TIGER BEETLES

ORDER: COLEOPTERA (koleos=sheath, pteryx=wing, refers to hardened forewings which cover the membranous hind pair)
Family: Cicindellidae (considered by many authors to be subfamily of Carabidae)

IMPORTANCE Both adults and larvae are fierce, voracious predators. Often found in high numbers.


BIOLOGY Most diurnal, some nocturnal. Very active, especially on hot, sunny days. Fastest running insect (almost 2 mph), fast flier. Single eggs laid in soil burrows. Larval development: many months (environment-dependent), pupation may occur in pupal chamber adjacent to larval tunnel. 2-3 years per generation. Holometabolous development (complete metamorphosis: larvae do not resemble adults, 4 life stages include egg, larva, pupa and adult). May bite when handled.

FOOD SOURCE Moth larvae, aphids, flies, small beetles, bugs, grasshoppers, ants, spiders and other small insects. Adults are aggressive hunters. Larvae wait in burrow entrance with jaws set to trap passing insects, dragging them to the bottom to be eaten.

SEASONAL OCCURRENCE (Adults):

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MONITORING
Methods - Light trap, pitfall trap, and aerial net (most effective).
Habitats - In or near vertical dry soil burrows in open, sunny areas such as fields, dry roadside paths, forest clearings, tree trunks.

CONSERVATION
Attractants - Maintain permanent groundcover for shelter.
Pesticide Toxicities -
Toxic: chrophenvinphos, diazinon, parathion.
Safe: azinphos-methyl. (42)

RECOMMENDED READINGS: 88, 135
TIGER BEETLES

DESCRIPTION

Adults  6-24 mm. Shiny, metallic bronze, blue, green, purple or orange, some with patterns or spots, slightly flattened, widest behind mid-body. Long, strong hairy legs, broad head with large, bulging eyes, thread-like antennae, distinct strong, sharp toothed mandibles, front wings hardened, and hindwings folded and membranous (Figs. 35 and 36).

Immatures  Segmented, S-shaped larvae. Flattened head acts as lid or plug for vertical soil burrow. 2 or 3 pairs of curved hooks anchor larva in tunnel.

Figure 35 - Tiger beetle.

Figure 36 - Tiger beetle.
GROUND BEETLES

**ORDER**: COLEOPTERA (*koleos*=sheath, *pteryx*=wing, refers to hardened front wings which cover the membranous hind pair)

**Family**: Carabidae

**IMPORTANCE**  Both adults and larvae are important predators of caterpillars and other insects, often found in large numbers. Attempts to establish colonies of *Calasoma sycophanta* for biological control (against various moths and loopers) in British Columbia, Washington, California, New Mexico and Colorado have been unsuccessful. Few feed on fungi, pollen, and seeds. One species (*Pterostichus algidus*) causes significant loss of Douglas-fir seed.

**DISTRIBUTION**  Worldwide: 40,000 spp. North America: 2,270 spp. Canada: 861 spp. (includes Cicindellidae)

**BIOLOGY**  Most nocturnal, some diurnal. Breed in spring or fall. Egg to adult: 1 year, adult: 2-4 years. Holometabolous development (complete metamorphosis: larvae do not resemble adults, 4 life stages include egg, larva, pupa and adult). Run quickly when disturbed, never fly. May emit strong odour.

**FOOD SOURCE**  Forest tent caterpillar larvae, tussock moths, cutworm larvae and other moth larvae, weevils, aphids, nematodes, mites, thrips, maggots, slugs, snails, earthworms, rove beetles, fruit flies, soldier flies, spiders, soldier beetles, springtails. Some feed on plant material including seeds.

**SEASONAL OCCURRENCE**  (Adults):

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**MONITORING**  Methods - Bait trap, Berlesse funnel trap, branch beatings, light trap, pitfall trap, sieves, aerial net.

Habitats - Hiding under stones, soil, plant debris during day, climb trees and shrubs to catch caterpillars at night.

