

# Life-history Traits of Armored Scales (Diaspididae) & Soft Scales (Coccidae, Eriococcidae)

## List of Families & Life History

Life-history Traits	Armored Scale	Soft Scale
Soft cover attached to the scale insect?	no	yes
Eggs laid in sac-like structure?	yes	yes
Overwintering stage	eggs or mated female	mated female or second instar
Seasonal time for crawlers	late April thru early July	April thru August
Ability to move after crawler?	no	limited movement from stageleaves in summer to twigs for the winter
Honeydew production?	no	abundant
Feeding site on the plant	cells of parenchyma beneath the scale	phloem
Species/Common Names	black pineleaf scale	calico scale
	euonymus scale	cottony maple scale
	gloomy scale	European fruit lecanium scale
	juniper scale	Fletcher scale
	obscure scale	pine tortoise scale
	oystershell scale	spruce bud scale
	pine needle scale	tuliptree scale
	scurfy scale	European elm scale (Eriococcidae)
elm scurfy scale		

**Chemical control:** Controlling scales is best achieved by targeting the crawler stage. Crawlers vary in color depending on species, pale red, yellow, or light brown, and are usually the size of a spider mite, so you will need a hand lens to see them.

Each species has its own particular time when crawlers emerge. Some scales have more than one generation. Crawlers of some armored scales are active in May, while crawlers of many soft scales emerge a few weeks later. However, there are exceptions. For example, magnolia scale crawlers (soft scale) hatch in late summer and early fall, while eggs of juniper scale and euonymus scale (armored scales) hatch in early and mid June, respectively in the Upper Midwest. Some scales have two (e.g. eastern strains of pine needle scale, Fletcher scale) or more (e.g. euonymus scale, San Jose scale) generations each year, depending on location. A good

monitoring program is critical for determining the period of crawler activity. Degree day or phenological models provide a seasonal period for monitoring insect populations and timing insecticide application (see chapter 11 by Dan Herms).

Monitor scale crawler emergence on individual trees by examining twigs, by tapping a branch over a white sheet of paper, or by applying two-sided tape to branches and examining the tape for crawlers at least weekly during the period when crawlers are expected.

Armored scales need to be controlled as crawlers before their waxy cover is produced. This cover protects them from contact insecticides. Only soft scales, not armored scales, produce honeydew, a sugary fluid on which a fungus, sooty mold grows. The black fungus often obscures the female scales beneath. Soft scales can be controlled as crawlers and immatures. Imidacloprid, a systemic insecticide, only controls soft scales. Timing pesticide application to the crawler stage is very important. Inappropriate timing is not only ineffective but may be counterproductive. Both armored and soft scales are usually noticed when mature females are present which is not the appropriate time to spray insecticides. Usually the predators and parasitoids (beneficial insects) attacking the scales are killed, while the females are protected beneath their covers. Improper insecticide timing results in poor control, wasted insecticide, and mortality of beneficial insects. Once beneficials are killed, it may take many years for their numbers to increase to the level providing control.

**Conservation of beneficial insects:** Use short duration, low residual insecticides, such as horticultural oil, insecticidal soap, insect growth regulators (IGR), and pyrethrins.

**Foliar applied broad spectrum insecticides, such as acephate, carbaryl, imidacloprid, and pyrethroids:** Use only when scale populations are high to rescue trees; beneficial insects will be also killed.

**Dormant season oil treatments:** Use for scales that winter as immatures, such as many soft scales; not for armored scales that winter as eggs under female cover.

**Summer oil treatment:** Oil smothers exposed eggs, crawlers, and immature females. Insect growth regulators (IGR), such as pyriproxifen and Instar II: Use for crawlers as it disrupts molting.

**Soil applied systemic insecticides or trunk injections, such as imidacloprid:** Apply in fall for crawlers in spring; not effective against armored scales which feed at different sites than soft scales. Less harmful to beneficial insects than foliar applied broad spectrum insecticides.

**Biological control:** Common soft scale predators are minute pirate bugs, lacewings, lady beetles, and predaceous midges. Common parasitoids are from the genera Aphytis, Coccophagus, and Metaphycus. The English sparrow will feed on scales.

**Plant mortality risk:** Medium

**Biorational pesticides:** horticultural oil, insecticidal soap, pyriproxifen

**Conventional pesticides:** acephate, bifenthrin, carbaryl, chlorpyrifos (nursery only), deltamethrin, lambda cyhalothrin, imidacloprid, malathion, permethrin