

NEW CANADIAN AND ONTARIO ORTHOPTEROID RECORDS, AND AN UPDATED CHECKLIST OF THE ORTHOPTERA OF ONTARIO

S. M. PAIERO¹* AND S. A. MARSHALL¹

¹School of Environmental Sciences, University of Guelph,
Guelph, Ontario, Canada N1G 2W1

email, steve.paiero@gmail.com

Abstract

J. ent. Soc. Ont. 145: 61–76

The following seven orthopteroid taxa are recorded from Canada for the first time: *Anaxipha* species 1, *Cyrtoxipha gundlachi* Saussure, *Chloroscirtus forcipatus* (Brunner von Wattenwyl), *Neoconocephalus exiliscanorus* (Davis), *Camptonotus carolinensis* (Gerstaecker), *Scapteriscus borellii* Linnaeus, and *Melanoplus punctulatus griseus* (Thomas). One further species, *Neoconocephalus retusus* (Scudder) is recorded from Ontario for the first time. An updated checklist of the orthopteroids of Ontario is provided, along with notes on changes in nomenclature.

Published December 2014

Introduction

Vickery and Kevan (1985) and Vickery and Scudder (1987) reviewed and listed the orthopteroid species known from Canada and Alaska, including 141 species from Ontario. A further 15 species have been recorded from Ontario since then (Skevington *et al.* 2001, Marshall *et al.* 2004, Paiero *et al.* 2010) and we here add another eight species or subspecies, of which seven are also new Canadian records. Notes on several significant provincial range extensions also are given, including two species originally recorded from Ontario on bugguide.net. Voucher specimens examined here are deposited in the University of Guelph Insect Collection (DEBU), unless otherwise noted.

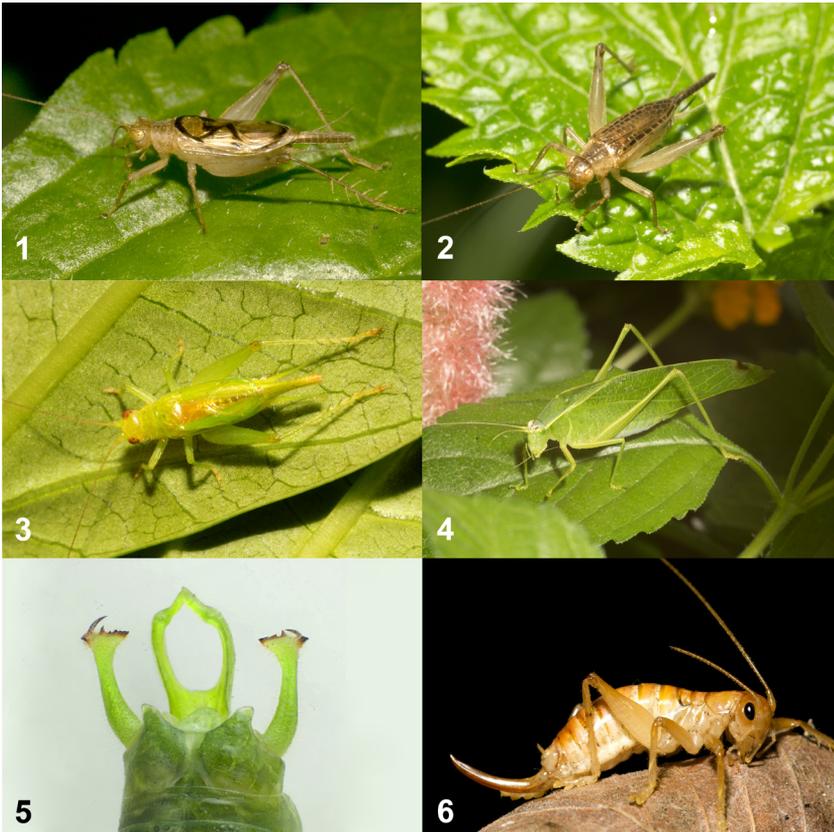
New Canadian records

Anaxipha species 1 (Figs 1, 2) (Gryllidae: Trigidoniinae)

This species, similar in appearance to the Florida endemic *Anaxipha calusa*

* Author to whom all correspondence should be addressed.

Walker & Funk, is here recorded as new to Canada based on specimens found in 2013 in the Wings of Paradise Butterfly Conservatory, Cambridge, Ontario. Numerous individuals (including nymphs, adult males and females) were observed at that time, and discussions with the conservatory staff indicate that this *Anaxipha* species has been established there for some time. Two other Ontario butterfly houses were contacted to determine if this species had been introduced elsewhere in the province, but no further populations were reported. *Anaxipha* “species 1” is an undescribed species, probably the same as an unnamed species known to occur in Central America (Funk, pers. comm.; see also http://entnem.ifas.ufl.edu/walker/buzz/SM_AcalusaRelatives.pdf) and was probably accidentally introduced with shipments of butterfly pupae from Central America. If it is indeed this tropical species, it is unlikely to become established outdoors in natural habitats in Canada. Distinctive dark markings on the fore wings distinguish males (Fig. 1) of *Anaxipha* “species 1” from other



FIGURES 1–6. 1, *Anaxipha* species 1, ♂. 2, *Anaxipha* species 1, ♀. 3, *Cyrtoxipha gundlachi*. 4, *Chloroscirtus forcipatus*, ♀. 5, *Chloroscirtus forcipatus*, male terminalia (dorsal view). 6, *Camptonotus carolinensis*, ♀.

Ontario cricket species. The pale veins bordering infusate cells make the females (Fig. 2) easy to separate from *A. exigua* (Say).

Specimen Records: ONTARIO: Wellington Co., Cambridge, Wings of Paradise Butterfly Conservatory, 43°27'7"N 80°22'2"W, in butterfly greenhouse, 20 April 2013, Paiero & Zinger (2 ♂♂); 3 July 2013, Paiero & Jackson (1 ♀, debu00367134); 22 May 2014, Paiero & Zinger (2 ♂♂; additional males and females from this collection were sent to Funk for further examination).

Cyrtoxipha gundlachi Saussure (Gryllidae: Trigidoniinae)

Cyrtoxipha gundlachi (Fig. 3), a species native to Florida and parts of the Caribbean (Eades *et al.* 2013), was found at the Cambridge Wings of Paradise Butterfly Conservatory and the Niagara Butterfly Conservatory. During visits to both sites, nymphs and adults were observed on foliage. No native *Cyrtoxipha* species occur in Canada but *Cyrtoxipha columbiana*, which is similar in appearance to *C. gundlachi*, is found as far north as New Jersey (Walker 1969) and southern Ohio (Walker and Moore 2012). *Cyrtoxipha columbiana*, like *Anaxipha* species 1, may have been introduced with shipments of butterfly pupae, but it may have also been brought in with plants used within the greenhouses as both greenhouses have previously received plants from Florida.