**CONSERVATION**  Attractants - Encourage white clover. Avoid disturbing groundcover.

Mowing - Leave some weeds (especially pigweed) between rows.

Pesticide Toxicities -

High : fenithrothion, phosphamidon, thionazin.

Variable (environment-dependent) : diazinon.

Low : permethrin.

Low to none: *Bacillus thuringiensis* (Dipel™)

Safe: carbofuran, chlorethrin, azinphosmethyl. (17,35,45,77,97)

**RECOMMENDED READINGS**: 13, 88, 135
GROUND BEETLES

DESCRIPTION

**Adults**  2-85 mm. Vary in size, shape and colour. Small to large, fast-moving, strong-jawed, flattened ground-dwelling, thread-like antennae. Metallic blue, brown, or black, and shiny, may have long legs. Punctures or grooves run length of the elytra (Fig. 37).

**Eggs**  Some eggs laid in cells made of mud, twigs, leaves.

**Immatures**  Free-living larvae, flattened, hairless, tough-skinned, tapered at both ends, elongate, paler colour than adult. Some have large heads with pincer-like jaws. Well-equipped hunters with well-developed legs, powerful jaws (Fig. 38).

---

Figure 37 - Ground beetle.

Figure 38 - Ground beetle larva.
ROVE BEETLES

ORDER: COLEOPTERA (*koleos*=sheath, *pteryx*=wing, refers to hardened front wings which cover membranous hind pair)
Family: Staphylinidae

IMPORTANCE: Both adults and larvae are important predators of aphids, mites, flies and soil dwelling pests. Some parasitize other insects (13), or decompose manure and dead plant matter. None are pests. May bite when handled.

Canada: 1129 spp. (87)

BIOLOGY: Large species nocturnal, small ones diurnal. Eggs laid in soil or decaying plant matter. 3 larval instars. Pupate in soil. Overwinter as adults, become active in spring. Holometabolous development (complete metamorphosis: larvae do not resemble adults, 4 life stages include egg, larva, pupa and adult). Often run fast with abdominal tip raised. Strong fliers.

FOOD SOURCE: Soil insects (especially eggs and larvae) including fly maggots, nematodes, pest springtails, aphids and spider mites. Also slugs and snails.

SEASONAL OCCURRENCE (Adults):

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

MONITORING
Methods - Light trap, pitfall trap, sieve trays, aerial net.
Habitats - Near dung, carrion and other decaying matter. Under stones or objects on ground, in fungi, leaf litter, flowers. In ant, termite, mammal or bird nests.

CONSERVATION
Attractants - Maintain permanent groundcover to protect overwintering adults. Provide rocks or boards for shelter. (42)

RECOMMENDED READINGS: 13, 42, 135
DESCRIPTION

**Adults** 1-25 mm. Small, elongate, black or brown, resemble earwigs without pincers. Short stubby outer wings cover folded, well-developed hindwings. Long, slender, sharp mandibles. Bead-like or clubbed antennae (Figs. 39 and 40).

**Immatures** Larvae resemble small adults, without wings.

Figure 39 - Rove beetle.

Figure 40 - Rove beetle.
HISTER BEETLES

ORDER: COLEOPTERA (koleos=sheath, pteryx=wing, refers to hardened front wings which cover membranous hind pair)
Family: Histeridae

IMPORTANCE Adults and larvae prey on beetles, flies and ants. Some scavengers.


BIOLOGY Eggs laid on decaying matter. Rate of growth depends on availability of resources. Pupate in soil beneath food supply. 1 generation per year. Holometabolous development (complete metamorphosis: larvae do not resemble adults, 4 life stages include egg, larva, pupa and adult). Feign death when disturbed.

FOOD SOURCE Mainly maggots. Also weevils and other beetles, mites, termites, ants, fly eggs, and springtails. Use sharp, curved jaws to seize and cut up prey.

