

Scientific Note

Earwigs (Dermaptera) of Manitoba: Records and Recent Discoveries

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The earwigs (Dermaptera) are a small order of insects (~1,800 described species) that are predominately tropical in distribution (Vickery and Kevan 1986; Hopkins *et al.* 2020). While earwigs tend to be secretive insects, some species are found in association with a variety of human-transported materials. As a result, humans have been responsible for the movement and introduction of a handful of synanthropic species well beyond their original distributions (Vickery and Kevan 1986). Although no known species of earwig is native to Manitoba or the Canadian Prairies, to our knowledge two species have become established following their introduction, and adventive species are also encountered, though infrequently. Here we document our limited but growing knowledge of the species of earwigs present in Manitoba and their distributions.

Forficulidae

Forficula auricularia (L.), the European earwig, is reported for the first time as resident in Winnipeg, Manitoba, Canada. The species was first recorded in Canada in British Columbia (Spencer 1926), where it became sufficiently numerous to reach minor pest status as a nuisance in gardens and orchards. Subsequently, it became established and sometimes abundant in the Maritime Provinces, southern Quebec and southern Ontario (Lamb 1979; Tourneur and Gingras 1992; Tourneur and Meunier 2019), but until now, European earwigs have not been reported as established in any of the three Prairie Provinces. No doubt European earwigs have arrived in Manitoba on numerous occasions, given the constant movement of nursery stock, fruits and vegetables from British Columbia and eastern Canada. The earwig behaviour of spending the day hidden in tight

spaces could easily result in them being transported undetected across Canada (Lamb and Wellington 1975).

European earwigs overwinter as adults without a diapause, and during the epigeal phase of the life-cycle, females lay their eggs and care for them in subterranean nests in winter (Lamb 1976). Although thought to be intolerant of sub-freezing temperatures, European earwigs are known to survive even where winter can be severe, as in Montreal, Canada (Tourneur and Gingras 1992). In such climates, females and their eggs probably die unless nests are protected from frost penetration by being near the foundations of heated buildings (Gingras and Tourneur 2001). In Manitoba, where winter temperatures are lower and insulating snow cover is often less than in Montreal, even some native insect species with a typical diapause cannot survive winter soil temperatures if the ground is not insulated by snow cover (Lamb *et al.* 1985). Thus, finding a resident population of European earwigs in Winnipeg was unexpected. The one nest observed in Winnipeg was at least 2 m from a heated foundation, within 5 cm of the surface under a flat stone. It may, however, have been protected from freezing by deep snow from a nearby walkway. We must accept that survival through severe winters is possible, since the populations of *F. auricularia* are well established in eastern Canada from ON to NL (Tourneur and Meunier 2019), and now in the prairies (Winnipeg).

The first European earwig observed (but not collected) in Winnipeg was a second- or third-instar nymph in a private garden in June, 2015. In the same garden, two adult female and three adult male earwigs were collected from 23 July 2016 – 9 September 2017. In 2018, 10 earwig traps (Lamb and Wellington 1974) and 10 pitfall traps were used to collect earwigs at the soil surface, and checked weekly through the spring, summer and autumn. Traps yielded an adult female on 17 June, three adult females on 8–15 August, and four nymphs on 29 June – 13 July (Table 1). Three second-instar nymphs were collected on 9 June 2018 as they escaped from a shallow subterranean nest disturbed when gardening, and an adult male was observed on 15 August, 2019. All collected specimens have been deposited in the J.B. Wallis/R.E. Roughley Museum of Entomology, Department of Entomology, University of Manitoba (Table 1).

We conclude that *F. auricularia* is resident in at least this one garden (N49.85, W97.13) in Winnipeg, where individuals, including young nymphs in a nest, have been observed in five successive years. Although only 19 individuals have been observed, the seasonal pattern of observations is consistent with successful overwintering: young juveniles and an adult female in early to mid-June, older juveniles in late June and early July, adult females and males from early August to September. This pattern is similar to that of earwigs in Montreal (Gingras and Tourneur 2001; Tourneur 2017), and fits the expected pattern of nesting and oviposition seen for populations living in a north-temperate climate with a severe winter (Tourneur and Meunier 2019). No other resident populations of *F. auricularia* have been reported in southern Manitoba, which is perhaps surprising as the adults often shelter during the day under or in the blooms of flowering plants in gardens.

As relatively large, darkly-coloured insects with highly visible “pincers”, they are likely to be encountered by the general public, but such encounters have not been reported. The population of resident *F. auricularia* must still be relatively low, possibly with a restricted distribution in Manitoba. Whether or not the apparent restricted distribution results from this earwig’s limited ability to survive a Manitoba winter remains to be determined.

Genetically distinct populations of European earwigs have been identified in North America, possibly reflecting introductions from different parts of Europe (Guillet *et al.* 2000). The genotypic characteristics of the specimens from Manitoba have yet to be determined, but based on the descriptions provided in Guillet *et al.* (2000), we expect the Manitoba population to be ‘Species A’, like those found in Quebec and other cooler, continental regions.

Spongiphoridae

Labia minor (L.)