Specimen Records: ONTARIO: Wellington Co., Cambridge, Wings of Paradise Butterfly Conservatory, 43°27'7"N 80°22'2"W, in butterfly greenhouse, August 2013, S.M. Paiero (3 ♂♂, 3 ♀♀, debu00367122-27); Niagara Reg., Niagara Falls, Niagara Butterfly Conservatory, 43°10'37"N 70°3'20"W, 22 June 2013, S.M. Paiero (2 ♀♀, debu00367135-36); same as previous except 8 August 2013 (1 ♂, 3 ♀♀, debu00367150-53); same as previous except 7 October 2013 (4 ♂♂, 2 ♀♀, debu00367128-133)

Neoconocephalus exiliscanorus (Davis) (Tettigoniidae: Conocephalinae)

Neoconocephalus exiliscanorus (the Slightly Musical Conehead) is here recorded from Canada for the first time, from a marsh adjacent to the Wheatley Provincial Park campgrounds. Although Vickery and Kevan (1985) indicate that *N. exiliscanorus* was expected to occur in Canada, the new Wheatley record is about 250 km north of the most northerly previous record. Its apparent preference for marsh habitat may be why this species had not previously been found. If *N. exiliscanorus* is established in extreme southern Ontario, additional populations may occur in similar habitats or along the shores of Lake Erie (e.g., Point Pelee).

Specimens examined: ONTARIO: Kent Co., Wheatley Provincial Park, 42°5'25"N 82°26'50"W, 10-11 August 2007, S.M. Paiero (2 ♂♂, debu00286872-73); same as previous except 7 September 2007, S.M. Paiero (2 ♂♂, debu00291156-57).

Neoconocephalus retusus (Scudder) (Tettigoniidae: Conocephalinae)

Neoconocephalus retusus (the Round-tipped Conehead) is an eastern North American species here newly recorded from Ontario on the basis of observations and collections from the Haldimand-Norfolk region. Gartshore and Carson (pers. comm.) have heard this species singing at the same site in successive years, suggesting that the species is established in Ontario. If *N. retusus* was previously overlooked in Ontario it may be either due to its later emergence (Rehn & Hebard 1915) or because it has a restricted distribution in

the Norfolk area or because it was only recently established. Catling *et al.* (2009) previously recorded this species as new to Canada on the basis of specimens from Nova Scotia, but suggested that the species was adventitious rather than established.

Specimens examined: ONTARIO: Hald.-Norfolk Reg., Walshingham, ~5km SW, Pterophyla, 42°38'27"N 80°34'29"W, 31 August 2010, M. Gartshore, (1 ♂, debu00340774, one of several males heard singing by M. Gartshore and P. Carson), 27 September 2014, Gartshore & Carson (2 ♂♂).

Chloroscirtus forcipatus (Brunner von Wattenwyl) (Tettigoniidae: Phaneopterinae) (Fig. 4)

Chloroscirtus forcipatus is a Central American species that has established a population at the Niagara Butterfly Conservatory, likely being transported there in shipping materials. Feeding and oviposition by this exotic phytophagous species has caused significant damage to a wide variety of cultivated plants at the conservatory and discussions with staff indicate that it has been present there for many years.

Chloroscirtus forcipatus (Fig. 4) is superficially similar to the common bush katydids in the genus *Scudderia* but the hind femur has no spines on the lateral genicular lobe (Nickle 1992a), the eyes are more pronounced with the hind margin somewhat angled, the fore wings are more strongly microreticulate, the femora are shorter (only extending 2/3 length of fore wings; *Scudderia* extend to 4/5 or more), and the male cerci are distinct (Fig. 5). It will key out in Walker and Moore (2012) as *Turpilia rostrata* (Rehn & Hebard) although *T. rostrata* has spines on the lateral genicular lobe of the hind femur.

Specimens examined: ONTARIO: Niagara Reg., Niagara Falls, Niagara Butterfly Conservatory, 43°10'37"N 70°3'20"W, 22 June 2013, S.M. Paiero (2 ♀♀, debu00367137-38); 8 August 2013 (1 ♂, 2 ♀♀, debu00367154-56); 7 October 2013 (5 ♂♂, 3 ♀♀, debu00367160-67).

Camptonotus carolinensis (Gerstaecker) (Gryllacrididae)

Also known as the Carolina Leaf-rolling Cricket, *C. carolinensis* (Fig. 6) is here newly recorded from Canada on the basis of a specimen from Point Pelee National Park. Since *C. carolinensis* is the only representative of this group in North America, it represents a new family record for Canada. This predaceous species was previously known from Indiana to Florida (Walker and Moore 2012). *Camptonotus carolinensis* is easily overlooked as it is nocturnal and creates a leaf shelter in which to hide during the day, which might explain why it was not found earlier in Ontario.

Specimens examined: ONTARIO: Essex Co., Point Pelee Natl. Pk., West Beach, 41°59'0"N 82°32'50"W, wooded area, Malaise & pan traps, 10-23 September 1999, O. Lonsdale (1 ♂, debu00013739).

Melanoplus punctulatus griseus (Thomas) (Acrididae)

New records of *M. punctulatus griseus* from southern Ontario represent the first Canadian records of this subspecies, previously known from nearby Michigan (Vickery and Kevan 1985, Bland 2003). *Melanoplus punctulatus punctulatus* (Scudder), the other subspecies in Ontario, is widespread and extends east into Quebec. Bland (2003) reviewed the differences between the two subspecies.

Specimens examined: ONTARIO: Kent Co., Rondeau Prov. Pk., South Point Trail, nr. East

parking lot, oak savannah, 42°15'42"N 81°50'49"W, 10 October 2003, S.A. Marshall (1 ♂, 1 ♀, debu01134545-46); Essex Co., Point Pelee National Park, Visitor Centre, malaise & pans, O. Lonsdale, 11-18 August 2000 (2 ♂♂, debu01004046-47); same as previous except 5-26 September 2000 (2 ♂♂, debu01006370, debu01006376); same as previous except 27 August-5 September 2000 (1 ♂, debu01006403).

