.09)	—	0.19 (0.22)	O	4, 6	4	—	3, 4, 6, 11	P	E	
Pseudomyrmex pallidus (Smith)	0.47 (0.49)	0.34 (0.68)	—	—	C	1, 2, 4, 6, 11, 12	1, 3, 4, 11	—	—	P	N	
Solenopsis invicta Buren	0.41 (0.58)	0.50 (0.33)	0.50 (0.61)	2.00 (4.55)	C	1, 2, 4, 11, 12	1-4, 6, 11, 12	2, 4, 6, 11, 12	2, 11	P	E	*
Technomyrmex albipes (Smith)	—	—	0.03 (0.09)	—	R	—	—	12	—	P	E	
Ichneumonidae												
Diadegma sp.	—	—	0.03 (0.09)	—	R	—	—	1	—	Pa		
Megaspilinidae												
Dendrocerus sp.	0.03 (0.09)	—	—	—	R	2	—	—	—	Pa		
Mutillidae												
Dasymutilla sp.	0.03 (0.09)	—	—	—	R	11	—	—	—	Pa	N	
Mymaridae												
Anaphes sp.	—	0.06 (0.12)	—	—	R	—	1, 11	—	—	Pa		
Pteromalidae												
Pachyneuron sp.	0.03 (0.09)	—	—	—	R	11	—	—	—	Pa		
poss. *Pteromalus* sp.	—	0.03 (0.09)	—	—	R	—	3	—	—	Pa		
Unidentified sp. A	0.03 (0.09)	—	—	—	R	11	—	—	—	Pa		
Unidentified sp. B	0.03 (0.09)	—	—	—	R	3	—	—	—	Pa		

TABLE 2. (CONTINUED) NON-HERBIVOROUS ARTHROPODS COLLECTED IN THE ABOVE-GROUND PORTIONS OF THE INVASIVE TREE, *MELALEUCA QUINQUENERVIA* IN SOUTH FLORIDA, USA.

Species	Abundance per site[1]					Months collected[2]				Trophic[3] level	Native/[4] Exotic	Pest[5] status
	A[6]	B[7]	C[8]	D[9]	Ave.[10]	A	B	C	D			
Scelionidae												
Macroteleia sp.	—	—	0.03 (0.09)	—	R	—	—	12	—	Pa		
Telenomus sp.	—	0.06 (0.12)	0.03 (0.09)	—	R	—	1, 11	12	—	Pa		
Trissolcus sp.	—	0.25 (0.33)	—	—	O	—	1, 2, 5, 12	—	—	Pa		
Sphecidae												
Tachytes sp.	—	—	0.03 (0.09)	—	R	—	—	11	—	Pa		
Torymidae												
Torymus sp.	—	0.09 (0.19)	—	—	R	—	3, 12	—	—	Pa		
Vespidae												
Mischocyttarus mexicanus (Saussure)	—	0.09 (0.13)	—	—	R	—	2, 4, 5	—	—	P	N	
Polistes dorsalis (Fabricius)	—	0.09 (0.19)	—	—	R	—	11, 12	—	—	P	N	
Polistes major Beauvios	—	0.03 (0.09)	—	—	R	—	1	—	—	P	N	
Neuroptera												
Chrysopidae												
Ceraeochrysa sp.	—	0.03 (0.09)	—	0.13 (0.23)	O	—	1	—	11, 12	P		
Chrysopa quadripunctatus Burmeister	—	—	—	0.03 (0.09)	R	—	—	—	11	P		
Chrysoperia sp.	0.06 (0.18)	0.06 (0.12)	—	—	R	1	1, 5	—	—	P		
Odonata												
Coenagrionidae												
Ischnura hastata (Say)	0.03 (0.09)	—	0.03 (0.09)	0.06 (0.12)	R	3	—	11	11, 12	P	N	
Nehalennia pallidula Calvert	0.03 (0.09)	—	—	—	R	5	—	—	—	P	N	
Libellulidae												
Erythrodiplax minusula (Rambus)	—	—	—	0.03 (0.09)	R	—	—	—	11	P	N	
Thysanoptera												
Phlaeothripidae												
Nesothrips lativentris (Karny)	—	0.16 (0.44)	—	—	O	—	12	—	—	D	N	

