

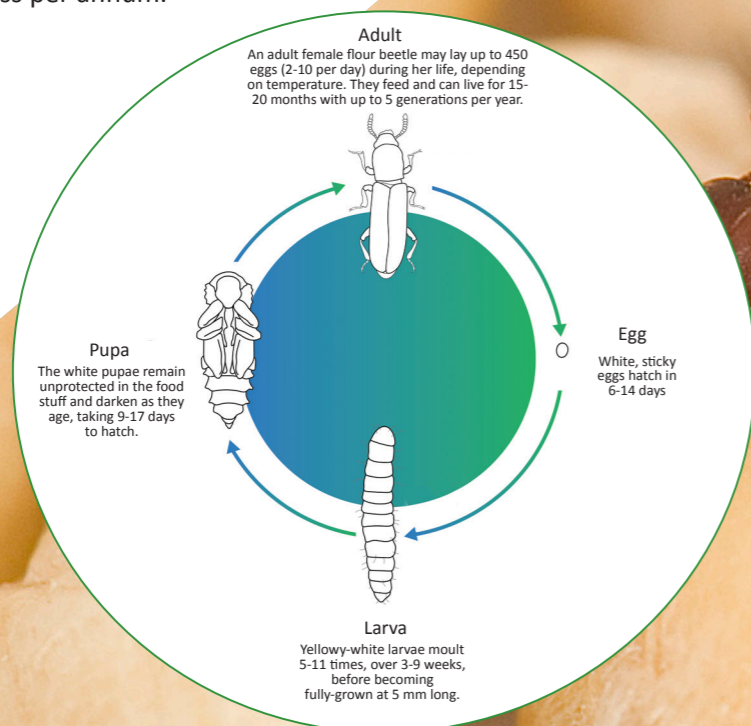
## Flour Beetles

The cosmopolitan red (*Tribolium castaneum*) and confused (*T. confusum*) flour beetles are two of the most common storage pests found in cereal-based products that are found in flour mills and bakeries. They also feed on oil seed, nuts, dried fruit, spices, chocolate and animal products. The red flour beetle can fly and has the highest rate of population increase of any stored product insect, multiplying 70x per month under ideal conditions. They are not cold tolerant, so do not over winter in cold stores. The flightless confused flour beetles are long-lived (1-3 years), and more tolerant of cold and very low humidity and have a 60-fold increase in population per month in good conditions.

## Damage

Economic damage is caused by direct loss of milling yield due to feeding; rejection of product due to infestation; cost of management tactics; contamination by unpleasant odours (quinones) secreted by beetles in heavy infestations; and loss of consumer trust. When present in large numbers, flour beetles make flour product prone to moulding and the product turns grey. Because flour beetles are common and widespread, they cause millions of pounds worth of loss per annum.

## Life Cycle

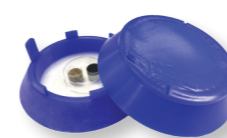


## Monitoring and Management

Good hygiene is an essential part of managing food stores in order to find and remove the source of new infestations, flour beetles can feed and survive on the smallest amounts of grain. Stores should be easy to clean, well-insulated, well-ventilated and damp-proof. Cracks and crevices that can harbour the beetles should be filled where possible. Stored grain should be dried (<15% moisture content) and kept cool (<15°C) for long-term storage. Freezing infected stored products below -18°C/0.4°F for three days can destroy these species. Flour products should be stacked away from floors and ceilings to allow for inspection and cleaning. Maintain stock rotation. It is also advised to create robust, well-sealed packs with smooth surfaces as they can deter an insect attack. Monitor routinely with Russell IPM traps and pheromones to detect the presence flour beetles as part of your management strategy.

Scientific and Common name	Image	Size (mm)	Identification
<i>Tribolium confusum</i> Confused flour beetle		2.6 - 4.4	Antennae with 5 or 6 segmented club; slight ridge above the eye. Reddish-brown in colour.
<i>Tribolium castaneum</i> Rust-red Flour beetle		2.3 - 4.4	Antennae with distinct 3-segmented club. No ridge above the eye. Reddish-brown in colour.
<i>Tribolium destructor</i> Dark flour beetle		2.3 - 4.4	Distinct from other flour beetles by being larger and darker. Black or dark brown in colour.
<i>Palorus ratzeburgii</i> Small-eyed flour beetle		2.4 - 3	Small, round eyes with no well-marked club. Reddish-brown in colour.
<i>Latheticus oryzae</i> Long-headed flour beetle		4.5 - 5.8	Antennae with compact 5-segmented club. Pale yellow.
<i>Gnathocerus cornutu</i> Broad-horned flour beetle		3.4 - 5	Males with large, toothed mandibles, broader at base than near apex. Reddish-brown in colour.
<i>Gnathocerus maxillosus</i> Slender-horned beetle		2.4 - 3.0	Males with large, toothed mandibles, slender and in-curved. Reddish-brown in colour.

## Associated Russell IPM Products



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**XlureMST**



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**safe store** Pitfall trap



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**safe store** Diamond trap



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**Qlure**