Scapteriscus borellii Linnaeus (Gryllotalpidae)

We identified one specimen of *S. borellii* from an Oakville bakery and it almost certainly represents an adventitious individual. *Scapteriscus borellii* is a Neotropical species (Nickel 1992b) that has become established in the southeastern U.S with its northernmost limit in North Carolina.

Specimen Examined: ONTARIO: Halton Reg., Oakville, found in a bakery, 13 October 1983, R. Ostrow (1 ♂, debu01076772).

Significant provincial range extensions

Meconema thalssinum (DeGeer) (Tettigoniidae: Meconematinae)

Meconema thalssinum (the Drumming Katydid) was originally recorded in Canada in 2004 (Marshall *et al.* 2004) on the basis of specimens from Harrow, and it has since been recorded in British Columbia as well (Cannings *et al.* 2007). This European species appears to have become widespread and established in Ontario from Windsor to Toronto, in both rural and urban environments.

Specimens examined: ONTARIO: York Reg., Toronto, 43°42'N 79°24'W, 8 July 2007, T. Careless, (1♂ 1♀, debu00296956-57); Toronto, prey of *Isodontia mexicana* (Hymenoptera: Sphecidae), July 2013, P.D. Careless (nymphs and adults; photograph); Toronto, 43°42'N 79°25'W, grass, sweep, 10 August 2007, A. Turko, (1♀, debu01031467); Essex Co., Harrow, 42°2'N 82°55'W, hand collection, 11 August 1997, M. Beaudoin (1♂ debu01031465); Durham Co., Darlington Prov. Pk., 43°52'17"N 78°47'02"W", 11 September 2007, G. Vogg, (1♂, debu01031466); Kent Co., Wheatley Prov. Pk., 42°5'25"N 82°26'50"W, 22 July 2011, S.M. Paiero, (1♂ 1♀, debu00340211-12); Hald.-Norfolk Reg., Turkey Point Prov. Pk., site 2, 42°42'28"N 80°20'29"W, savannah, at night, 4 August 2011, S.M. Paiero (1♂, debu01148938); Wellington Co., Guelph, Wellington Woods, 43°31'12"N 80°13'53"W, 11 August 2011, D.K.B. Cheung (1♀, debu00340228); Halton Reg. Oakville, nr. Hwy 25 & Burnhamthorpe Rd., August 2012, S.M. Paiero (1♂, debu00361466).

Neoxabea bipunctata (DeGeer) (Gryllidae)

This Carolinian species was originally recorded from Ontario on the basis of specimens from Essex County (Marshall *et al.* 2004). The more recent records presented here suggest that *N. bipunctata* now has a much more extensive range in southern Ontario.

Specimens examined: ONTARIO: Brant Co., Newport Forest, 30 July 2009, S.A. Marshall (1 nymph, photographed); Elgin Co., Springwater Forest, 3 October 2013, J. Allair (1♂, Allair 2013); Essex Co., Wheatley Prov. Pk., 1 Sep 2007, S.M. Paiero (1♀, debu00291096); Hald.-Norfolk Reg., Walshingham, ~5km SW, Pterophyla, 42°38'27"N 80°34'29"W, 31 August 2013, at light sheet, Carson & Gartshore (2♂♂, 2♀♀; observed); same data as previous except 1 September 2013 (2♂♂, 2♀♀; photograph/observed); same

data as previous except 3 September 2013 (1 ♀; observed); Halton Reg., Oakville, nr. Hwy. 25 & Burnhamthorpe Rd., 29 August 2014, S.M. Paiero (1 ♂); Kent Co., Rondeau Prov. Pk., campground, 42°19'4"N 81°50'41"W, 25-26 September 2009, S.M. Paiero (1 ♀, debu00318141); Middlesex Co., London, Environmental Sciences Western Field Station, 43°4'29"N 81°20'13"W 13 September 2013, L. Des Marteaux (1 ♀, photograph).

Myrmecophila pergandei (Bruner) (Myrmecophilidae)

Although this species was first formally recorded from Canada during an insect survey of Ojibway Prairie, Windsor, Ontario (Paiero *et al.* 2010), the earliest Canadian collection of *M. pergandei* (the Eastern Ant Cricket) was from Ancaster, Ontario (Borer's Falls Conservation Area) in 2006, and we have also found it at Wheatley Provincial Park, Ontario. *Myrmecophila pergandei* is rarely encountered outside of ant colonies and most of the specimens we have observed were found in slave-maker ant colonies (*Formica* species) in Ancaster. Specimens from Wheatley Provincial Park and Ojibway Prairie Provincial Nature Reserve were found at night on the bark of trees, walking with foraging carpenter ants (*Camponotus* species).

Specimens examined: ONTARIO: Hamilton-Wentworth Reg., Dundas, Borer's Falls Conservation Area, in slave maker ant colony, in rotten fallen log, 24 May 2006, Umphrey, Marshall & Paiero (10 nymphs, debu00264402-264411); Kent Co., Wheatley Provincial Park, 42°5'25"N 82°26'50"W, on tree with carpenter ants at night, 22 July 2011, S.M. Paiero (1 ♂ 1 ♀, debu01154454-55); Essex Co., Ojibway Prairie, 42°15'51"N 83°4'30"W, 6 September 2007, S.M. Paiero (2 ♀♀, debu00291089-90)

Ectobius lapponicus (Linnaeus) (Ectobiidae)

This species, previously recorded in Canada from the Maritimes (Chandler 1992, Clements *et al.* 2013), is here recorded from Ontario for the first time although it appears to have been established in the province at least since 2006. Several specimens were collected during a 2014 "Bioblitz" in Toronto's Humber Valley and the species appears to be well established in the area. Several *Ectobius* nymphs collected during a 2013 "Bioblitz" in the nearby Rouge Valley are also likely to be *E. lapponicus*. Hoebeke and Carter (2010) gave features to separate this species from other introduced *Ectobius* in the northeast.

Specimen data: ONTARIO: Muskoka Distr., Gravenhurst, Muskoka Lake, 1 July 2006, on tree leaf, J.S. MacIvor, (1 ♂ debu01040861); same as previous except 2 July 2006 (1 ♀ debu01040862); Peel Reg., Mississauga, nr. Mississauga Rd. & Dundas Rd., 18 July 2008, S.M. Paiero, (1 ♂ debu00302523); York Reg., McMichael Canadian Art Gallery, 43°50'30"N 79°37'2"W, nymphs collected on gravel nr. lights, 24 May 2014, S.M. Paiero (5 ♂♂ 3 ♀♀ 3 nymphs); Halton Reg., Oakville, nr. Hwy.25 & Burnhamthorpe Rd., 25 June 2014, S.M. Paiero (1 ♂); same as previous except 1 July 2014 (1 ♂).

