

Stored Product Pests: Diagnostic Dossier

An ACE Preparation Field Guide
& Identification Matrix



The Stored Product Ecosystem



Farinaceous & Plant-Based

- Whole grains & cereals
- Dried vegetables, fruits & nuts
- Spices & dried flowers (potpourri)
- Chocolates & candy



Animal Proteins & Keratin

- Dry pet food
- Hides, furs & trophy heads
- Museum specimens
- Feathers, woolens & silks
- Dried meats, milk & cheese products



Commonly found in commercial food warehouses, processing plants, restaurants, and residential pantries.

The Four Feeding Guilds

Internal Feeders

Larvae develop entirely within the kernel of whole grain or seed.



External Feeders

Larvae develop outside whole whole kernels; capable of feeding on both whole and processed grains.



Secondary Pests

Infest grain products that are out of condition, damp, or actively moldy.

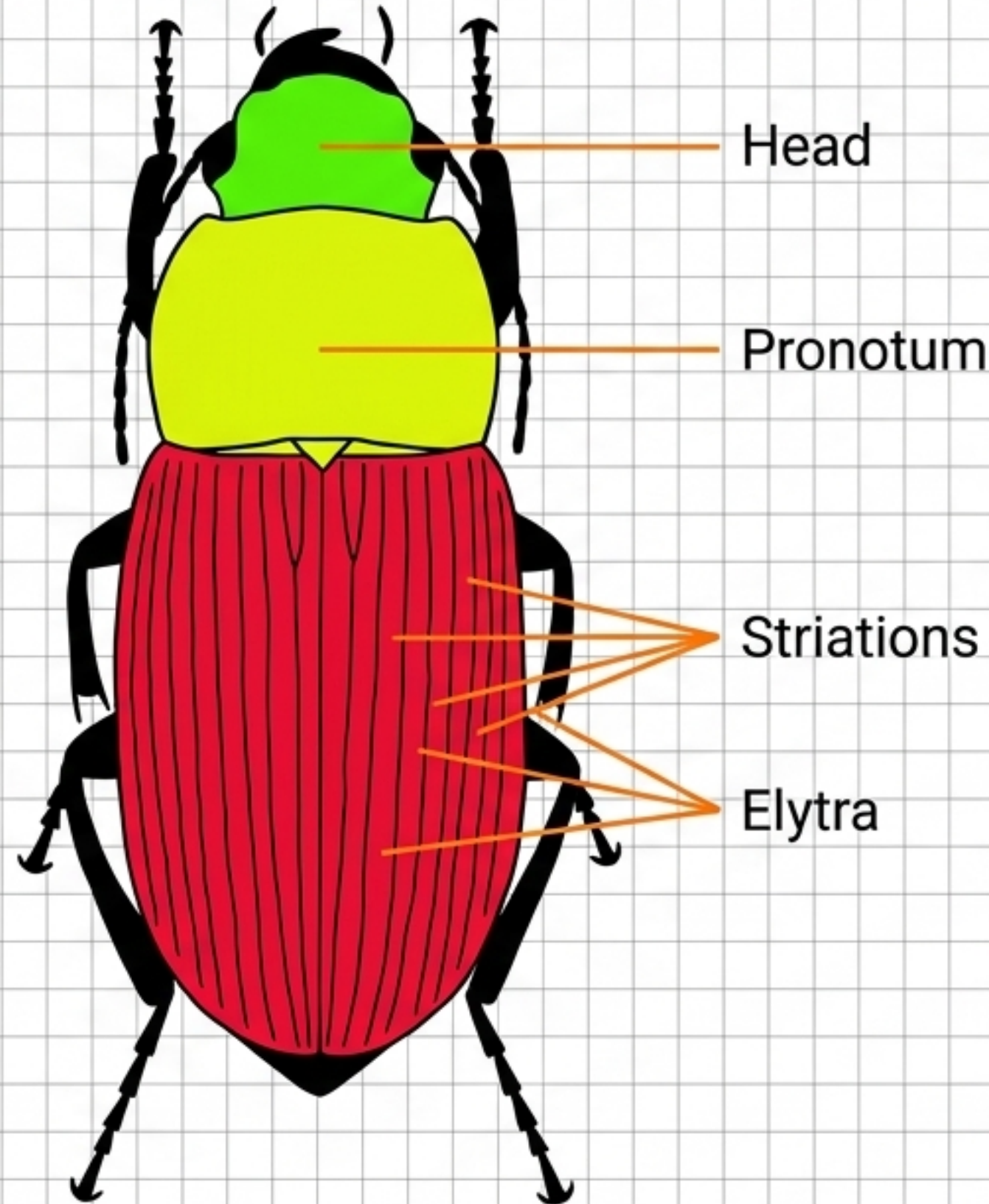
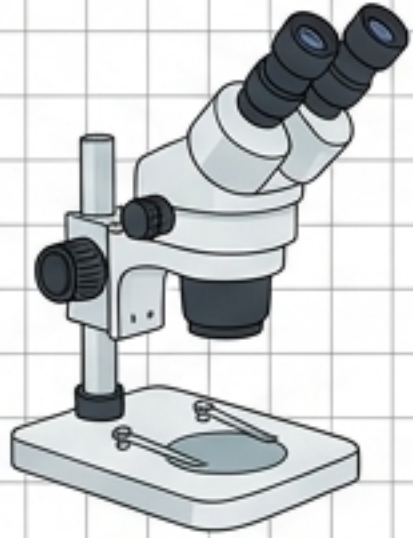