SEASONAL OCCURRENCE (Adults):

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MONITORING
Methods - Malaise trap, pitfall trap, visual examination of tree wounds, rotting vegetation, and dung.
Habitats - In or near decaying organic matter including dung, fungi, carrion, tree wounds. Some flat species occur under loose bark, others in ant or termite nests. Some live in wood boring insect galleries.

CONSERVATION
Pesticide Use - Use pesticides only as a last resort.

RECOMMENDED READINGS: 13, 89
HISTER BEETLES

DESCRIPTION

**Adults** 0.5-10 mm. Small, shiny, black, hard-shelled oval to round body with short hindwings. Some flattened, others elongate and cylindrical (Figs. 41 and 42). Short, elbowed, clubbed antennae.

**Immatures** Elongate, cylindrical larvae. Well-developed legs, antennae, and mouthparts.

Figure 41 - Hister beetle.

Figure 42 - Hister beetle.
CLICK BEETLES

ORDER: COLEOPTERA (koleos=sheath, pteryx=wing, refers to hardened front wings which cover membranous hind pair)

Family: Elateridae

IMPORTANCE Mainly agricultural pests. Some predaceous forest species. Few potential minor pests in forest nurseries and outplantings but no threat to mature trees.


BIOLOGY Eggs laid in soil. Egg hatch: 2-4 weeks, larvae: 2-5 years. During last year of development larvae form cell in soil in late summer to pupate (some pupate in dead wood or under bark). Move deep into soil each fall, returning to upper soil in spring to feed on roots and lay eggs. Overwinter as larvae or adults in soil. Holometabolous development (complete metamorphosis: larvae do not resemble adults, 4 life stages include egg, larva, pupa and adult). Named for behavior of clicking and throwing their bodies into the air when placed on backs. Body is arched, snapped and recoiled in air.

FOOD SOURCE Adults: some feed on plant material, many do not feed. Larvae: predators feed on wood borers and soil dwelling moth pupae. Others feed on roots, underground stems, tubes, bulbs, corms. Larvae digest food externally.

SEASONAL OCCURRENCE (Adults):

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MONITORING
Methods - Branch beatings, light trap, malaise trap, pan trap, pitfall trap, sweep net, outer and inner examination of rotting logs or stumps.
Habitats - Adults: on ground, under bark and litter, on foliage and flowers, in decaying wood. Larvae: under bark, in soil, fungi and ant nests, rotting wood, living or decaying vegetation, near dung and rotting fungi, in damp shaded woodlands.

CONSERVATION
Pesticide Use - Use pesticides only as a last resort.

RECOMMENDED READINGS: 13, 50, 87
**CLICK BEETLES**

**DESCRIPTION**

**Adults** 10-30 mm. Distinctive shape: elongate, flattened, parallel-sided, posterior corners of pronotum drawn out to sharp point, brown or black, some with yellow, red or white eyespots (Fig. 43), slightly shiny, smooth, may be covered in short red-brown or black hairs.

**Im matures** “Wireworm” larvae: cylindrical, elongate, shiny, hard-shelled, with horny hooks at posterior end (Fig. 44). Some soft-bodied.

---

*Figure 43 - Click beetle.*

*Figure 44 - Click beetle larvae.*
SOLDIER BEETLES

ORDER: COLEOPTERA (koleos=sheath, pteryx=wing, refers to hardened front wings which cover membranous hind pair)

Family: Cantharidae

IMPORTANCE Adults feed on pollen and nectar. Most larvae feed on soft-bodied insects. Some are omnivorous.


FOOD SOURCE Adults: aphids, moth larvae, beetle larvae, grasshopper eggs. Some feed on pollen and nectar of flowers including milkweed, goldenrod and wild parsley. Larvae: soft-bodied insects such as small moth larvae, maggots, grasshopper eggs. May feed on plants.

SEASONAL OCCURRENCE (Adults):

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MONITORING

Methods - Branch beatings, sweep net, visual examination of goldenrod, milkweed, and catnip.

