**Emerged Gall Dissection Protocol**

Modified from Jo Itami and Tim Craig’s dissection key

#### **Measuring and dissecting**

1. Remove goldenrod gall from storage.
2. Use a calliper to measure at the widest part of the ball gall. Round to the nearest tenth of a mm (round .5 up). Or if using Art’s method, sort into cups by mm class.
3. Using a clipper, remove excess stem from top and bottom of gall
4. Inspect gall for emergence or predator attack hole of any kind, noting shape
5. Being careful not to cut through any emergence hole, open the gall by cutting partway in, longitudinally (from pole to pole). Use the blade to cut nearly half-way through, then twist to pry it open and reveal the gall’s central chamber
6. Inspect the chamber to determine the gall’s current or prior occupant(s). Galls may have multiple occupants. Make sure to enter in the corresponding code for the combination of occupants. Make sure to carefully inspect and cut into the gall to look for signs of *Mordellistena* as they may have tunnelled in a portion of the gall not initially visible in the first cut.

**Gall Occupants Codes**

**Single occupant codes**

**EE—** *Eurosta solidaginis* emerged, the gallmaker

**EFE —** *Eurosta solidaginis* failure to emerge, the gallmaker

**LLD —** *Eurosta solidaginis* failure to emerge, the gallmaker

**ELD —**Early larval death of *Eurosta solidaginis*

**gig —** *Eurytoma gigantea,* external parasitoid wasp

**obt —** *Eurytoma obtusiventris,*internal parasitoid wasp

**mc —** *Mordelestena convicta*, inquiline beetle

**st —** parasitoid of *Mordelestena convicta*, parasitoid wasp of beetle

**wp —** gall empty, pecked open by downy woodpecker

**ck —** gall empty, pecked open by black-capped chickadee

**eld —** gall empty, Early Larval Death, no sign of occupancy

**uk —** gall empty, but signs of occupancy/attack by another insect (i.e., frass)

**Multiple occupant codes**

**eum** **—** presence of both *Eurosta solidaginis*, the gallmaker and the inquiline beetle

**gigm —** presence of both *Eurosta gigantea* and the inquiline beetle

**obtm —** presence of both *Eurytoma obtusiventris* and the inquiline beetle

**wpm —** presence of both woodpecker predation and the inquiline beetle.

**ckm —** presence of both chickade predation and the inquiline beetle.

**Identification Guide for Gall Occupants**

|  |
| --- |
| **EE** **—** *Eurosta solidaginis* emerged  **Or multiple occupants:**  **eum** **—** presence of both *Eurosta solidaginis*, and the inquiline beetle (see MC entry for signs)  1.irregular round exit hole present, sometimes flaps of plant epidermis remain 2. Exit tunnel present 3. pupal case present: uniform brown in color except for black mouth region  A close-up of a piece of wood  Description automatically generatedClose-up of a piece of bread  Description automatically generated  Goldenrod Gall Fly (Eurosta solidaginis) · iNaturalist United KingdomA brown object on a white surface  Description automatically generated      Adult Emerged Emergence holes Exit tunnel Pupal case |

|  |
| --- |
| **EFE** **—**  *Eurosta solidaginis* failure to emerge  **Or multiple occupants:**  **eum** **—** presence of both *Eurosta solidaginis*, and the inquiline beetle (see MC entry for signs)   1. no exit hole 2. exit tunnel present 3. Intact pupa with fly inside present, often in tunnel   A brown object on a white surface  Description automatically generatedA group of brown objects on a white surface  Description automatically generatedA close up of a vegetable  Description automatically generated    Pupa Exit tunnel Pupa in tunnel |

**LLD —**  Late larval death

**Or multiple occupants:**

**eum** **—** presence of both *Eurosta solidaginis*, and the inquiline beetle (see MC entry for signs)

1. exit tunnel usually not present. 2. feeding chamber present. 3. dead larva present. 4. Packed light colored frass, chamber not much larger than larva

