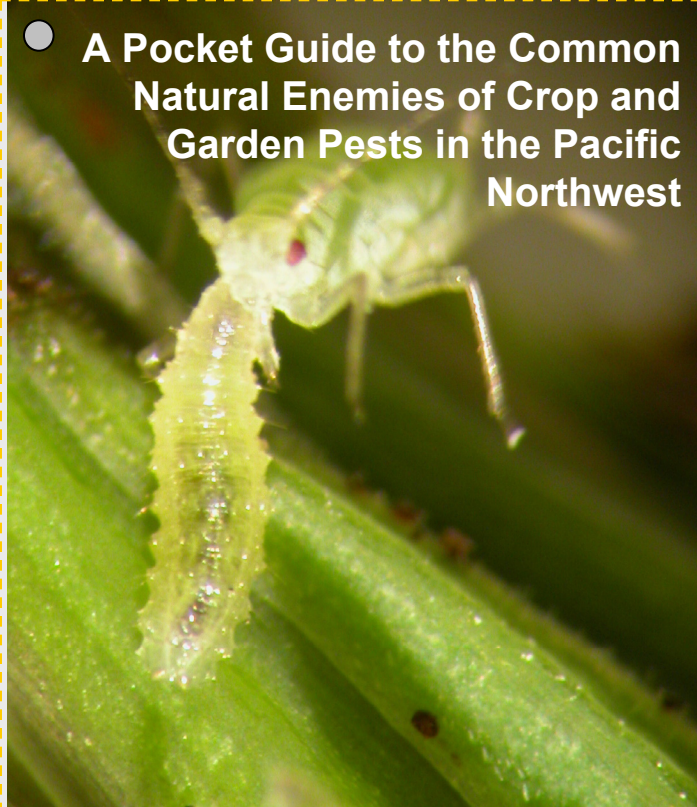


A Pocket Guide to the Common Natural Enemies of Crop and Garden Pests in the Pacific Northwest



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Using this Guide

The cards in this guide are designed to help the user quickly learn the main groups of natural enemies, their predacious activity, and tips for observing them. Photographs are of the most common species in this region.

This guide should be used as a field supplement to other publications that provide more detail on how to scout for and manage specific pests and natural enemies:

Each sheet can be printed on regular paper or cardstock & turned into pocket-sized cards by folding along the central horizontal line and then cutting on the dotted orange lines to trim into three 2-sided cards (laminare if needed).

Most photographs from the Ken Gray collection.

Questions & comments can be directed to:

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Biological Control

After the relative amounts of pests and natural enemies are determined with preliminary monitoring, a number of tactics can be used to enhance biological control and be integrated into an IPM program:

1. Protecting natural enemies from disturbances such as pesticides, other management practices, their own natural enemies (eg. ants), or adverse environmental conditions.
2. Providing supplementary nectar or pollen sources, alternate hosts, or shelter.
3. Manipulating the behaviors of natural enemies with food sprays, kairomones, or plant structure and arrangement.
4. Augmenting natural enemy populations with mass releases of lab-reared individuals.
5. Introducing natural enemies that are totally absent from an area.

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General Observation Tips

1. When doing visual counts, also inspect the underside of leaves
2. Approach fast-moving insects slowly, or use nets, beating trays and traps for these to get a closer look

Distinguishing Natural Enemies from Plant Pests in General

1. Spend a few extra seconds or minutes observing the specimen to see if it feeds on animals or plants
2. To see if a particular natural enemy attacks a target pest species, place them together in an enclosed environment that allows both animals room to move

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Lady Beetles

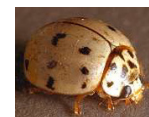
(Coleoptera: Coccinellidae)

Identification

Adults orange to red with black spots, or mostly black, larvae longer, eggs in clusters



Coccinella novemnotata



Olla abdominalis



Hippodamia convergens



eggs



Adalia bipunctata



larva

1/8 - 1/3"

Observation Tips

All stages found on plants

Predacious Activity

Adults & larvae prey on aphids, scale insects, mites, and other small insects

Similar Beetles



Chrysomelid beetles

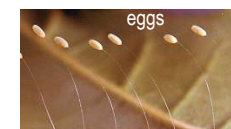
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Green & Brown Lacewings

(Neuroptera: Chrysopidae & Hemerobiidae)

Identification

Light green or brown, large wings, long antennae, larvae flat with long mouthparts, eggs on stalks



eggs



larva



Green lacewings, eg. *Chrysopa californica*

Observation Tips

Adults often seen flying or on plants, eggs & larvae on plants

Predacious Activity

Larvae & adults mostly prey on aphids, mealybugs, and other small insects



Brown lacewings, eg. *Hemerobius spp.*

1/2 - 3/4"