Scavengers

Attack only grains that have been processed or previously damaged by other feeding insects.



The Inspector's Diagnostic Key



Threadlike



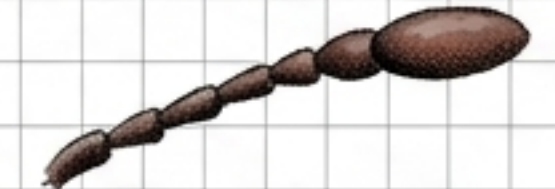
Beadlike



Saw-toothed
(serrate)



Comb-like
(pectinate)



Clubbed
(gradual)



Clubbed
(abrupt)



Lamellate

Internal Feeders: True Weevils (Curculionidae)



	Rice Weevil (<i>Sitophilus oryzae</i>)	Granary Weevil (<i>Sitophilus granarius</i>)
Thorax Pits	Closely spaced, oval pits.	Widely spaced, oval pits.
Flight & Light Behavior	Can fly; Attracted to light.	Cannot fly; Not attracted to light.
Wing Covers (Elytra)	Lighter X-marking on wing covers.	Solid reddish-brown.

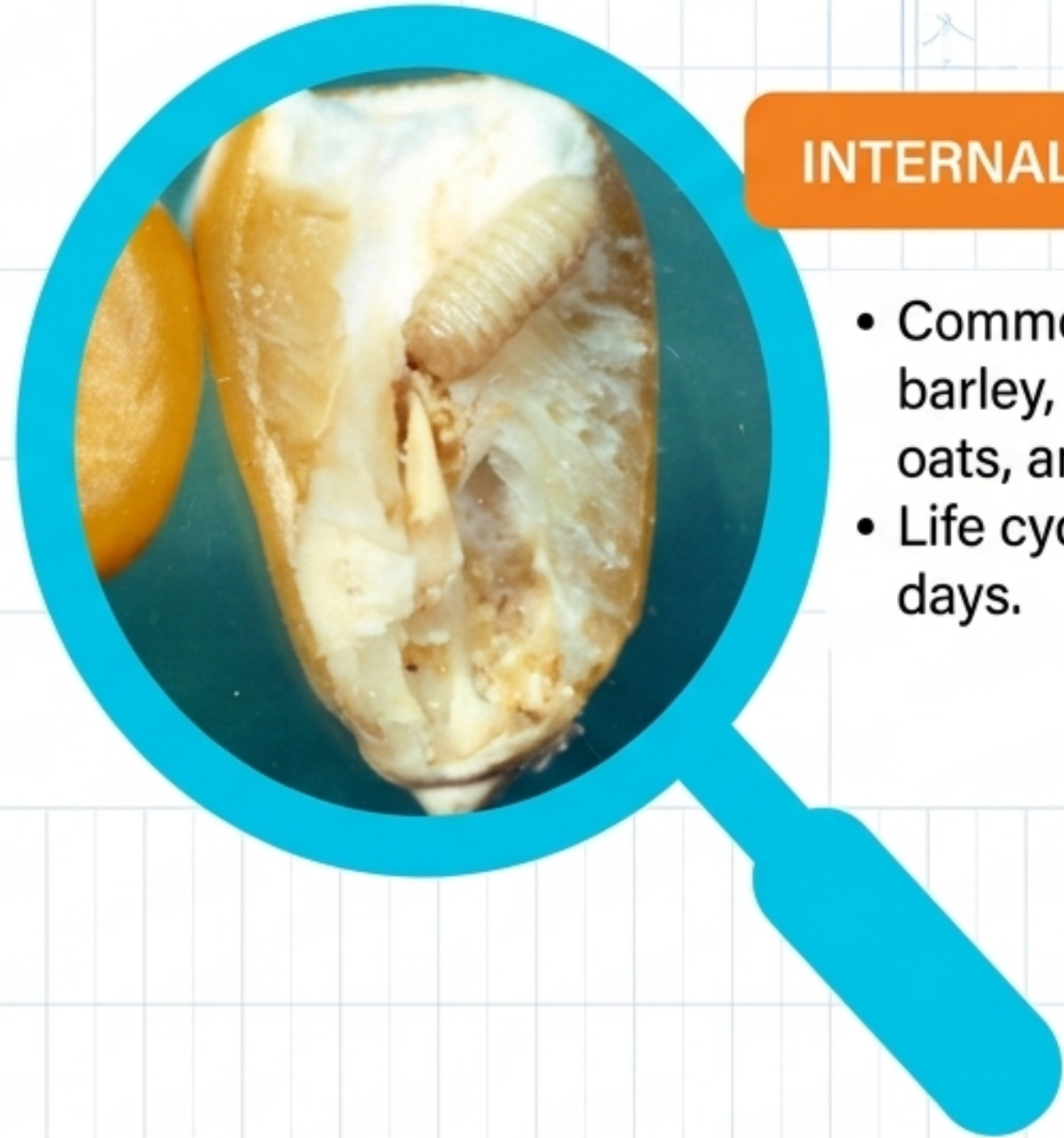
Diagnostic Note: Bean & Pea Weevils (*Bruchidae*)

Internal feeders on legumes. Lacks the long proboscis of true weevils; leaves distinct round exit holes in beans.

Internal Feeders: Angoumois Grain Moth (*Sitotroga cerealella*)



- Wingspan: 13mm (1/2 inch)
- Appearance: Yellowish-white with pale yellow forewings.
- Distinguishable from clothes moths by its larger size (clothes moths are ~5-7mm).



INTERNAL FEEDER

- Commonly infests barley, rye, corn, oats, and rice.
- Life cycle: 35-50 days.

External Feeders: The Silk Spinners



Indian Meal Moth (*Plodia interpunctella*)

- **Wingspan:** 18mm
- **Identifier:** Outer 1/2 to 1/3 of front wing is covered with reddish-copper scales.
- **Behavior:** Nocturnal, attracted to lights. Feeds on grain, dried fruits, candy, pet food.

Diagnostic Cue: Both species' larvae spin extensive silk webbing over their feeding substrates.