[1]Abundance per transect for each site averaged over 8 months. Each transect equals 100 sweeps with a 90cm diameter sweep net. One sweep consists of an 180° sweeping motion.
[2]Samples were taken from November (month 11) through June (month 6).
[3]D = Detritivore (including scavengers), Pa = Parasitiod (including secretion feeders and blood suckers), P = Predator, U = Undetermined.
[4]N = Native, E = Exotic, Blank space = Undetermined.
[5]An * indicates that the species is a known economic pest.
[6]Weston, FL, Broward Co., N 26.035483 and W -80.43495, M. *quinquenervia* stand under a power line.
[7]University Rd. and Griffin Rd., Fort Lauderdale, FL, Broward Co., N 26.05605 and W -80.25168, vacant lot occupied by *M. quinquenervia*.
[8]Tamiami Tr. and Corkscrew Rd., Estero, FL, Collier Co., N 26.4255 W -81.81033, Cow pasture occupied with small *M. quinquenervia* stumps.
[9]Belle Meade, FL, Collier Co., N 26.10478 W -81.63392, *M. quinquenervia* stand in the Picayune Forest.
[10]Average abundance among all sites includes total number of specimens collected. R = Rare, 1-5 specimens; O = Occasional, 6-10 specimens; C = Common, >10 specimens.
[11]/ indicates a difference in trophic level of larvae stage and adult stage. Trophic level data include larval then adult trophic level.

city of herbivores indicates that direct competition between natives and introduced biological control agents will be minimal.

Habitats dominated by invasive plants are often assumed to be sterile environments with few wildlife species utilizing the ecosystem (Bodle et al. 1994). However, Mazzotti et al. (1981) determined that differences exist among invasive plants in their ability to support native fauna, indicating that habitats invaded and dominated by non-indigenous plants are not necessarily biological deserts. After eight months of surveying arthropods in melaleuca dominated ecosystems, rarefaction curves of both herbivorous and non-herbivorous arthropods suggests that continued surveying efforts would result in the collection of additional species (Figs. 1 and 2; Magurran 1988). The variety of arthropods, both collected (Tables 1 and 2) and predicted (Figs. 1 and 2), reported herein indicates that melaleuca dominated habitats do support an arthropod community. However, this does not necessarily imply that melaleuca is a superior habitat for such fauna as indicated by the paucity of basal trophic levels (i.e., herbivores). Without the ability to compare arthropod diversity in surrounding native habitats, the probability that many species are transient, and considering the dearth of commonly collected arthropods, caution should be exercised when making conclusions concerning the functional well being of melaleuca invaded ecosystems.

The role of invasive species as facilitators of other invasive species has received little attention in the literature (Simberloff & Von Holle 1999). One example of this interaction may include the ability of nonindigenous plants to modify the habitat in a way that favors exotics over natives. In this study, 20 exotic species were collected in the melaleuca habitat (Tables 1 and 2). Among the exotic species, *Solenopsis invicta* Buren, the red imported fire ant, was common (Table 2) and is included as one of the most ecologically destructive invasive species in the southeastern U.S. These ant colonies not only cause human disturbance, but also are known to cause 70% mortality of freshwater turtle hatchlings (*Pseudemys nelsoni* Carr), can negatively impact the endangered Schaus swallowtail (*Papilio aristodemus porceanus*), and can dramatically change arthropod communities (Porter et al. 1988; Allen et al. 2001; Forys et al. 2001). Although native to Florida, the glassy-winged sharpshooter is an invasive species in California, where it vectors *Xylella fastidiosa* Wells et al., the causal agent of Pierce's disease in vineyards. Because the