Ectobius lucidus (Hagenbach) (Ectobiidae)

Hoebeke and Carter (2010) reviewed the distribution of *Ectobius* in northeastern North America and gave characteristics to separate this species from other northeastern *Ectobius*, but did not record *E. lucidus* from Ontario. *Ectobius lucidus*, like *E. lapponicus*, was first recorded from Ontario (Orillia, 20 June 2008, "helmetinthebush", 1 ♀; Barrie, Ontario, 25 June 2005, "shemiles", 1 ♂) on the basis of images posted to and identified

on BugGuide.net. The additional specimen records below confirm the establishment of *E. lucidus* in Ontario, and further suggest that this species has been here since at least 1973. Specimen data: ONTARIO: Simcoe Co., Barrie, 2 August 1973, R.J. Hellewell, (1 ♂, debu01035451); Barrie, 11 July 2010, “vireo” (1 ♂, photo posted on bugguide.net); Midhurst, Neretra St., 2 July 2007, A. Brunke, (1 ♂, debu01035452); Simcoe Co., Georgian College, u.v. light, 20 July 1977, E.R. Fuller (1 ♂, ROM); Simcoe Co., S of Washago, mixed forest, 23 July 1992, L.D. Coote (1 ♂, ROM); Middlesex Co., London, Public Submission, 12 June 2001, T.A. Zowinski (1 ♂ 1 ♀).

Dubious record

Orocharis saltator Uhler (Gryllidae: Eneopterinae)

The University of Guelph Insect Collection has a specimen of *O. saltator* (the Jumping Bush Cricket) labelled as “Brant Co.?” without a collector or date. As no other Brant County exists in Canada or the United States, it is presumed that this locality refers to Ontario where it would be both a new species and subfamily record for Canada. The northern limit of the range of this species is close to southern Ontario but we have not included it in the checklist because the single record is doubtful.

Complete checklist of Ontario Orthoptera

Table 1 is a list of all 134 species and two additional subspecies of Orthoptera recorded from Ontario, including native species (125, including multiple subspecies), introduced species occurring outdoors (2), introduced species only found indoors (6), and adventitious species (7, including intercepted material). Table 2 is a list of the 36 other orthopteroids recorded from Ontario, including native species (6), introduced species occurring outdoors (8), introduced species only found indoors (8), adventitious species (9), and cultured species (5). Cultured species used in the pet trade were not treated as provincial records, as they are not known to occur in Ontario outside of captivity. Nomenclature follows Eades *et al.* (2013) for the Orthoptera, Beccaloni (2014) for the Blattodea, Deem (2014) for the Dermaptera, Otte *et al.* (2014) for the Mantodea, and Brock (2014) for the Phasmida.

Changes in status

Melanoplus differentialis differentialis (Thomas) was considered by Vickery and Scudder (1987) to be an introduced species. We consider it to be a native species as its occurrence in Ontario is close to the northern limit of its historical range. *Syrbula admirabilis* (Uhler) was also treated as an invasive by Vickery and Scudder (1987), but this species too has a historical range with Ontario being its northern limit. Although there are no recent Ontario records of *S. admirabilis*, historical records from southwestern Ontario are consistent with the overall range of the species, and it is here considered as native to the province. Similarly, *Parcoblatta caudelli* Hebard was treated by Vickery and Kevan (1987) as an adventitious species in Ontario but, based on the overall distribution of this species and its occurrence in Rondeau Provincial Park, we treat it as a native species. *Psinidia fenestralis fenestralis* (Audinet-Serville) was treated by Vickery and Scudder (1987) as “expected to occur in Ontario”, but we have not included it in the checklist because we have yet to see a verifiable Ontario record of this species. *Schistocera americana* (Drury) was treated by Vickery and Scudder (1987) as an adventitious species not established in Ontario.

TABLE 1. Checklist of Ontario Orthoptera. (* denotes an introduced species occurring outdoors; \$ denotes an introduced species only found indoors; ‡ denotes an intercepted or adventitious species).