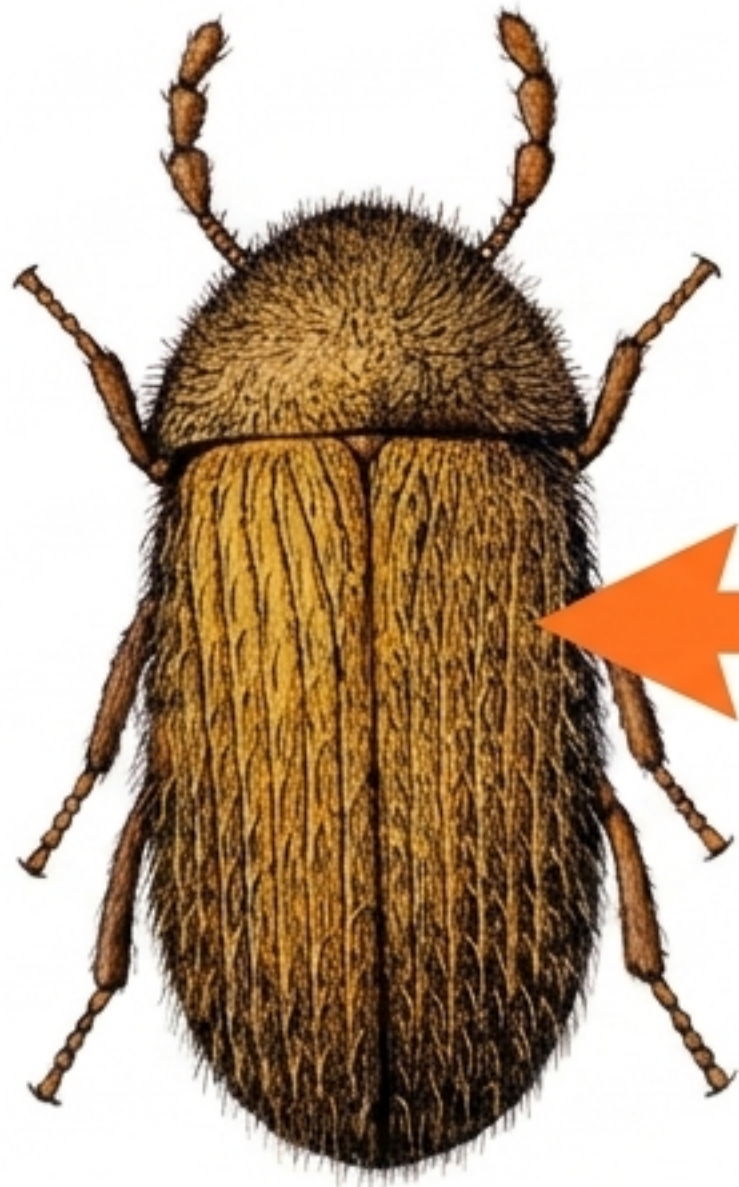
Mediterranean Flour Moth (*Ephestia kuehniella*)

- **Wingspan:** 25mm
- **Identifier:** Pale gray forewings with transverse black wavy bars.
- **Behavior:** Attracted to lights. Common pest in flour mills.

External Feeders: The Pantry Beetles

Note: Both beetles fly and are attracted to light; identification relies strictly on anatomy.

Drugstore Beetle (*Stegobium paniceum*)



Elytra (Wing Covers):
Rows of longitudinal
grooves (striations)

Antennae: Ends in a
loose, 3-segmented
club.

Cigarette Beetle (*Lasioderma serricorne*)



Elytra (Wing Covers): Smooth, absolutely no
grooves.

Antennae: Saw-toothed (serrate), absolutely
no club.

