N O T E

Thigmotactic Behavior of *Limothrips cerealium* (Thysanoptera: Thripidae) Leads to Laboratory Equipment Damage in the Czech Republic[1]

Rudolf Masarovič, Martina Zvaríková, Jana Fedorová[2], and Peter Fedor[3]

Department of Environmental Ecology, Faculty of Natural Sciences, Comenius University, Mlynská dolina, Ilkovičova 6, 842 15 Bratislava 4, Slovakia

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Thigmotaxis is contact-oriented behavior of organisms (Resh and Cardé 2008 [eds.], Glossary. *in* Encyclopedia of Insects, Elsevier, 1073–1091.) that is associated with the movement toward or away from a mechanical stimulus (Hutchins et al. 2003 [eds.], Behavior. *in* Grzimek's Animal Life Encyclopedia, Gale, Vol 1: 37–43. such as occurs in narrow spaces or borders. The terminology of thigmotaxis has been widely discussed (Lewis 1997, Thrips as crop pests. CAB International, Wallingford, 740 pp.; Hutchins et al. 2003), and includes other related phenomena, such as thigmokinesis as increased locomotion in response to changes in contact with immediate physical environment or orthokinesis and klinokinesis, connected with the rate and direction of locomotion in a crevice. This behavior is widespread even among Thysanoptera (Lewis 1973, Thrips, their biology, ecology and economic importance. Academic Press Inc., London, 349 pp.) in which each species chooses crevices with different sizes and suitable widths, sometimes varying between males and females (de Mallman 1964, Ann. Soc. Entomol. Fr. 133: 1–141). Thigmotaxis likely provides protection against inhospitable conditions, such as during hibernation in deeper layers of tree bark (Lewis 1997) or during aestivation in relatively more humid microhabitats, thereby avoiding desiccation (Kirk 1997. Feeding, pp. 19–41, In Lewis (ed.), CAB International, Wallingford, 749 p,).

The short communication herein reports our experience with applied consequences of thigmotactic behavior and ecology of the grain thrips, *Limothrips cerealium* Haliday (Thysanoptera: Thripidae). Thousands of these thrips invaded privately owned, accredited microbiological laboratories and chemical food-testing

[1]Received 21 April 2017; accepted for publication 25 April 2017.
[2]Municipal Museum of Senec, 90301 Senec, Slovakia.
[3]Corresponding author (email: fedor@fns.uniba.sk).

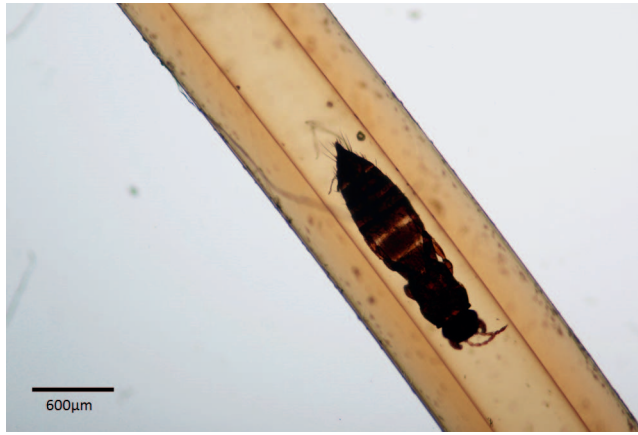

Fig. 1. Specimen of *Limothrips cerealium* inside a capillary tube.

facilities in the Czech Republic in late June and early July of 2015 and 2016, although the thrips populations were lower in 2015 than in 2016.

Thrips, apparently originating from cereal crops on a nearby farm, were especially troublesome as they sought refuge in 600-µm-wide capillary tubes (Fig. 1) in capillary electrophoresis and atomic absorption spectroscopy laboratory equipment. Consequently, the capillary electrophoresis analyzer required service and the atomic absorption spectrometer had to be absolutely replaced with total cost of €56,000. Thrips were also found in the liquid as well as gas chromatography equipment, but no service was required. Furthermore, many specimens crawled under adhesive tapes, under covers of flasks containing reference materials and mobile phase fluids, and under monitors.

Specimens were collected using a brush and placed in 70% ethyl alcohol. Representative specimens were mounted on slides using the methods of Mound and Kibby (1998, Preparatory techniques for identification. *in* Thysanoptera: An Identification Guide. CAB, Wallingford, 4–6.) and identified according to Zur Strassen (2003, Die terebranten Thysanopteren Europas. Goecke and Evers, Keltern, 277 pp.) as *L. cerealium*. Capillary tubes with the specimens of grain thrips were analyzed and photographed.

The thigmotactic behavior that results in thrips hiding in narrow spaces has been documented previously, including reports of *L. cerealium* recovered from glass picture frames and time pieces that were rendered nonfunctional by the thrips (e.g., Cuthbertson 1989, Entomology 108: 246–256; Lewis 1991, pp. 3–22, In Parker et al. (eds.), Proc. Intern. Conf. on Thrips, 3–22). Lewis (1991) reported that thrips caused numerous malfunctions of fire and smoke alarms over a 4-d period in Suffolk, United Kingdom, in 1985, resulting in false fire alarms and responses by fire units.

Such thigmotaxis also impacts agricultural production in that it impedes the success of quarantine treatment and practices (Kirk 1997; Morse and Hoddle 2006, Annu. Rev. Entomol. 51: 67–89), decreased efficiency of sampling methods

(Sutherland and Parrella 2011, J. Econ. Entomol. 104: 1323–1328), and reduced efficacy of contact insecticides (Kirk 1997).

Limothrips cerealium commonly occurs in Europe as a pest of cereal crops, inhabiting a range of habitats and breeding in grasses (Lewis 1973; Lewis 1997). As a relatively strong flyer, actively moving up to 24.1 cm/s (Lewis 1973; Fedor et al. 2010, Entomol. Fenn. 21: 221–231), it occasionally migrates over long distances from its breeding sites by prevailing winds. Thrips also are noteworthy for their tendency for mass flights in large population levels reaching up to 17 million specimens/ha (Lewis 1973), mainly in the summer and early autumn during sunny conditions without rain. Flights usually occur during the warmest period of the day with minimal temperatures of 20°C (Lewis 1964, Ann. Appl. Biol. 53: 165–170; Lewis 1973). These biological phenomena obviously resulted in the migration of thrips populations from nearby cereal grain fields into the laboratory facilities reported herein.

However, the thigmotactic behavior observed in these facilities should not be associated with hibernation behavior, which primarily involves winged, but sexually immature, females of the first generation that move to potential shelters (Lewis 1973), including bark crevices measuring 150–600 μm in width (de Mallmann 1964). Thrips observed in the laboratory and testing facilities were largely mature females from the overwintering generation that leaves cereal fields at the end of June. Their observed thigmotactic behavior can only be postulated at this time. Several explanations are possible; it might be that these adult females leave the crops to estivate to avoid potential desiccation (Lewis 1973), thrips movement might be triggered by thunderstorms and their associated electrical fields so that the thrips find suitable shelter and avoid potential rainfalls (Kirk 2004, Acta Phytopathol. Entomol. Hung. 39(1–3): 131–136), or the thrips may have been leaving the crops as they desiccated (Lewis 1964) with the dry and hot summer conditions of 2015 and 2016.

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