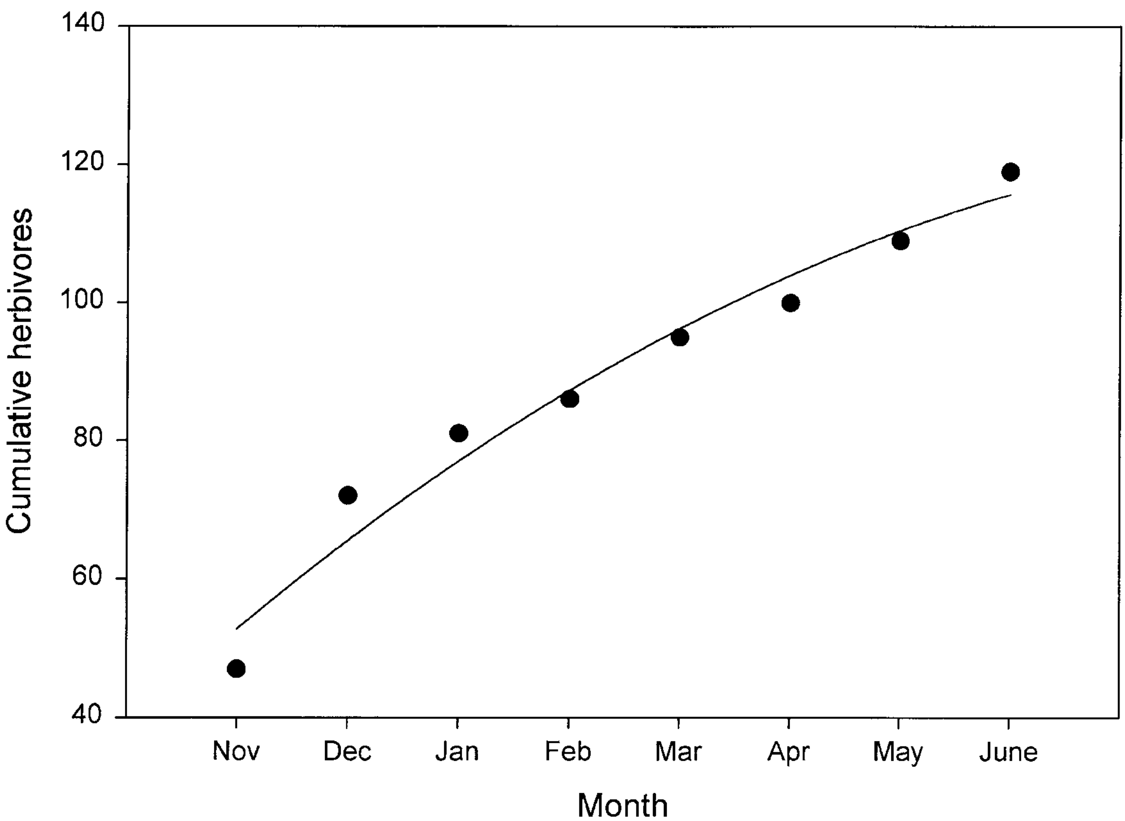

Fig. 1. Rarefaction curve for cumulative herbivorous species collected from *M. quinquenervia* (Nov.-June).