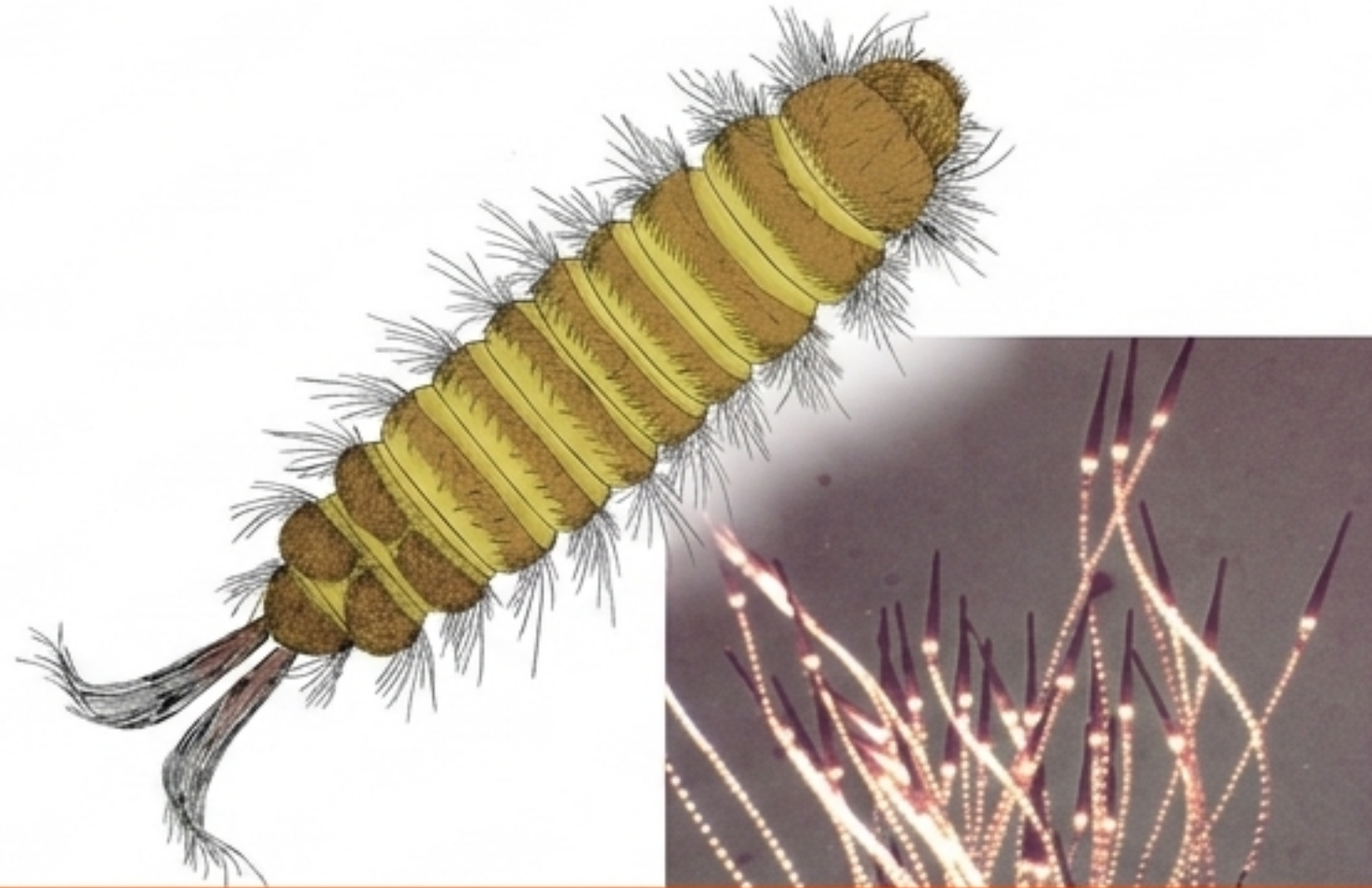
Scavengers: The Dermestids (Skin & Carpet Beetles)

Hide Beetle

- Feeds on meat, dead animals, trophy heads.

Warehouse Beetle

- Black/brown mottled elytra.
- Penetrates food packaging.



MEDICAL HAZARD ALERT: HASTISETAE

Larvae of Trogoderma and Anthrenus carry hastisetae (spear-headed hairs). If ingested, these cause severe irritation of the gastrointestinal tract. Hide beetle larvae feature two terminal horns (urogomphi).