Habitats - Adults: flying in warm sunshine, on flowers and foliage in moist and shady areas, on ground, in soil and low-growing plants, under bark, near hedgerows, grassy areas and woodland edges, under bark. Larvae: in soil, leaf litter, on damp ground, under loose bark and debris.

CONSERVATION

Attractants - Encourage pollen plants. Maintain permanent groundcover for protection of pupating beetles.

Mowing - Leave some flowering weeds such as milkweed, goldenrod and wild parsley between rows. (42, 97)

RECOMMENDED READINGS: 42, 87, 135
SOLDIER BEETLES

DESCRIPTION

Adults 5-15 mm. Elongate, parallel-sided, soft-bodied beetles, black or dark blue with bright yellow, red or orange markings, some mainly yellow, some entirely black. Large head with bulging eyes, curved, sharply-pointed jaws, long, slender legs, long thread-like antennae pointing downward. Short, leathery elytra expose wings and abdomen. Family name comes from colouring resembling old military uniforms (Figs. 45 and 46).

Imatures Similar to ground beetle larvae, dark-coloured, flattened, covered with short, dense, velvet-like bristles.

Figure 45 - Soldier beetle.

Figure 46 - Mating soldier beetles.
CHECKERED BEETLES

ORDER: COLEOPTERA (*koleos*=sheath, *pteryx*=wing, refers to hardened front wings which cover membranous hind pair)

Family: Cleridae

IMPORTANT: Both adults and larvae are predaceous. Important in suppressing bark beetle populations. Some scavengers. Few species also feed on flower pollen and nectar. One pest species on stored meat.


BIOLOGY: Diurnal. Very active. Larvae may develop inside grasshopper egg pods. Pupate at base of tree. Overwinter as larvae, pupae or adults. Holometabolous development (complete metamorphosis: larvae do not resemble adults, 4 life stages include egg, larva, pupa and adult). Some use pheromones of bark beetles to find them.

FOOD SOURCE: Adults: wood- and bark-boring insects, sometimes pollen and nectar. Larvae: wood- and bark-boring beetle larvae and pupae, sometimes bee and wasp larvae and grasshopper egg pods. *Enoclerus schaefferi* feeds on cone insect pests (including Douglas-fir cone moth and *Cydia* sp. seed moths) on true fir, Douglas-fir, pine and spruce. Adults and larvae use bark beetles sex pheromones to locate prey.

SEASONAL OCCURRENCE: (Adults):

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MONITORING:
Methods - Branch beatings, light trap, sweep net, visual inspection of habitats. Habitats - Adults: wooded areas, on foliage of woody plants, on or under bark of dying trees or recently killed trees, near bark beetle infested trees. Sometimes associated with carrion. Larvae: under bark.

CONSERVATION:
Pesticide Use - Use pesticides only as a last resort.

RECOMMENDED READINGS: 50, 87, 135
CHECKERED BEETLES

DESCRIPTION

**Adults** 5-12 mm. Small to medium, elongate, slightly-flattened, cylindrical, soft-bodied, brightly coloured with blue, green, red, brown or pink (may be checkered). Few species black or brown, may have grey marks. Some with red abdomen. Forest species dark-coloured with whitish-grey checkers, large, wide head with bulging eyes, short, clubbed antennae, covered with long bristles, strong-legged, fast-moving (Fig. 47).

**Imatures** 9-14 mm. Slender, cylindrical, slightly flattened larvae, white when young, turning pink, then purple or blue when mature. Hairy, lightly sclerotized with a pair of abdominal hooks (Fig. 48).

Figure 47 - Mating checkered beetles.

Figure 48 - Checkered beetle larva.
LADYBIRD BEETLES

ORDER: COLEOPTERA (koleos=sheath, pteryx=wing, refers to hardened front wings which cover membranous hind pair)
Family: Coccinellidae

IMPORTANCE Predaceous adults and larvae help control orchard insect pests. Scymnus (Pullus) impexus Mulsant and Aphiucta obliterata (L.) were introduced from Europe to British Columbia, Washington and Oregon to control balsam woolly adelgid and successfully established, but adequate control not achieved. Several species commonly purchased for greenhouse pest control. Not recommended for outdoors unless release is community wide. ‘Ladybird’ name derived from middle ages dedication to ‘Our Lady’ in appreciation for natural pest control obtained on grapevines.