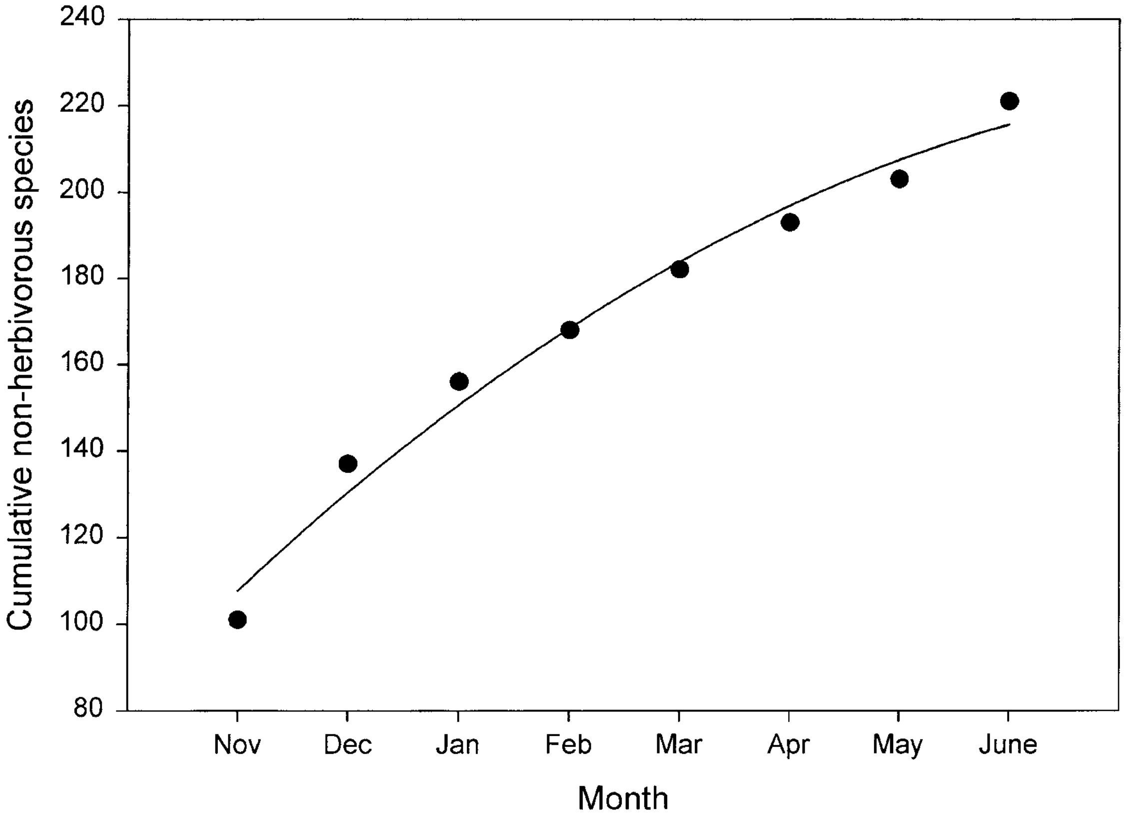

Fig. 2. Rarefaction curve for cumulative non-herbivorous species collected from *M. quinquenervia* (Nov.-June).

glassy-winged sharpshooter is commonly associated with melaleuca in Florida, it may be predicted that the plant also provides a refuge for the invasive sharpshooter in California. In this manner, melaleuca may serve as a reservoir for these and other invasive species in Florida and beyond.

In addition to the facilitation of ecological impacts by exotic species, invasive weeds may also harbor agricultural pests. For instance, 1/3 of the phytophagous insects associated with *Salsola kali* L. var. *tenuifolia* Tausch (Russian thistle) and 1/2 of the insect species on *Carduus pycnocephalus* L. (Italian thistle) proved to be pests of agricultural importance (Goeden & Ricker 1968). In our study, 18 arthropods collected from melaleuca canopies are major or minor economic pests of agricultural crops. Three species, *Aphis spiraecola* Patch (Aphididae), *T. aurantii* (Aphididae), and *S. invicta* (Formicidae), were commonly associated with melaleuca. Both aphid species are cosmopolitan, phytophagous pests of *Citrus* spp. and many other plants. An infestation of these aphid species can result in abortion of *Citrus* flower buds and both aphids produce honeydew, thus favoring the development of sooty molds.