Varied Carpet Beetle

- 3mm size.
- Covered in colorful scales.

Scavengers: The Flour Beetles (*Tribolium* spp.)

Background: Both are 3.5mm, reddish-brown, and feed on flour, cereals, and grains already infested by other beetles.

Red Flour Beetle (*T. castaneum*)



- **Antenna Type:** Ends in an abrupt 3-segmented club.
- **Behavior:** Attracted to lights; CAN fly.
- **Geography:** More common in warmer climates (Southern U.S.).

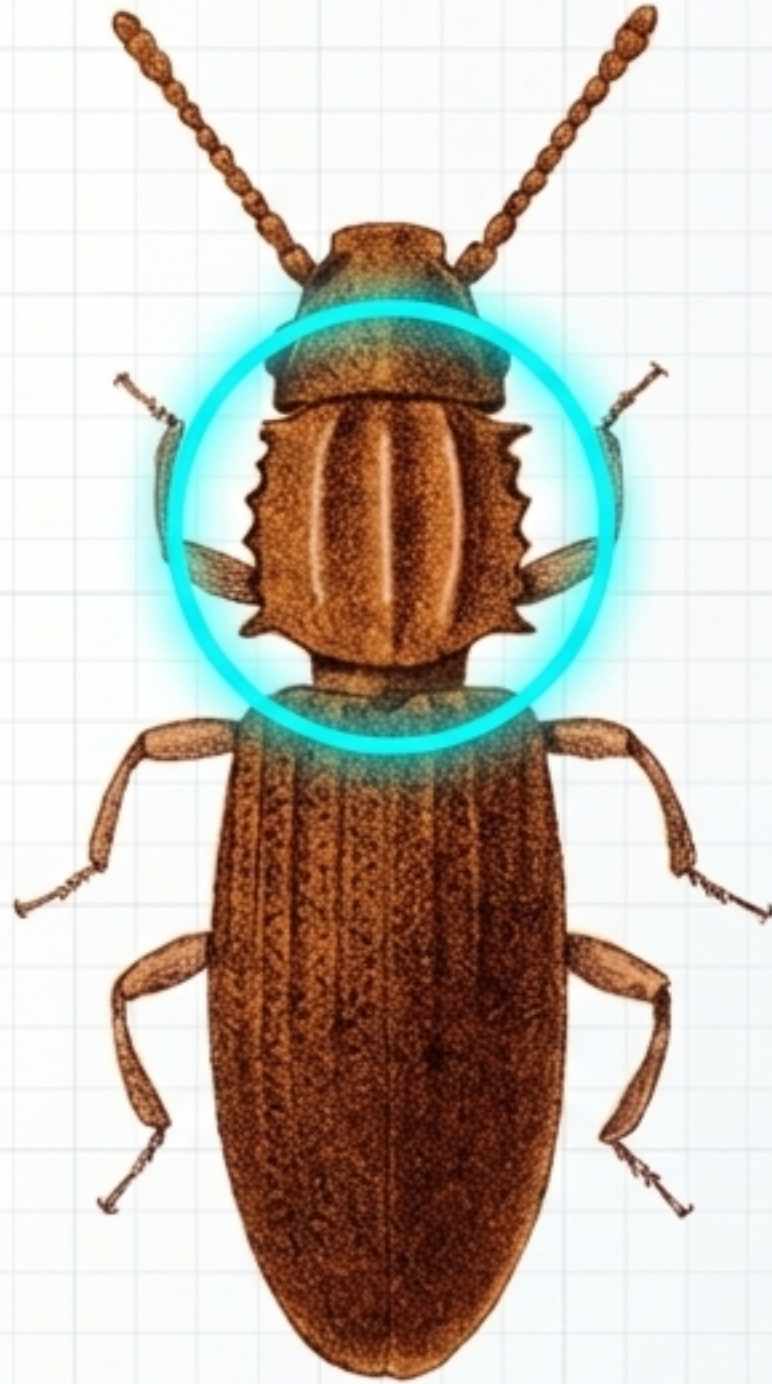
Confused Flour Beetle (*T. confusum*)



- **Antenna Type:** Ends in a gradual 4-segmented club.
- **Behavior:** Cannot fly.
- **Geography:** More common in cooler climates (Northern U.S.).