ACRIDIDAE – Grasshoppers (52 species + 1 subspecies)	<i>Melanoplus bruneri</i> Scudder
Acridinae (1 species)	<i>Melanoplus confusus</i> (Scudder)
<i>Metaleptea brevicornis</i> (Johansson)	<i>Melanoplus dawsoni</i> (Scudder)
Cyrtacanthacridinae (3 species)	<i>Melanoplus differentialis differentialis</i> (Thomas)
<i>Schistocerca alutacea</i> (Harris)	<i>Melanoplus eurycerus</i> Hebard
<i>Schistocerca americana</i> (Drury)	<i>Melanoplus fasciatus</i> (F. Walker)
‡ <i>Schistocerca lineata</i> Scudder	<i>Melanoplus femurrubrum</i> (DeGeer)
Gomphocerinae (8 species)	<i>Melanoplus huroni</i> Blatchley
<i>Chloealtis abdominalis</i> (Thomas)	<i>Melanoplus islandicus</i> Blatchley
<i>Chloealtis conspersa</i> Harris	<i>Melanoplus keeleri luridus</i> (Dodge)
<i>Dichromorpha viridis</i> (Scudder)	<i>Melanoplus mancus</i> Smith
<i>Orphulella pelidna</i> (Burmeister)	<i>Melanoplus punctulatus griseus</i> (Thomas)
<i>Orphulella speciosa</i> (Scudder)	<i>Melanoplus punctulatus punctulatus</i> (Scudder)
<i>Pseudochorthippus curtipennis curtipennis</i> (Harris)	<i>Melanoplus sanguinipes</i> (Fabricius)
<i>Pseudopomala brachyptera</i> (Scudder)	<i>Melanoplus scudderi scudderi</i> (Uhler)
<i>Syrbula admirabilis</i> (Uhler)	<i>Melanoplus stonei</i> Rehn
Oedipodinae (16 species)	<i>Melanoplus walshii</i> Scudder
<i>Arphia conspersa</i> Scudder	<i>Paroxya hoosieri</i> (Blatchley)
<i>Arphia pseudonietana</i> (Thomas)	Oxyinae (1 species)
<i>Arphia sulphurea</i> (Fabricius)	‡ <i>Oxya hyla intricata</i> (Stål)
<i>Camnula pellucida</i> (Scudder)	ROMALEIDAE – Lubber Grasshoppers (1 species)
<i>Chortophaga viridifasciata</i> (DeGeer)	‡ <i>Romalea microptera</i> (Beauvois)
<i>Dissostertia carolina</i> (Linnaeus)	TETRIGIDAE – Pygmy Grasshoppers (7 species)
<i>Encoptolophus sordidus</i> (Burmeister)	Batrachideinae (1 species)
<i>Pardalophora apiculata</i> (Harris)	<i>Tettigidea lateralis lateralis</i> (Say)
<i>Spharagemon bolli</i> Scudder	Tetriginae (6 species)
<i>Spharagemon collare</i> (Scudder)	<i>Nomotettix cristatus cristatus</i> (Scudder)
<i>Spharagemon marmorata marmorata</i> (Harris)	<i>Paratettix cucullatus</i> (Burmeister)
<i>Stethophyma gracile</i> (Scudder)	<i>Tetrix arenosa angusta</i> (Hancock)
<i>Stethophyma lineata</i> (Scudder)	<i>Tetrix brunneri</i> (Bolivar)
<i>Trimerotropis huronia</i> E.M. Walker	<i>Tetrix ornata ornata</i> (Say)
<i>Trimerotropis maritima</i> (Harris)	<i>Tetrix subulata</i> (Linnaeus)
<i>Trimerotropis verruculata verruculata</i> (Kirby)	TRIDACTYLIDAE – Pygmy Mole Crickets (3 species)
Melanoplinae (23 species + 1 subspecies)	<i>Ellipes gurneyi</i> Günther
<i>Booneacris glacialis canadensis</i> (Walker)	<i>Ellipes minuta</i> (Scudder)
<i>Booneacris variegata</i> (Scudder)	<i>Neotridactylus apicalis</i> (Say)
<i>Dendrotettix quercus</i> Packard	MYRMECOPHILIDAE – Ant Crickets (1 species)
<i>Melanoplus angustipennis</i> (Dodge)	<i>Myrmecophilus pergandei</i> Bruner
<i>Melanoplus bivitatus</i> (Say)	
<i>Melanoplus borealis borealis</i> (Fieber)	

TABLE 1 continued...

GRYLLIDAE – Crickets (23 species)**Gryllinae (4 species)**

- \$*Acheta domesticus* (Linnaeus)
- \$*Grylloides sigillatus* (F. Walker)
- Gryllus pennsylvanicus* Burmeister
- Gryllus veletis* (Alexander & Bigelow)

Nemobiinae (6 species)

- Allonemobius allardi* (Alexander & Thomas)
- Allonemobius fasciatus fasciatus* (DeGeer)
- Allonemobius griseus griseus* (E.M. Walker)
- Allonemobius maculatus* (Blatchley)
- Eunemobius carolinus carolinus* (Scudder)
- Neonemobius palustris* (Blatchley)

Oecanthinae (10 species)

- Neoxabea bipunctata* (DeGeer)
- Oecanthus argentinus* Saussure
- Oecanthus exclamationis* Davis
- Oecanthus fultoni* T.J. Walker
- Oecanthus laricix* T.J. Walker
- Oecanthus latipennis* Riley
- Oecanthus nigricornis* F. Walker
- Oecanthus niveus* (DeGeer)
- Oecanthus pini* Beutenmüller
- Oecanthus quadripunctatus* Beutenmüller

Trigonidiinae (3 species)

- \$*Anaxipha* species 1
- Anaxipha exigua* (Say)
- \$*Cyrtoxipha gundlachi* Saussure

GRYLLOTALPIDAE – Mole Crickets (2 species)

- Neocurtilla hexadactyla* (Perty)
- ‡*Scapteriscus borellii* Linnaeus

RHAPHIDIPHORIDAE – Camel Crickets (9 species + 1 subspecies)**Aemodogryllinae (1 species)**

- \$*Diestrammena asynamora* (Adelung)

Ceuthophilinae (8 species + 1 subspecies)

- Ceuthophilus brevipes* Scudder
- Ceuthophilus divergens* Scudder
- Ceuthophilus guttulosis guttulosis* F. Walker
- Ceuthophilus guttulosis thomasi* Hubbell
- Ceuthophilus latens* Scudder
- Ceuthophilus maculatus* (Harris)

- Ceuthophilus meridionalis* Scudder
- Ceuthophilus pallidipes* E.M. Walker
- Ceuthophilus uhleri* Scudder

GRYLLACRIDIDAE – Leaf-rolling Crickets (1 species)

- Camptonotus carolinensis* (Gerstaecker)

TETTIGONIIDAE – Katydid (35 species)**Conocephalinae (20 species)**

- Conocephalus attenuatus* (Scudder)
- Conocephalus brevipennis* (Scudder)
- Conocephalus fasciatus* (DeGeer)
- Conocephalus nigropleurum* (Bruner)
- Conocephalus saltans* (Scudder)
- Conocephalus strictus* (Scudder)
- Neoconocephalus ensiger* (Harris)
- Neoconocephalus exiliscanorus* (Davis)
- Neoconocephalus lyristes* (Rehn & Hebard)
- Neoconocephalus retusus* (Scudder)
- Neoconocephalus robustus* (Scudder)
- ‡*Neoconocephalus triops* (Linnaeus)
- Orchelimum campestre* Blatchley
- Orchelimum concinnum* Scudder
- Orchelimum delicatum* Bruner
- Orchelimum gladiator* Bruner
- Orchelimum nigripes* Scudder
- Orchelimum silvaticum* McNeill
- Orchelimum voltanum* McNeill
- Orchelimum vulgare* Harris

Meconematinae (1 species)

- **Meconema thalassinum* (DeGeer)

Phaneopterinae (9 species)

- Amblycorypha oblongifolia* (DeGeer)
- \$*Chloroscirtus forcipatus* (Brunner von Wattenwyl, 1878)
- Microcentrum rhombifolium* (Saussure)
- Scudderia curvicauda* (DeGeer)
- Scudderia fasciata* Beutenmüller
- Scudderia furcata furcata* Brunner von Wattenwyl
- Scudderia pistillata* Brunner von Wattenwyl
- Scudderia septentrionalis* (Audinet-Serville)
- Scudderia texensis* Saussure & Pictet

Pseudophyllinae (1 species)

TABLE 1 continued...