A close up of a heart

Description automatically generated

Dead larva

|  |
| --- |
| **OBT —** *Eurytoma obtusiventris,* internal parasitoid wasp  **Or multiple occupants:**  **obtm —** presence of both *Eurytoma obtusiventris* and the inquiline beetle (see MC entry for signs)  1 small sharp exit hole present. 2. brownish, ovoid pupal case present. ~3-5 mm long.  A round object with a hole in it  Description automatically generatedEurytoma obtusiventris - BugGuide.NetA drawing of a plant  Description automatically generated with medium confidence  A close up of a piece of food  Description automatically generatedA close up of a fruit  Description automatically generated      Adult emerged Central chamber Emergence hole Exit tunnel |

|  |
| --- |
| **ELD —** Early Larval Death  1. No discernable central chamber, but there may be voids in the surrounding tissue due to shrinkage from dehydration. 2. Occasionally small drops of resin 3. No frass.  A close-up of a fruit  Description automatically generated |

|  |
| --- |
| **GIG —** *Eurytoma gigantea,* external parasitoid wasp  **Or multiple occupants:**  **gigm —** presence of both *Eurosta gigantea* and the inquiline beetle (see MC entry for signs)  1. small sharp round exit tunnel present. 2. no puparium present. 3. central chamber enlarged and irregular with often brownish fecal pellets often  A close up of a brown object  Description automatically generatedA close up of a round object  Description automatically generatedA close up of a banana  Description automatically generatedEurytomid Wasp - Eurytoma gigantea - BugGuide.Net      Larva Adult emerged Central Chamber Emergence hole Exit tunnel |

|  |
| --- |
| **MC —** inquiline beetle *Mordellistena convicta*  **Or multiple occupants:**  **eum** **—** presence of both *Eurosta solidaginis* and the inquiline beetle (see EE and EFE entry for signs)  **wpm —** presence of both woodpecker predation and the inquiline beetle (see WP entry for signs)  **ckm —** presence of both chickadee predation and the inquiline beetle (see CK entry for signs)  **gigm —** presence of both *Eurosta gigantea* and the inquiline beetle (see GIG entry for signs)  **obtm —** presence of both *Eurytoma obtusiventris* and the inquiline beetle (see OBT entry for signs)  1. one or many oval exit holes present 2. one or many narrow but long tunnels present commonly running along surface of gall. 3. large quantities of fine sawdust in tunnels  A brown object with a hole in it  Description automatically generatedA close up of a brown object  Description automatically generatedTumbling Flower Beetle - Mordellistena syntaenia - BugGuide.Net          Larva Adult Emergence hole Burrowing tunnel |

|  |
| --- |
| **ST —** *Schizoprymnus texanus*  1. no *Eurosta* exit tunnel present 2. yellow cocoon in mordellid tunnel usually  near gall surface. Yellow cocoon anchored with silken webbing in the tunnel  A close-up of a piece of food  Description automatically generated  Close-up of a piece of fruit  Description automatically generated    Empty cocoon Cocoon with parasitoid inside |

|  |
| --- |
| **WP —** *Pocoides pubesneces*, Downy Woodpecker  **Or multiple occupants:**  **wpm —** presence of both woodpecker predation and the inquiline beetle (see MC entry for signs)  Round, nearly cylindrical hole, ~3mm diameter, chiselled from surface into central chamber of an empty gall.  Solving the mystery of the tiny holes in goldenrod plants |

|  |
| --- |
| **CK —** *Poecile atricapillus*, Black-capped Chickadee  **Or multiple occupants:**  **ckm —** presence of both chickadee predation and the inquiline beetle (see MC entry for signs)  Irregular, broadly conical hole ripped from surface into central chamber of an empty gall. |

|  |
| --- |
| **UK —** unknown  A small percentage of galls may have no inhabitants but contain frass or show signs of tunneling. Most of these are probably an instance in which *Mordellistena* has burrowed out of the gall and into the stem. |

#### 