Scavengers: Distinctive Anatomies

Sawtoothed Grain Beetle (*Oryzaephilus surinamensis*)



- **Identification:** Identifiable by six saw-like projections on each side of the thorax.
- **Details:** 2-3mm, flattened brown body.
- **Behavior:** Cannot fly, not attracted to light. Feeds on processed grains.

- **Identification:** Small, globular, spider-like shape.
- **Resilience:** Tolerant of extreme temperatures and desiccation.
- **Behavior:** Do not fly. Scavengers on everything from nuts to rodent excrement.

Spider Beetles (Ptinidae)



Secondary Feeders: The Mold Indicators

Mealworms (*Tenebrio spp.*)



- **Size:** Large (13mm / 1/2 inch).
- **Appearance:** Dark brown/black adult beetles; yellow or dark banded larvae.
- **Behavior:** Do not fly, not attracted to light. Life cycle over 365 days.
- **Ecology:** Exclusively infests moldy grain products.

Foreign Grain Beetle (*Ahasverus advena*)

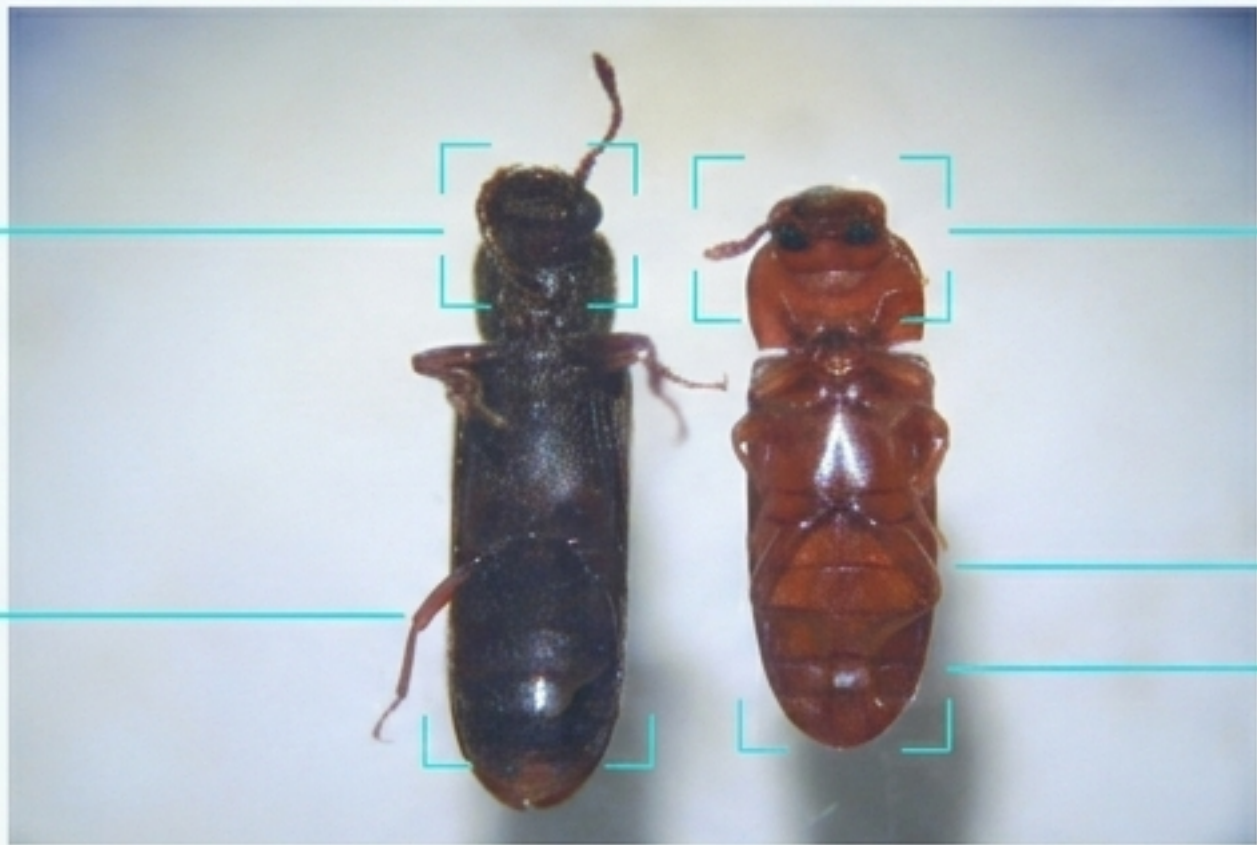


- **Size:** 2mm long.
- **Identification:** Clubbed antennae, notches in the square pronotum.
- **Ecology:** Feeds specifically on molds and mildews. Often found associated with damp grain products or newly constructed housing (where green lumber molds).

Diagnostic Trigger: Presence indicates out-of-condition, damp, or actively moldy environments.

Diagnostic Challenge: Stored Product vs. Wood-Destroying

Powderpost Beetle
(*Lyctus* sp.)



Flour Beetle
(*Tribolium* sp.)

Feature	Flour Beetle (Stored Product)	Powderpost Beetle (Wood-Destroying)
Antennal Club	3-segmented	2-segmented
Eye Shape	Wrap-around eyes	Globular eyes
Hind Coxae	Enlarged	Not enlarged
Tarsal Formula	5-5-4	4-4-4