<i>Pterophylla camellifolia camellifolia</i> (Fabricius)	* <i>Roeseliana roeselii roeselii</i> (Hagenbach)
Tettigoniinae (4 species)	<i>Sphagniana sphagnorum</i> (F. Walker)
<i>Atlanticus davisii</i> Rehn & Hebard	
<i>Atlanticus testaceus</i> (Scudder)	

TABLE 2. Checklist of Ontario's other orthopteroids (Blattodea, Dermaptera, Mantodea, Phasmatodea). (* denotes an introduced species occurring outdoors; \$ denotes introduced species only found indoors; ‡ denotes an intercepted or adventitious species, % denotes a species that is reared in cultures in Ontario but not known to be established outside of these cultures).

BLATTODEA – Cockroaches (22 species)	(Infraorder ISOPTERA)
and Termites (3 species)	Kalotermitidae (1 species)
Blattidae (4 species)	‡ <i>Cryptotermes brevis</i> (F. Walker)
\$ <i>Blatta orientalis</i> Linnaeus	Rhinotermitidae (2 species)
\$ <i>Periplaneta americana</i> (Linnaeus)	* <i>Reticulitermes flavipes</i> (Kollar)
\$ <i>Periplaneta australasiae</i> (Fabricius)	‡ <i>Reticulitermes virginicus</i> (Banks)
% <i>Shelfordella lateralis</i> (Walker)	
Ectobiidae (5 species)	DERMAPTERA – Earwigs (8 species)
* <i>Ectobius lapponicus</i> (Linnaeus)	Anisolabididae (2 species)
* <i>Ectobius lucidus</i> (Hagenbach)	* <i>Anisolabis maritima</i> (Bonelli)
‡ <i>Nyctibora laevigata</i> (Palisot de Beauvois)	\$ <i>Euboriella annulipes</i> (Lucas)
‡ <i>Nyctibora noctivaga</i> Rehn	Forficulidae (4 species)
‡ % <i>Symploce pallens</i> (Stephens)	‡ <i>Chelidurella acanthopygina</i> (Gene)
Blatellidae (7 species)	<i>Doru aculeatum</i> (Scudder)
\$ <i>Blatella germanica</i> Linnaeus	‡ <i>Doru taeniatum</i> (Dohrn)
‡ <i>Cariblatta sp. A</i>	* <i>Forficula auricularia</i> Linnaeus
<i>Parcoblatta caudelli</i> Hebard	Spongiphoridae (2 species)
<i>Parcoblatta pennsylvanica</i> (DeGeer)	* <i>Labia minor</i> (Linnaeus)
<i>Parcoblatta uhleriana</i> (Saussure)	\$ <i>Marava arachidis</i> (Yersin)
<i>Parcoblatta virginica</i> (Brunner von Wattenwyl)	
\$ <i>Supella longipalpa</i> (Fabricius)	MANTODEA – Praying Mantids (2 species)
Blaberidae (6 species)	Mantidae (2 species)
% <i>Blaberus discoidalis</i> Serville	* <i>Mantis religiosa</i> Linnaeus
% <i>Blaberus giganteus</i> (Linnaeus)	* <i>Tenoderella sinensis</i> Saussure
% <i>Blaptica dubia</i> (Serville)	
% <i>Gromphadorhina portentosa</i> (Schaum)	PHASMATODEA – Walkingsticks (1 species)
‡ <i>Panchlora nivea</i> (Linnaeus)	Heteronemiidae (1 species)
\$ <i>Pycnoscelus surinamensis</i> (Linnaeus)	<i>Diapheromera femorata</i> (Say)

Since *S. americana* has a historical eastern North American range within flying distance of Canada, we consider it to be a native, albeit migrant, species. *Pycnoscelis surinamensis* was also recorded by Vickery and Kevan (1987) as an adventitious species in Ontario but this species is now well established in many greenhouses.

Nomenclatural changes

Nomenclatural changes since Vickery and Scudder (1987) are summarized below.

Acrididae

Schistocerca emarginata (Scudder) is now treated as a synonym of *S. lineata* Scudder (Song 2004).

Stethophyma was previously treated within the Acridinae (Vickery and Kevan 1985) and Oedopodinae (=Locustinae, Vickery and Scudder 1987); it is now treated in the Oedopodinae (Chapco and Contreras 2007).

Chorthippus curtipennis curtipennis (Harris) is now treated as *Pseudochorthippus curtipennis curtipennis* (Harris) (Défaut 2012).

Arphia pseudonietana pseudonietana (Thomas) is now treated as *A. pseudonietana*; no subspecies are recognized (Otte 1984).

Orphulella pelidna pelidna (Burmeister) is now treated as *O. pelidna*; subspecies are no longer recognized (Eades *et al.* 2013).

Spharagemon bolli bolli Scudder is now treated as *S. bolli* Scudder; subspecies are no longer recognized (Otte 1984).

Trimerotropis verruculata (Kirby) is now treated as *Trimerotropis verruculata verruculata* (Kirby) because an additional subspecies is now recognized (*T. verruculata suffusa*; Eades *et al.* 2013).

Trimerotropis maritima interior Walker is now treated as *T. maritima* (Harris); subspecies are no longer recognized (Otte 1984).

Melanoplus viridipes euryercus Hebard is now treated as a separate species, *M. euryercus* Hebard (Otte 2002).

Melanoplus femurrubrum femurrubrum (DeGeer) is now treated as *M. femurrubrum*; subspecies are no longer recognized (Eades *et al.* 2013).

Romaleidae

Romalea guttata (Houttuyn) is now treated as *R. microptera* (Beauvois) (the Eastern Lubber Grasshopper); it is apparently occasionally carried north from the southeastern USA in plant shipments or as bait by fishermen, but is not established in Ontario.

Tridactylidae

Ellipes minutus minutus (Scudder) is now treated as *E. minuta* (Scudder) (spelling corrected); subspecies are no longer recognized (Eades *et al.* 2013).

Tetrigidae

Tettigidea lateralis (Say) is now treated as *T. lateralis lateralis* (Say) as another subspecies is recognized (Rehn and Grant 1958). Vickery and Kevan (1985) recognized the

subspecies but it was omitted in Vickery and Scudder (1987).

Gryllidae

The Tropical House Cricket (*Grylloides sigillatus* (F. Walker)) was previously confused with *G. supplicans* (F. Walker) (Otte 2006). *G. sigillatus* is occasionally brought into Canada as cultures and is commercially available as reptile food, but is not known to be established outside of cultures.