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Predacious Hoverflies

(Diptera: Syrphidae)

Identification 1/4 - 3/4"

Adults are mimics of wasps & bees, but fly more quickly or hover, often with yellow markings, larvae maggotlike, eggs small, whitish and oblong

Observation Tips

Eggs, larvae, and tar-like excrement are found at aphid colonies, adults mostly found on or hovering at flowers

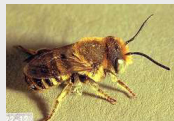
Predacious Activity

Larvae prey mostly on aphids & scale insects, adults obligate flower feeders, some species not predacious

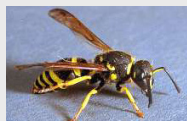
Other Insects Confused with Hoverflies



bee flies



small bees



small wasps

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Parasitoid Tachinid Flies

(Diptera: Tachinidae)

Identification 1/3 - 2/3"

Adults similar to houseflies, but with very long bristles on tail end, puparia red to brown & oblong, larvae inside host, eggs white & oblong on host

Parasitic Activity

Important endoparasitoids of many worm, beetle, sawfly and bug pests, can increase populations rapidly

Observation Tips

Adults seen on flowers, look for eggs on host, puparia near host

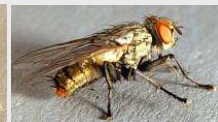
Flies Commonly Confused with Tachinids



house flies



blow flies



flesh flies

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Ground or 'Carabid' Beetles

(Coleoptera: Carabidae)

Identification

Adults are dark or metallic with ridged wing covers, larvae grublike with large mandibles

Observation Tips

Adults mostly active at night. Look for fast running adults under objects on soil surface or in soil samples, larvae in soil samples

Predacious Activity

Prey mostly on soil organisms, some others feed on seeds

Other Beetles Confused with Carabids



Tenebrionid beetles



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Rove Beetles

(Coleoptera: Staphylinidae)



Leptacinus batychrus

1/8 - 1/3"

Identification

Adults small with short wing covers not covering abdomen

Predacious Activity

Prey mostly on small soil organisms

Observation Tips

Adults mostly active at night. Look for fast running adults under objects on soil surface or in soil samples

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Damsel or 'Nabid' Bugs

(Hemiptera: Nabidae)

Identification 1/3 - 1/2"

Adults & nymphs long and thin with front legs slightly enlarged for grabbing prey

Observation Tips

Most commonly found running on low, dense vegetation

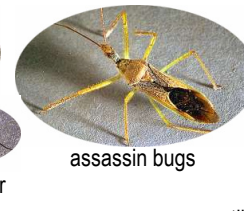
Predacious Activity

Adults and nymphs prey on other insects in same habitat

Other Bugs Confused with Nabid Bugs



some of the thinner Mirid bugs



assassin bugs



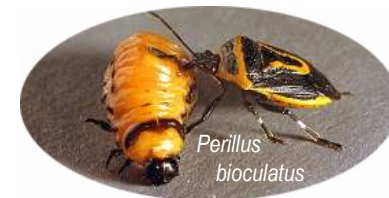
stilt bugs

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Predacious Stink Bugs

(Hemiptera: Pentatomidae)



Perillus bioculatus

Identification 1/3 - 2/3"

Adults & nymphs have a broad pentagon or shield shape. Usually brown or grey rather than green

Observation Tips

Found on vegetation, may have to observe activity to determine if the species is predacious or herbivorous

Predacious Activity

Adults and nymphs prey on other insects in same habitat



Brochymena sp. nymph

Similar-looking Herbivorous Stink Bugs



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Minute Pirate Bug

(Hemiptera: Anthocoridae)



Identification < 1/8"

Adults with a black & white cross pattern, larvae orange to dark red

Predacious Activity

Adults and nymphs prey on other small insects in same habitat

Observation Tips

Found on vegetation and flowers, more easily monitored with nets or beating trays due to small size

Other Similar-looking Small Bugs



big-eyed bug nymphs



chinch bugs



some plant bug nymphs

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Big-eyed Bugs

(Hemiptera: Lygaeidae)



Geocoris pallens



Identification < 3/16"

Adults and nymphs with big eyes, fast-moving and slightly larger than minute pirate bugs



Observation Tips

Found on vegetation or the ground, more easily monitored with nets or beating trays due to speedy flight & size

Predacious Activity

Adults and nymphs prey on other small insects in same habitat

Other Similar-looking Small Bugs



chinch bugs



some plant bug nymphs



minute pirate bugs

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Assassin Bugs

1/3 - 1"

(Hemiptera: Reduviidae)