Labia minor, the lesser earwig, is a cosmopolitan species that has been present in Manitoba since at least 1909 (based on our earliest record, Table 1), possibly longer since it was first recorded in North America in 1838 (Wanborough, NY) and was noted as being widespread by the early 1900’s (Doubleday 1838, Caudell 1913, Langston and Powell 1975). *Labia minor* is believed to have been introduced from Europe (Buckell 1929), but that introduction would have occurred at least 182 years ago and is likely impossible to retrace. Vickery and Kevan (1986) listed the Canadian distribution of *L. minor* as British Columbia to Nova Scotia, but only mapped two collection localities in the Canadian Prairies (Aweme, Manitoba, and one site near the Alberta-Saskatchewan border).

Although *L. minor* has now been present in Manitoba for over a century, it has been infrequently collected because it is rather inconspicuous (Langston and Powell 1975) (Table 1), and we are not aware of any previous efforts to document the occurrence of earwigs in the province beyond Vickery and Kevan (1986). Recent collections at a dairy farm near Whitemouth, in southeastern Manitoba, have yielded numerous specimens by focusing on areas with abundant muscid fly maggots (predominately *Musca domestica* (L.) but also *Stomoxys calcitrans* (L.)). Specimens were most reliably collected at the interface of straw mixed with manure and the underlying soil, generally matching previously documented habitat preferences (Hebard 1917, Morse 1920). Several specimens were also collected at the interface of spilled feed grain and the soil. Four specimens were collected at light traps or exterior lights, which has also been previously reported (Vickery and Kevan 1986).

In Manitoba, adults of *L. minor* were recorded from 17 April until 21 October based on all known records, with the largest number of collections in August (Table 1). All records, are from southern Manitoba (below 50° latitude), we do not know how far north this species can be found. Specimens have been collected from the same site (dairy farm near Whitemouth MB) for consecutive years, demonstrating this species’ ability to overwinter

successfully even in Manitoba's cold, continental climate, something few other species of earwigs appear to achieve (Langston and Powell 1975, Vickery and Kevan 1986).

Marava arachidis Yersin

Marava arachidis, the bone-house (or chief) earwig, is recorded from Africa, Australia, Caribbean, Europe, Asia (with the exception of China), and North and South America (Hopkins *et al.* 2020). The origins of this species are not fully known other than the assumption of it being a tropical species (Patel and Habib 1978). In California, *M. arachidis* was first detected in 1920, and has since been documented breeding in the state (Dowell *et al.* 2016). The species has also been recorded in AZ, TX, NJ, FL, HI, and MA (Vickery and Kevan 1986; Tullis and Goff 1987; Choate 2001).

There are no records of established populations *M. arachidis* in Canada. As of 2014, however, it was recorded in Ontario as an introduced species (Paiero and Marshall 2014). *Marava arachidis* is a cosmopolitan species, often found among stored products (Kamimura *et al.* 2016). Therefore, its presence in Manitoba (Table 1) is not considered abnormal, although collections (in pitfall traps) from a farm compost pile outdoors and away from factories was unusual given other previous records in temperate countries/regions are from indoors (Paiero and Marshall 2014; Matzke and Kocarek 2015). There is one additional record of this species on iNaturalist.ca, from 2012 in Winnipeg.

This species is known to exhibit maternal care (Patel and Habib 1978), so finding both adults and juveniles in the same samples suggests that in-site reproduction may have occurred. We cannot confirm this, since it is unknown how and when they were introduced at this site.

Anisolabididae

There are two records of *Euborellia annulipes* (Lucas), the ring-legged earwig, from Manitoba (Table 1). This species is predominately found along the east and west Coasts of North America, having been introduced to North America prior to 1884 (Langston and Powell 1975), but is also found in heated greenhouses and warehouses (Vickery and Kevan 1986). There is no evidence that this species is established in Manitoba, indoors or out, but it may occasionally be introduced in the same way other earwigs are, through commerce. The specimen collected in 2019, for example, was discovered alive in a package of potting soil mix.

Acknowledgements

We thank Owen Lonsdale for providing the records for earwigs in Manitoba from the Canadian National Collection of Insects, Arachnids and Nematodes (CNC), Agriculture

and Agri-Food Canada, Ottawa. We thank the two anonymous reviewers for their suggestions on a previous version of this manuscript.

