

Limonius californicus (sugarbeet wireworm) – Lesser or regional pest

Area where reported as pests: southern Alberta, Saskatchewan, Manitoba (van Herk and Vernon 2014). Found mostly on irrigated land (Brooks 1960).

Wireworm (larval) stage: Wireworms (larvae) of this species are yellow, hard-bodied and, interestingly, have no eyes (Lanchester 1946). At maturity, they are 17–22 millimetres (0.7–0.9 inches) long (Glen et al. 1943). Different from the other main pest wireworm species, the caudal notch of *L. californicus* (sugarbeet wireworm) is nearly closed, like a keyhole shape (Figure 20). The urogomphal prongs are much smaller than those of *H. bicolor* and *S. a. destructor* (Prairie grain wireworm).

Beetle (adult) stage: The slender adult beetles are 8.5–11 millimetres (0.3–0.4 inches) long and have very short hind angles. Their pronotum (thorax cover) is black and their elytra (wing covers) are reddish brown. Both are covered in dense white or yellow hair. (Figure 20).

Life cycle: The biology of *L. californicus* (sugarbeet wireworm) in the Prairies is not well known, and what is presented here is based on studies done in California by Stone (1941). *L. californicus* (sugarbeet wireworm) wireworms pass through 10–13 instars and, in California, complete development in 2–3 years (Stone 1941). It is likely that development lasts longer (probably 3–4 years) on the Prairies due to colder climate. In Stone's (1941) studies, pupation occurred in summer and fall, 17–30 centimetres (7–12 inches) below the soil surface, and lasted approximately 21 days. The new adults overwinter in the soil and emerge in the spring. Females become active several days after males, and mate soon after.

Reproduction: Males can apparently mate more than once, dying approximately one month after mating. As with other species, the adult life span can last longer under

cold conditions (Stone 1941). In southern Alberta, adult males are active in May, starting when mean daily temperatures are still low (4°C / 39°F) (van Herk et al., unpublished data).

Females begin laying eggs (oviposition) approximately one week after mating and are largely finished after one week, but, depending on temperature, can continue up to nine weeks. Females produce an average of 250 or more eggs, and die after completing egg laying. Eggs are laid in soil with 10–20% soil moisture, generally in cracks in the soil surface, but female beetles will burrow 10 centimetres or more to find suitable soil moisture to lay in. Egg laying in fields does not appear to be affected by the type of vegetation present. Eggs hatch on average 30 days after they are laid (Stone 1941).

Feeding/damage: A study in Washington state and Idaho found that *L. californicus* (sugarbeet wireworm) wireworm feeding, especially by small wireworms, is aggressive from May to August (Milosavljević et al. 2017). This was different than the close relative *Limonius infuscatus* (western field wireworm), for which feeding activity dropped off as the summer went on.