Identification

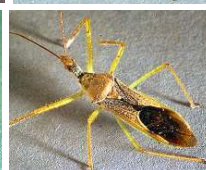
Adults & nymphs resemble damsel bugs, but larger, with a wider abdomen, thinner neck and often with spines

Predacious Activity

Adults and nymphs prey on many types of insects in same habitat

Observation Tips

Found on vegetation and flowers



nymph



nymph

Other Bugs Confused with Assassin Bugs



damsel bugs



ambush bugs



stilt bugs

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Ambush Bugs

(Hemiptera: Phymatidae)

Identification 1/3 - 2/3"

Adults and nymphs are often camouflaged like leaves & flowers to ambush prey

Observation Tips

Found on flowers and vegetation

Predacious Activity

Adults and nymphs prey on other insects in same habitat



Phymata metcalfi



nymph

Similar-looking Bugs



assassin bugs



leaf-footed bugs



alydid bugs

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Tiger Beetles

(Coleoptera: Cicindellidae)

Identification 1/2 - 2/3"

Adults shiny with large eyes & mandibles, very fast runners and flyers

Observation Tips

Adults usually seen flying over & running on light & sandy soils

Predacious Activity

Adults & larvae prey many types of insects in the same habitat



Cicindela oregona



Cicindela longilabrus columbiana

Similar Beetles



soft-winged flower beetles



ground beetles

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Soldier Beetles

(Coleoptera: Cantharidae)

Identification 1/2 - 1"

Adults are long and thin with long antennae, often with red or orange markings

Observation Tips

Found on leaves and flowers

Predacious Activity

Adults prey on other insects in same habitat



Cantharis sp.



Podabrus cavicollus

Podabrus sp.



Podabrus pruinus

Similar Types of Beetles



soft-winged flower beetles



'fireflies'

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Any comments or questions regarding the content of this handbook are welcomed and can be directed to the author:

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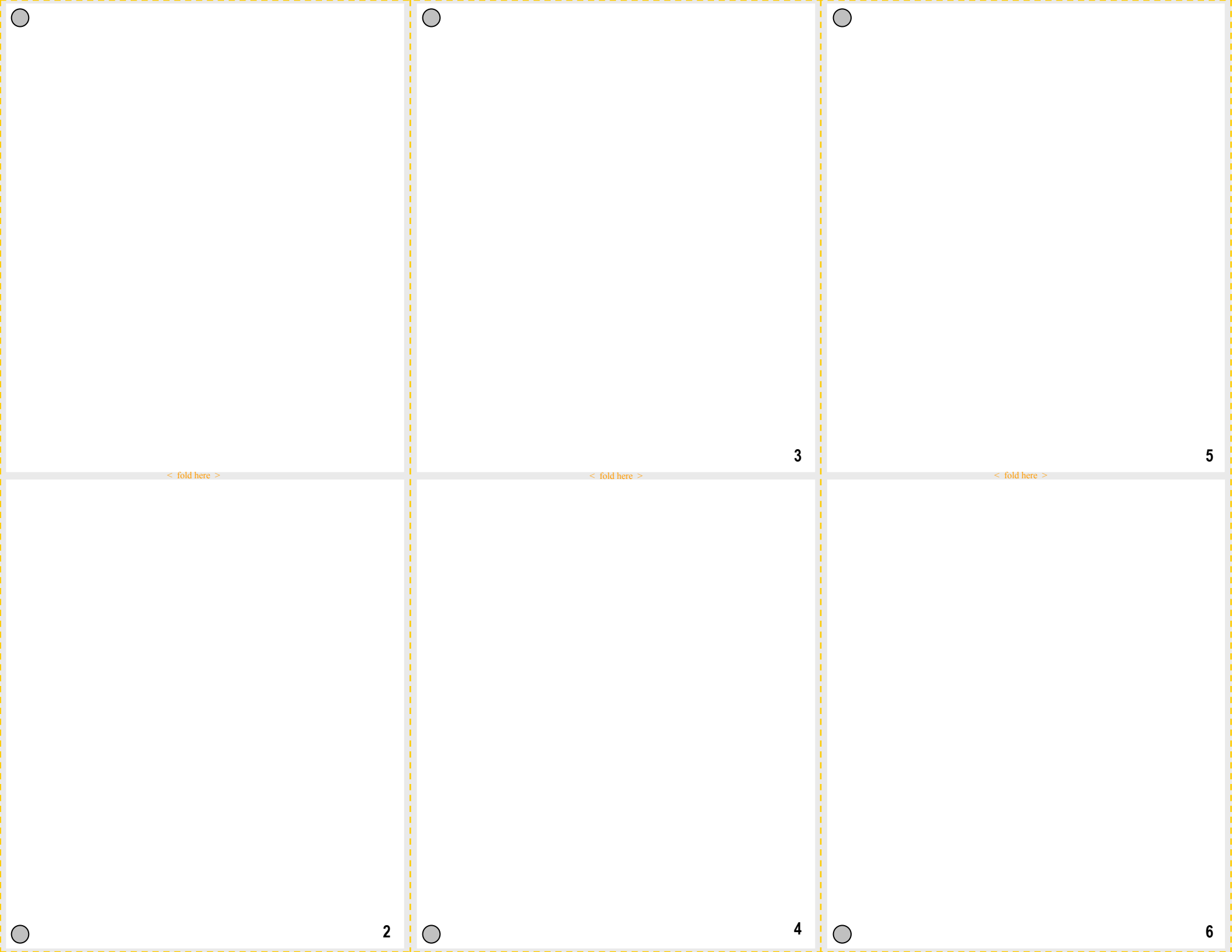
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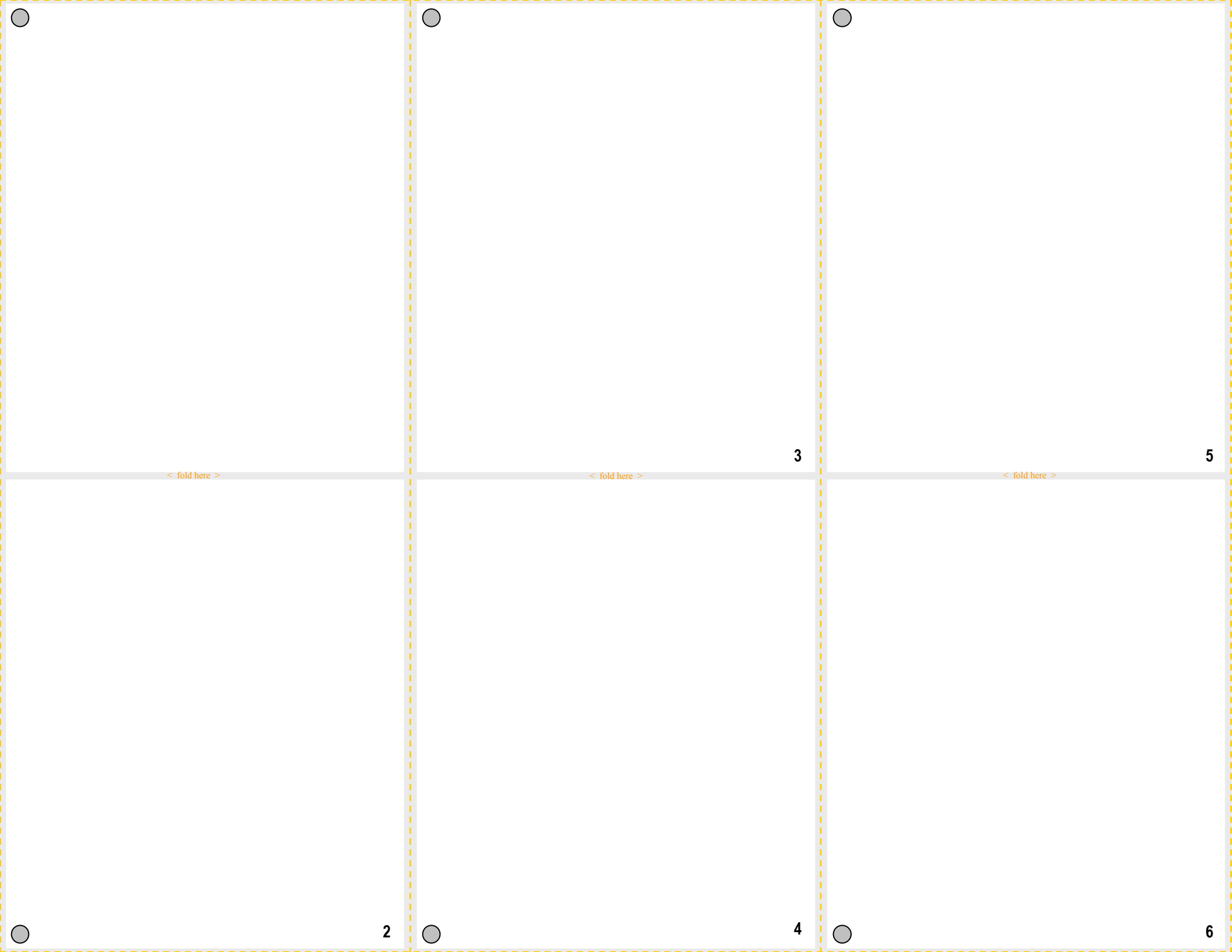
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