Table 1. Manitoba earwig records.

| Family | Identity | Depository | No. | Sex | Location | Lat. (N); Long. (W) | Date | Collector |
|-------------------------|------------------------------|-------------------|-----|---------------------|-----------------------------------|------------------------|-------------------|--|
| Anisolabididae | | WRME ¹ | 1 | ♀ | Winnipeg | 49.81; -97.15 | 22.ix.1998 | W.B. Preston |
| | <i>Euborellia annulipes</i> | | | | | | | |
| Forficulidae | | WRME | 1 | ♂ | Winnipeg | 49.82; -97.19 | 17.xi.2019 | S. Storozuk |
| | <i>Forficula auricularia</i> | Observed only | | Juv. | Winnipeg | 49.8456; -97.1282 | -.vi.2015 | R.J. Lamb |
| | | WRME | 1 | ♂ | Winnipeg | 49.8456; -97.1282 | 23.vii.2016 | R.J. Lamb |
| | | WRME | 1 | ♂ | Winnipeg | 49.8456; -97.1282 | 07.viii.2016 | R.J. Lamb |
| | | WRME | 1 | ♂ | Winnipeg | 49.8456; -97.1282 | 26.viii.2016 | R.J. Lamb |
| | | Observed only | | ♂ | Winnipeg | 49.8456; -97.1282 | 05.viii.2017 | R.J. Lamb |
| | | WRME | 2 | 1 ♀, 1 ♂ | Winnipeg | 49.8456; -97.1282 | 09.ix.2017 | R.J. Lamb |
| | | WRME | 1 | ♂ | Winnipeg | 49.8456; -97.1282 | 17.vi.2018 | R.J. Lamb |
| | | WRME | 1 | ♂ | Winnipeg | 49.8456; -97.1282 | 08.viii.2018 | R.J. Lamb |
| | | WRME | 2 | ♂ | Winnipeg | 49.8456; -97.1282 | 15.viii.2018 | R.J. Lamb |
| | | WRME | 3 | Juv. | Winnipeg | 49.8456; -97.1282 | 09.vi.2018 | R.J. Lamb |
| | | WRME | 2 | Juv. | Winnipeg | 49.8456; -97.1282 | 29.vi.2018 | R.J. Lamb |
| | | WRME | 1 | Juv. | Winnipeg | 49.8456; -97.1282 | 06.vii.2018 | R.J. Lamb |
| | | WRME | 1 | Juv. | Winnipeg | 49.8456; -97.1282 | 13.viii.2018 | R.J. Lamb |
| | | Observed only | | ♂ | Winnipeg | 49.8456; -97.1282 | 15.viii.2019 | R.J. Lamb |
| Spongiphoridae | | WRME | 1 | ♂ | Aweme | 49.71; -99.60 | 28.vi.1909 | E. Criddle |
| | <i>Labia minor</i> | | | | | | | |
| | | WRME | 1 | ♂ | Aweme | 49.71; -99.60 | 11.ix.1909 | S. Criddle |
| | | WRME | 1 | ♂ | Aweme | 49.71; -99.60 | 18.ix.1910 | N. Criddle |
| | | CNC ² | 2 | | Aweme | 49.71; -99.60 | 09.vii.1914 | N. Criddle |
| | | WRME | 1 | ♂ | Winnipeg | 49.88; -97.17 | 10.viii.1924 | L. H. Roberts |
| | | CNC | 5 | | Aweme | 49.71; -99.60 | 13.viii.1927 | N. Criddle |
| | | WRME | 1 | ♂ | Aweme | 49.71; -99.60 | 13.ix.1927 | N. Criddle |
| | | WRME | 1 | ♂ | Morden | 49.18; -98.10 | 05.viii.1965 | |
| | | WRME | 1 | ♂ | Morden | 49.18; -98.10 | 13.viii.1965 | |
| | | WRME | 1 | ♂ | Winnipeg | 49.88; -97.17 | 15.viii.1971 | W.B. Preston |
| | | WRME | 1 | ♂ | Winnipeg | 49.87; -97.16 | 21.x.1973 | W.B. Preston |
| | | WRME | 1 | ♂ | Winnipeg | 49.88; -97.17 | 15.viii.1982 | I. Wylie-Toal |
| | | WRME | 1 | ♂ | 10 km SE | 49.96; -96.64 | 26.ix.1996 | T McKay |
| | | WRME | 1 | ♂ | Beausejour | | | |
| | | | | ♂ | Winnipeg, St. Charles Rifle Range | 49.91; -97.34 | 17- 22.iv.1998 | D.A. Pollock, J.K. Diehl, R.E. Roughley |
| | | WRME | 1 | ♂ | St. Adolphe | 49.67; -97.11 | 10.vi.2001 | J.M. Le Gal |
| | | WRME | 1 | ♂ | St. Adolphe | 49.67; -97.11 | 24.vi.2001 | J.M. Le Gal |
| | | WRME | 1 | ♂ | Winnipeg | 49.87; -97.16 | 16.viii.2003 | W.B. Preston |
| | | WRME | 2 | ♂ | Whitemouth | 49.955; -95.955 | 26.viii.2014 | R. Loch |
| | | WRME | 2 | ♂ | Whitemouth | 49.955; -95.955 | 26.viii.2014 | N. Chubey |
| | | WRME | 10 | 5 ♀, 5 ♂ | Whitemouth | 49.956; -95.954 | 26.viii.2017 | ENTM 3180 class |
| | | WRME | 8 | 2 ♀, 6 ♂ | Whitemouth | 49.956; -95.954 | 25.viii.2018 | ENTM 3180 class |
| <i>Marava arachidis</i> | | WRME | 8 | 4 ♀, 1 ♂, 3 Juv. | Grunthal | 49.427; -96.797 | 2.ix.2018 | D. Geverink |

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