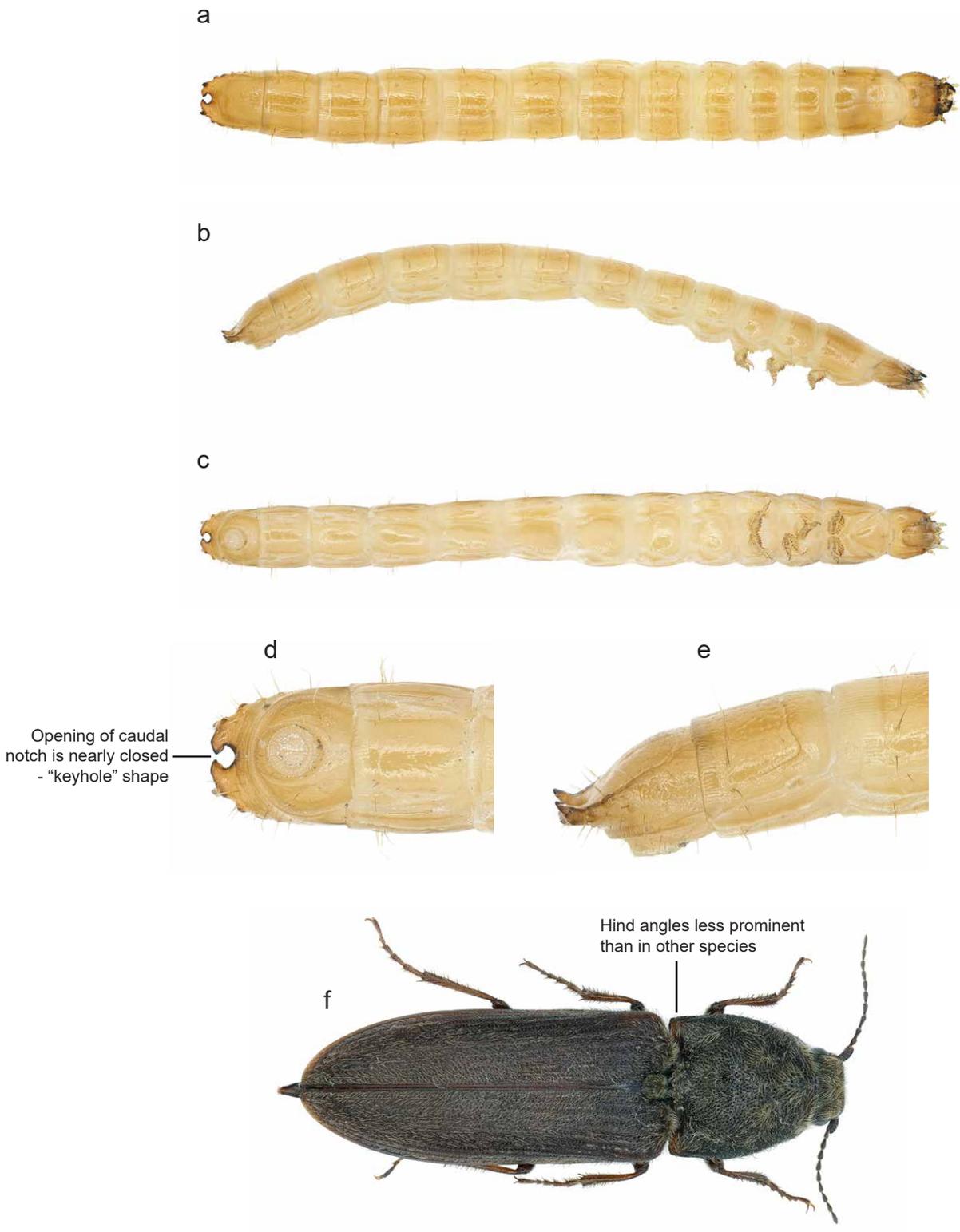
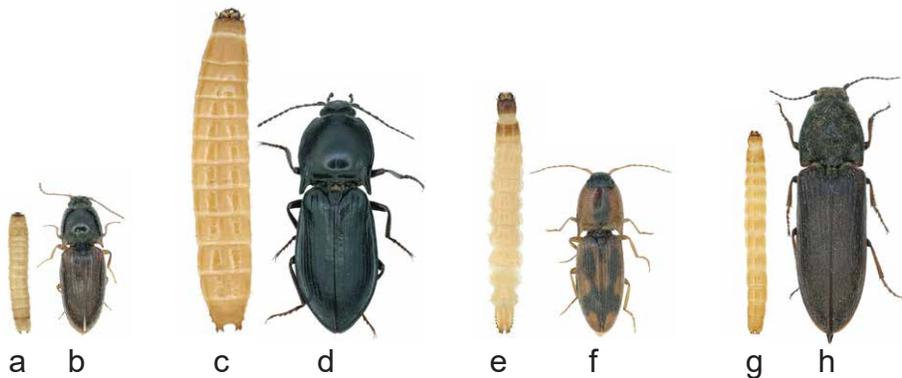


Figure 20. *Limonius californicus*. a) larva - top view; b) larva - side view; c) larva - bottom view; d) larva - caudal notch, top view; e) larva - caudal notch, side view; f) adult. Photos: J. Saguez, CÉROM