Canada: 162 spp. (includes subspecies).

BIOLOGY Diurnal. Clusters of 3-300 eggs laid near aphid colonies in early spring, several hundred eggs laid per lifetime. Lifespan: 1 year. Egg hatch: 5-8 days. Larvar (4 instars): several weeks, last one attaches to foliage to pupate for 7-10 days. Adults: 1-2 months, feed throughout fall, lay eggs and die, or disperse under shelter, emerging in spring to feed, lay eggs and die. Mates in spring and summer. 2-3 generations per year. Holometabolous development (complete metamorphosis: larvae do not resemble adults, 4 life stages include egg, larva, pupa and adult). Adults reflex bleed (toxic fluid oozes from leg joints to deter predators or trap enemies).

FOOD SOURCE Aphids (larvae: 3-600, adults: 23000), adelgids, scales (e.g. pine needle scale, oystershell scale), mites, mealybugs. When prey is scarce will feed on insect eggs, small moth larvae, immature plant bugs, aphid honeydew, or siblings.

SEASONAL OCCURRENCE:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

MONITORING Methods - Branch beatings, malaise trap, sweep net.

Habitats - Adults: vegetation infested with aphids, adelgids, scales, mites or mealybugs. Under loose bark or leaf litter (in winter). Larvae: in aphid colonies.

CONSERVATION Attractants - Encourage pollen or nectar flowers such as alfalfa, angelica, California coffeeberry, camphorweed, evergreen euonymus, goldenrod, Mexican tea, morning-glory, oleander, ragweed, soapbark tree. Extrafloral nectaries may be provided.

Mowing - Leave weeds such as dandelions, wild carrot and yarrow between rows.
Pesticide Toxicities - More tolerant than other predators. Ultra-low volume applications are safer than conventional sprays.

High: azinphos-methyl (Guthion™), Bacillus thuringiensis (B.t.) (Bitoxibacillin™, Ecotoxin™), BHC, carbaryl, carbofuran, carbophenothion, cryolite, demeton, diazinon, dicrotophos, dimethoate, endosulfan, endrin, dioxathion (Deltam™), ethion, fenithion, fenvalerate (Sumicidin™), formetanate, lindane, malathion, malathion + oil, methoxychlor, methylparathion, mevinphos, mexitacarb (Zctran™), naled, oxfemeton-methyl (Metasystox-R™), parathion, parathion + oil, permethrin (Ambush™), phosphamidon, rotenone, sulphur.

Low to Moderate: aldrin, B.t. (Entobacterin™), nicotine (Nicotine Sulfate™), trichlorfon.
Safe: aldicarb, B.t. (Dipel 4L™, Thuricide™), endosulfan (eggs), monocrotophos, NPV, phosalone, phosmet, pirimicarb (Pirimor™), tetradifon.

RECOMMENDED READINGS: 63, 87, 97
DESCRIPTION

**Adults 4-10 mm.** Oval to round, flat-bottomed, shiny, usually red or orange with black dorsal spots or marks, some solid black or black with red spots (bright colours warn predators of unpleasant taste). Short, clubbed antennae, hard outer wings cover membranous flying wings, highly mobile (Fig. 49). Feign death by pulling short legs under body.

**Eggs** Elongate, upright, yellowish-orange, spindle-shaped (Fig. 50).

**Immatures 1-15 mm.** Very active, elongate, slightly-flattened, soft-bodied, alligator-like larvae, with warts or spines. Dark with bright-coloured spots or bands, well-developed legs (Fig. 51), some with fragile hairs which release repellent liquid when broken.

**Pupae** Resemble bird droppings, one end attached to foliage (Fig. 52).