Rhaphidophoridae

Tachycines asynamorus Adelung is now treated as *Diestrammena* (*Tachycines*) *asynamorus* (Adelung); *Tachycines* has been lowered to subgeneric rank (Sugimoto 2002).

Tettigoniidae

Atlanticus davisii Rehn & Hebard was previously treated by some authors as a synonym of *A. monticola* Davis but its species status is here retained, following Eades *et al.* (2013).

Roeseliana roeselii (Hagenbach) was placed in *Roeseliana* by Zeuner (1941) but has since been treated by most authors as belonging to *Metrioptera* or *Sphagiana*. Massa & Fontana (2011) reinstated *Roeseliana* as a valid genus. Multiple subspecies are also recognized and *R. roeselii roeselli* is the subspecies present in North America (Eades *et al.* 2013).

Pterophylla camellifolia (Fabricius) is now treated as *P. camellifolia camellifolia* as several subspecies are recognized (Alexander 1968, Walker and Moore 2012).

Mantidae

Tenodera sinensis Saussure was originally treated as a subspecies of *T. aridifolia* Stoll; Ehrmann (2002) treated it as a separate species.

Discussion

Although the orthopteroids are relatively well studied in North America, further Canadian records are to be expected. Several species so far unknown from Canada have known ranges that almost reach the border, especially near southern Ontario. For example, *Oecanthus forbesi* Titus, morphologically indistinguishable from *O. nigricornis* F. Walker, likely occurs in southwestern Ontario based on range maps (Walker and Moore 2012) but has not yet been formally recorded from Canada. This species would be most effectively sought out on the basis of its song. Other species currently known from nearby localities just south of the border, such as *Phyllopapulus pulchellus* Uhler or *Trachyrhachys kiowa* (Thomas) are likely candidate additions to our fauna in response to a warming climate, and might already occur here as undocumented populations. There also remains some possibility of adding previously undescribed species to the provincial fauna. Several *Anaxipha*, for example, have only recently been described from the eastern USA (Walker and Funk 2014) and some of these may yet be discovered in southwestern Ontario. There is also a high probability of continued discoveries of newly introduced exotic species. Although most of the recently discovered introductions are of tropical species that are unable to survive

outside during the winter in Canada, several exotic orthopteroids (*Meconema thalassinum*, *Roeseliana roeselii roeselii*, *Ectobius lapponicus* and *E. lucidus*) have become successfully established in Ontario. And while the presence of *Anaxipha* species 1 is surprising, finding an undescribed tropical species in temperate climates is not unprecedented. Weissman *et al.* (2012) found a previously undescribed *Gryllus* species (*G. locorojo* Weissman & Gray, also known as the “crazy red”), apparently native to South America, being used as a feeder cricket in parts of Denmark, England and the United States.

The ongoing task of documenting the presence and ranges of orthopteroids (and other arthropods) in Canada is expedited by keys and photographic guides that enable amateurs and biologists without entomological training to recognize species. Vickery and Kevan (1985; available through the Entomological Society of Canada’s website) remains an important resource although can be difficult to use without access to an extensive reference collection. Bland (2003), Walker and Moore (2012) and Kirk and Bomar (2005) are more extensively illustrated guides that cover parts of Ontario’s fauna and supplement the keys given in Vickery and Kevan (1985). Correctly identified photos of most Canadian orthopteroid species can be found on bugguide.net (<http://bugguide.net/node/view/15740>) and Walker (2014) provided keys and songs to the Gryllidae and Tettigoniidae of North America.

Acknowledgements

The authors would like to thank M. Tomlinson, D. Constantinides and other personnel at the Niagara Butterfly Conservatory for access to specimens and the facility; A. Stapley and other personnel at the Cambridge Butterfly Conservatory for access to specimens and the facility; Drs. T.J. Walker and D.H. Funk for confirming the identity of the *Anaxipha* species; Dr. P. Naskreki, for confirming the identity of *Chloroscirtus forcipatus*; Dr. G. Umphrey for drawing the authors’ attention to *Myrmecophila* in Ontario; P. Carson and M. Gartshore for sharing their observations and records of *Neoxabea bipunctata* and *Neoconocelphalus retusus* with the authors; Dr. R. Cannings for sharing specimen data for *Ectobius lapponicus*; and P.D. Careless for sharing his observations on *Meconema thalassinum*.

References

- Alexander, R. D. 1968. Arthropods. Pp 167–216 in Sebeok, T.A. (ed.), Animal communication: techniques of study and results of research. Indiana University Press, Bloomington, Indiana. 686 pp.
- Allair, J. 2013. Two-spotted Tree Cricket (*Neoxabea bipunctata*) photographed at Springwater Forest on October 3, 2013. <http://instagram.com/p/fOE-YJlsmo> [accessed 16 September 2014].
- Beccaloni, G. W. 2014. *Cockroach Species File Online*. Version 5.0/5.0. <http://Cockroach.SpeciesFile.org> [Accessed 20 October 2014].