(Tarsal formula requires microscope verification)

Integrated Pest Management (IPM) Protocols

Step 1: Inspection & Sanitation

Locate and dispose of infested materials (spilled pet food, potpourri, old rodent baits, abandoned bird/bee nests). Rotate goods strictly.

Step 2: Exclusion & Environment

Manage exterior landscaping. Alter exterior lighting to reduce attraction vectors for nocturnal flyers.

Step 3: Trapping & Monitoring

Deploy sex pheromones to attract males and monitor populations. Available for Indian meal moth, Mediterranean flour moth, and Angoumois grain moth.

Step 4: Physical Control Thresholds

- **HEAT:** 120°F for 60-90 minutes kills all life stages in packages. (120°-150°F for 24 hours for entire buildings).
- **COLD:** -4°F for 7-14 days in a deep freeze kills the hardest pests. Drop temperatures rapidly for best results.



The ACE Quick-Reference Master Matrix

Pest Name	Guild	Flight?	Light Attracted?	Key Identifier
Rice Weevil	Internal	Flies	Yes	Thorax pits close, X on wings
Granary Weevil	Internal	No Fly	No	Thorax pits wide, solid brown
Angoumois Moth	Internal	Flies	Yes	Pale yellow, internal feeder
Indian Meal Moth	External	Flies	Yes	Copper-tipped wings, silk
Drugstore Beetle	External	Flies	Yes	Grooved wings, 3-seg club
Cigarette Beetle	External	Flies	Yes	Smooth wings, serrate antenna
Red Flour Beetle	Scavenger	Flies	Yes	3-seg club, Southern US
Red Flour Beetle	Scavenger	Flies	Yes	3-seg club, Southern US
Confused Flour	Scavenger	No Fly	No	4-seg club, Northern US
Sawtoothed	Scavenger	No Fly	No	6 thorax projections
Dermestids	Scav./Ext.	Varies	Yes	Hastisetæ on larvae (GI hazard)
Mealworms/Foreign	Secondary	No Fly	No	Indicate mold/moisture