Native predators, parasitoids, and pathogens have interfered with half of the published case histories involving insect introductions for weed control (Goeden & Louda 1976). Parasitoids and pathogens, for instance, caused 24% larval mortality of the introduced moth, *Samea multiplicalis* Guenee (Semple & Forno 1987). Herein, we collected several generalist predators that may potentially impact current and future biological control agents, including *Euthyrhynchus floridanus* (Pointer) (Pentatomidae), *Podisus mucronatus* Uhler (Pentatomidae), *Podisus saggita* (Fabricius) (Pentatomidae), *Stiretrus anchorago* (Fabricius) (Pentatomidae), and *Zelus longipes* (L.) (Reduviidae), as well as various ant and spider species. Predation on populations of the recently released biological control agent *Boreioglycaspis melaleucae* Moore (melaleuca psyllid, Psyllidae) by various pentatomid and coccinellid species has been observed in the field and may be negatively affected by generalist predators. During host specificity testing and under mass rearing conditions prior to its introduction, *B. melaleucae* was attacked by multiple arachnid species. However, the level of predation observed in the field or under laboratory conditions does not appear to impact colonies in a significant way (P. D. Pratt, pers. obs.; S. A. Wineriter pers. comm.). Studies on other psyllids, *Psylla pyricola* Forester (pear psyllid) and *Diaphorina citri* Kuwayama (Asian citrus psyllid), have shown that their populations are reduced by generalists predators such as: *Chrysopa* sp. (Chrysopidae), *Anthocoris* sp. (Anthicoridae), and *Olla v-nigrum* (Mulsant) (Coccinellidae) (Watson & Wilde 1963; Michaud 2001). Furthermore, Watson & Wilde (1963) and Santas (1987) demonstrated a reduction in psyllid populations by generalist predators. Nevertheless, in each study psyllid populations were suppressed by generalist predators at different levels, suggesting that predicting the acquisition and impact of these predators on introduced biological control agents is tenuous.

During our study, we also collected several parasitic hymenopteran species associated with melaleuca in south Florida (Table 2). Hymenopteran species in Australia parasitized ca. 40% of galls formed by the potential biological control agent *Fergusonia* spp. (gall fly) (Davies et al. 2001). Davies et al. (2001) suggested the impact by *Fergusonia* spp. as biological control agents of melaleuca will likely be reduced due to parasitism from local hymenopteran species in Florida. However, predicting which parasitoids may exploit this or other proposed biological control agents is difficult. Initial steps may include a taxonomic comparison among the co-evolved parasitoids in the agent's native and adventive ranges. For instance, *Cirrospilus* sp. (Eulophidae), *Eupelmus* sp. (Eupelmidae) and *Eurytoma* sp. (Eurytomidae) were collected in Australia associated with *Fergusonia* spp. and during our survey we also collected parasitoids belonging to these genera in south Florida (Goolsby et al. 2001). Unfortunately, species determination was not possible for those reported herein. Due to the diversity of both genera, geographic separation over evolutionary time, and lack of Fergusoninidae in the New World, it is unlikely that the species occurring in Australia and Florida are the same. Other genera found during our survey do not correspond to those genera known to parasitize current and candidate biological control agents in their native range, including *Fergusonina* spp., *B. melaleucae*, *Poliopaschia lithochlora* (Lower) (tube-dwelling moth) and *Lophyrotoma zonalis* (Rohwer) (melaleuca sawfly) (Jensen 1957; Riek 1962; Burrows & Balciunas 1997; Davies et al. 2001; J. A. Goolsby, USDA/ARS, Aust. Bio. Cont. Lab., pers. comm.). Predictions based solely on this survey may grossly underestimate parasitoid acquisition as additional species may be recruited to the system after introduction of the biological control agent. In the future a more accurate assessment may be obtained by surveying melaleuca for endophagic arthropods and comparing regional species databases or arthropod collections in the native and adventive ranges. Further studies may also include an evaluation of predator and parasitoid arthropod recruitment after the release of new biological control agents.

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