Guide to Pest Wireworms in Canadian Prairie Field Crop Production





Front cover species: *Hypnoidus bicolor* a) larva; b) adult; *Selatosomus aeripennis destructor* c) larva; d) adult; *Aeolus mellillus* e) larva; f) adult; *Limonius californicus* g) larva; h) adult

Guide to Pest Wireworms in Canadian Prairie Field Crop Production

© Her Majesty the Queen in Right of Canada, represented by the Minister of Agriculture and Agri-Food (2021)

Electronic version available at www.publications.gc.ca

Print version

Catalogue No.: A42-125/2021E

ISBN: 978-0-660-39114-4

AAFC No.: 13074E

PDF version:

Catalogue No.: A42-125/2021E-PDF

ISBN: 978-0-660-39113-7

AAFC No.: 13074E

This publication may be cited as:

Catton H, van Herk W, Saguez J and Svendsen E (2021) Guide to pest wireworms in Canadian Prairie field crop production. Agriculture and Agri-Food Canada, Lethbridge, Alberta, Canada.

Paru également en français sous le titre : « Guide sur les vers fil-de-fer nuisibles aux cultures dans les Prairies canadiennes »

For more information, you can find us at www.agr.gc.ca or call us toll free at 1-855-773-0241

ACKNOWLEDGEMENTS

We would like to thank the Alberta Wheat Commission, the Western Grains Research Foundation, and Agriculture and Agri-Food Canada for funding the production of this field guide (Agriculture Funding Consortium Project 2017F080R). Thanks also to David Shack and Cheryl Chelle for valuable comments and technical support as well as to the many colleagues who contributed photos to the guide, especially John Gavloski for his help with Box A. We are grateful for Ted Labun's (Syngenta Canada Inc.) years of work on bringing attention to the importance of wireworms on the Prairies, and for help with Box C. Thanks to Finch van Baal (AAFC-Halifax) for assisting with the layout and design of this guide. And finally, we are indebted to Bob Vernon for his guidance and mentorship in the world of wireworms, and to all of the other researchers that worked for decades to provide the fundamental information on wireworms presented in this guide.



FOREWORD

This guide is intended to provide information on wireworm damage, biology, management, research and challenges in crop production on the Canadian Prairies. We have summarized the knowledge of this persistent and complicated pest on the Prairies by discussing the general life cycle, behaviours, and management options for the main pest species in this region. We have also identified major gaps in knowledge and where research is needed. Our target audience include farmers, agronomists, crop scouts, extension personnel and anyone else interested in the impact of wireworms on Prairie crop production.

Note that this guide is a summary of the scientific literature. No content of the guide should be considered as an endorsement of any product.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS.....	i
FOREWORD.....	ii
INTRODUCTION.....	1
What are wireworms?	1
What is the problem?	3
How big is the problem?	6
What research is out there for the Canadian Prairies?	7
History of wireworm research on the Prairies	7
PRAIRIE WIREWORM LIFE CYCLE AND ACTIVITY.....	17
Adult click beetles and eggs	17
Newly hatched wireworms (neonates) — a vulnerable stage	18
Resident wireworms — resilient and damaging	19
Pupal stage and overwintering adult	21
PROBLEM WIREWORM SPECIES ON THE PRAIRIES.....	23
<i>Hypnoidus bicolor</i> (no common name)	24
<i>Selatosomus aeripennis destructor</i> (Prairie grain wireworm)	26
<i>Limoniuss californicus</i> (sugarbeet wireworm)	28
<i>Aeolus mellillus</i> (flat wireworm)	30
<i>Hadromorphus glaucus</i> (no common name)	32
<i>Agriotes mancus</i> (wheat wireworm)	34
MONITORING.....	37
Wireworm trapping	37
Bait trapping for wireworms	37
Types of bait traps	38
Adult click beetle trapping	39
INTEGRATED PEST MANAGEMENT OPTIONS.....	45
Cultural control	45
Biological control	51
Chemical control	53
RESEARCH NEEDS.....	57
Biological information	57
Decision support tools	57
Integrated pest management methods and their effects	58
TABLES	59
RESOURCES.....	65
REFERENCES.....	67