- Bell, W. J., Roth, L. M. and Nalepa, C. A. 2007. Cockroaches: ecology, behavior, and natural history. The Johns Hopkins University Press, Baltimore, Maryland. 230 pp.
- Bland, R. G. 2003. The Orthoptera of Michigan: Biology, keys, and descriptions of grasshoppers, katydids, and crickets. *Michigan State University Extension. Extension Bulletin E-2815*, East Lansing, Michigan 220 pp.
- Brock, P. D. 2014. *Phasmida Species File Online*. Version 5.0/5.0. <http://Phasmida.SpeciesFile.org> [Accessed 20 October 2014].
- Cannings, R. A., Miskelly, J. W., Schiffer, C. A. H., Lau, K. L. A. and Needham, K. M. 2007. *Meconema thalassinum* (Orthoptera: Tettigoniidae), a foreign katydid established in British Columbia. *Journal of the Entomological Society of British Columbia*, **104**: 91–92.
- Catling, P., Lucas, Z. and Freedman, B. 2009. Plants and insects new to Sable Island, Nova Scotia. *The Canadian Field Naturalist*, **123**: 141–145.
- Chandler, D. S. 1992. New records Of *Ectobius lapponicus* in North America (Dictyoptera, Blattellidae). *Entomological News*, **103**: 139–141.
- Chapco, W. and Contreras, D. 2007. A molecular phylogenetic analysis of the Oedipodinae and their intercontinental relationships. *Journal of Orthoptera Research*, **16**: 115–125.
- Clements, J. C., Doucet, D. A. and McCorquodale, D. B. 2013. Establishment of a European cockroach, *Ectobius lapponicus* (L.) (Dictyoptera: Blattodea), in the Maritime Provinces of eastern Canada. *Journal of the Acadian Entomological Society*, **9**: 4–7.
- Deem, L.S. 2014. *Dermaptera Species File*. Version 5.0/5.0. <http://Dermaptera.SpeciesFile.org> [Accessed 20 October 2014].
- Défaut, B. 2012. Implications taxonomiques et nomenclaturales de publications récentes en phylogénie moléculaire: 1. Les Gomphocerinae de France (Orthoptera, Acrididae). *Matériaux Orthoptériques et Entomocénétiques*, **12**: 15–20.
- Eades, D. C., Otte, D., Cigliano, M. M. and Braun, H. 2013. *Orthoptera Species File*. Version 5.0/5.0. [12 June 2013]. <http://Orthoptera.SpeciesFile.org>
- Ehrmann, R. 2002. Mantodea Gottesanbeterinnen der Welt. Natur und Tier-Verlag, Münster. 519 pp.
- Hoebeke, E. R. and Carter, M. E. 2010. **First North American record of *Ectobius lucidus* (Hagenbach) (Blattodea: Blattellidae: Ectobiinae)**, with notes on recognition characters and seasonal history, and additional records for other *Ectobius* species in the northeastern United States. *Proceedings of the Entomological Society of Washington*, **112**: 229–238.
- Kirk, K. and Bomar, C. R. 2005. Guide to the grasshoppers of Wisconsin. Bureau of Integrated Science Services, Madison, Wisconsin. 154 pp.
- Marshall, S. A., Paiero, S. M. and Lonsdale, O. 2004. New records of Orthoptera from Canada and Ontario. *Journal of the Entomological Society of Ontario*, **135**: 101–107.
- Massa, B. and Fontana, P. 2011. Supraspecific taxonomy of Palaearctic Platycleidini with unarmed prosternum: a morphological approach (Orthoptera: Tettigoniidae,

- Tettigoniinae). *Zootaxa*, **2837**: 1–47.
- Nickle, D. A. 1992a. Katydidids of Panama (Orthoptera: Tettigoniidae). Pp142–184 in D. Quintero and A. Aiello (eds.): *Insects of Panama and Mesoamerica: Selected Studies*. Oxford University Press, New York, New York. 720 pp.
- Nickle, D. A. 1992b. *Scapteriscus borellii* Giglio-Tos: the correct species name for the southern mole cricket in southeastern United States, Orthoptera: Gryllotalpidae. *Proceedings of the Entomological Society of Washington*, **94**: 524–526.
- Otte, D. 1984. *The North American Grasshoppers Volume II*. Harvard University Press. Cambridge, Massachusetts. 376 pp.
- Otte, D. 2002. Review of the *viridipes*-group (Acrididae: Melanoplinae). *Journal of Orthoptera Research*, **11**(2): 91–118.
- Otte, D. 2006. *Grylloides sigillatus* (Walker) is a valid species distinct from *Grylloides supplicans* (Walker). *Transactions of the American Entomological Society*, **132**: 223–227.
- Paiero, S. M., Marshall, S. A., Pratt, P. D. and Buck, M. 2010. Insects of Ojibway Prairie, a southern Ontario tallgrass prairie. Pp 199–225 in Shorthouse, J., and Floate, K. D. (eds), *Arthropods of Canadian grasslands, Volume 1: Ecology and interactions in grassland habitats. Biological Survey of Canada Monograph Series 3*: 1–358.
- Rehn, J. A. G. and Grant. H. J. 1958. The Batrachideinae (Orthoptera: Acridoidea: Tetrigidae) of North America. *Transactions of the American Entomological Society*, **85**: 13–103.
- Rehn, J. A. G. and Hebard, M. 1915. Studies in American Tettigoniidae (Orthoptera) III. A Synopsis of the species of the genus *Neoconocephalus* found in North America north of Mexico. *Transactions of the American Entomological Society*, **40**: 365–413.
- Skevington, J., Caloren, D., Stead, K. and Zufelt, K. 2001. *Insects of North Lambton. Lambton Wildlife Incorporated, Sarnia, Ontario*. 181 pp.
- Song, H. 2004. Revision of the Alutacea Group of genus *Schistocerca* (Orthoptera: Acrididae: Cyrtacanthacridinae). *Annals of the Entomological Society of America*, **97**: 420–436.
- Sugimoto, M. 2002. Is *Tachycines minor* a junior synonym of *Diestrammena asynamora*? *Tettigonia*, **21**(4): 25-27.”
- Vickery, V. R. and McE. Kevan, D. K. 1985. *The Insects and Arachnids of Canada; Part. 14: The Grasshoppers, Crickets, and Related Insects of Canada and Adjacent Regions (Ulonata: Dermaptera, Cheleuoptera, Neoptera, Dictuoptera, Grylloptera, and Orthoptera)*. Publication 1777, Agriculture Canada. 918 pp.
- Vickery, V. R. and Scudder. G. G. E. 1987. The Canadian orthopteroid insects summarized and updated, including a tabular check-list and ecological notes. *Proceedings of the Entomological Society of Ontario* **118**: 25–45.
- Walker, T. J and Moore, T. E. 2014. Singing Insects of North America. <http://entnemdept.ufl.edu/walker/buzz/> (accessed 18 September, 2014).
- Walker, T. J. 1969. Systematics and acoustic behaviour of United States crickets of the genus *Cyrtoxipha* (Orthoptera: Gryllidae). *Annals of the Entomological Society of America*, **62**: 945–952.
- Walker, T. J., and Funk, D. 2014. Systematics and acoustics of North American *Anaxipha*

- (Gryllidae: Trigonidiinae). *Journal of Orthoptera Research*, **23**: 1–38.
- Weissman, D. B., Gray, D. A., Pham, H. T. and Tijssen, P. 2012. Billions and billions sold: pet-feeder crickets (Orthoptera: Gryllidae), commercial cricket farms, an epizootic densovirus, and government regulations make for a potential disaster. *Zootaxa*, **3504**: 67–88.
- Zeuner, F. E. 1941. The classification of Decticinae hitherto included in *Platypleis* Fiedlb. or *Metrioptera* Wesm. (Orthoptera, Saltatoria). *Transactions of the Royal Entomological Society of London*, **91**: 1–50.