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VISUAL IDENTIFICATION GUIDE FOR STORED-PRODUCT BEETLES

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ABSTRACT

Stored-product insects can be difficult for non-experts to identify because they may not be familiar with the technical language of keys. We have developed two visual keys using photographs to illustrate the distinguishing characters. One key identifies 14 of the most common stored-product insects, and another, more detailed key, identifies 32 stored-product beetles. The keys will be available online and as a smart phone application.

Key words: Key, identification, guide, mobile phone

INTRODUCTION

Currently, to identify a stored-product insect, you can use keys (Bousquet 1990, Gorham 1991) that require a good knowledge of the technical terms used to describe the distinguishing characters. The alternative is to use photographs or line drawings of insects (White et al. 2001) that may not correctly identify the insect. Therefore, there exists a need for a simple, visual key to stored-products insects, that is both easy to use and is more directed than current publications. Complex, text-oriented keys often prove difficult for new users and for some more experienced users terminology may also present a challenge. By using photographs of the features of an insect needed for identification, we hope to make insect identification easier, while retaining the critical information needed for correct identification.

RESULTS AND DISCUSSION

The two keys are directed at different audiences. The first, simple key is targeted at people working in the grain-storage industry who do not have the technical knowledge to use insect keys (Bousquet 1990, Gorham 1991). This key is brief and covers most of the orders of arthropods (14 groups or species) that are associated with stored grain. It also goes into greater detail with the most common stored-product beetles. The second key describes 32 beetles associated with stored grain and is modified from Bousquet (1990). The second version is aimed more at those with a strong background in entomology. In both versions of the key, the terminal couplet ends with the name of the species (scientific and common names) and links to descriptions of the species' biology.

1 (A)	Larger beetles (11 mm or more).	<u>2</u>
1'	Smaller (up to 10 mm).	<u>3</u>

Fig. 1- Sample screenshot from key showing choice between large (1(A)) or small insects (1'). Decision will lead to a selection of option 2 or option 3 leading to subsequent couplets. Selection of (A) will take user to preceding couplet. Wheat is used as a background to give scale.

Both keys were developed first using text versions of the keys. This was followed by developing an extensive image library of the insects. Images were taken to illustrate the whole insect from various aspects and their distinguishing features. Over 2000 images were taken over a period of several months.

15 (14)	Eye one or two facets wide laterally at level of incision.	<i>Tribolium confusum</i> Confused Flour Beetle
15'	Eye three or four facets wide laterally at level of incision.	<u>16</u>

Fig. 2- Sample screenshot of couplet 15 with figures 15.1 and 15.2 from key with choices 15(14) and 15' showing distinguishing feature that identifies *Tribolium confusum* Jacquelin du Val or option 16 leading to another couplet.

The key will be available to the general public via two main avenues: publication in the online journal, Canadian Journal of Arthropod Identification and on the Canadian Grain Commission website. Smart phone applications will be developed for the simplified key.

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REFERENCES

- Bousquet Y (1990) Beetles Associated with Stored Products in Canada: An Identification Guide. Agriculture and Agri-Food Canada, Publication 1837, Ottawa, <http://www.esc-sec.ca/aafcmonographs/bousquet1990.pdf>
- Gorham JR (1991) Insect and Mite Pests in Food: An Illustrated Key. United States Department of Agriculture, Washington
- White NDG, Abramson D, Demianyk CJ, Fields PG, Jayas DS, Mills JT, Muir WE, Timlick B (2001) Protection of Farm-stored Grains, Oilseeds and Pulses from Insects, Mites and Moulds. Agriculture and Agri-Food Canada, Publication 1851/E Ottawa, <http://www.grainscanada.gc.ca/storage-entrepouse/aafc-aac/pfsg-pgef-eng.htm>