



ScienceWatch – House Finch Adaptability 2: The First Shall Be Last and the Last Shall Be First

Four years ago I summarized a study on house finch (*Carpodacus mexicanus*) adaptability led by Alexander Badyaev, an evolutionary ecologist, at Auburn University in Alabama- see – *ScienceWatch - House Finch Adaptability: Mother Knows Best!* (September 2002).

Badyaev and colleagues showed that female finches control the laying order of their male and female eggs, and adjust it in response to environmental conditions.

The two finch populations they studied, one in Montana, the other in Alabama, have completely opposite egg laying orders. In Montana first-laid eggs produce mostly females, while last-laid eggs yield mostly males. In Alabama the sex ratio with respect to hatching is completely reversed. In Alabama these differences result in males that are larger, have wider bills and longer tails than females. By contrast, in Montana females grow faster than males and are bigger. Larger females are more fecund, which Badyaev speculated was important for the expanding Montana population. In the moist Alabama climate, however, males succumb more readily to disease and parasites, so larger more robust males are favored there. By altering their egg-laying strategy to accommodate these contrasting climatic conditions, breeding females reduce fledging mortality by 10% - 20%. These types of adaptations, Badyaev concluded, have enabled the house finch to spread across the country.

Badyaev has since moved to the University of Arizona where he continues to study house finches. Writing in the September 26, 2006 issue of the *Proceedings of the National Academy of Sciences*, he and his colleagues now show that a single population of finches, exhibiting no sex-biased egg laying under parasite-free conditions, will revert to a sex-biased laying order to enhance survival when nests are infested with parasites.

In southwestern Arizona, house finches breeding in late winter rarely encounter nest ectoparasites; however, when the birds breed again in late spring they are often heavily infested with a blood-sucking nest mite (*Pellonyssus reedi*). The mites increase with hatchling age and reach a maximum at nine days (fledging occurs at about 15 days). The team studied a resident population in southwestern Arizona during the 2002 season. They marked eggs to determine laying order, banded chicks, measured tarsus (leg) length to determine growth, and counted mites on chicks every second day.

When mites are absent, the team found that longer time in the nest (i.e., first-laid eggs) prompted greater survival to fledging for both sexes, with females benefiting most. Under these conditions there was no sex bias in egg-laying order. However, when mites are present, longer nest time decreases hatchling survival, especially for males. In apparent response to the mites, the team found a strong sex bias in egg-laying. Early-hatched eggs are predominantly females, while late-hatched eggs are males. By changing their egg-laying strategy breeding females significantly shorten the time of mite exposure for the more sensitive males and increase it for the more resistant female chicks.

Although mite exposure increased chick mortality for both males and females, overall mortality in the sex-biased clutches, where males hatched last, was significantly lower (10% - 12%) than clutches with no sex bias.

These results show that house finches can make reversible sex-biased adjustments in laying order that favorably affect growth and survival of their offspring. Badyaev believes that exposure of breeding females to mites before egg-laying may induce them to cluster eggs of the same sex in their ovaries and provide each with the appropriate hormone, testosterone or estrogen, to promote growth and survival. But how females can tell one egg from another one remains a mystery. Whatever the mechanism is we now have a greater insight into how the house finch, once indigenous to the deserts of California and the southwest U.S., has spread across the country.*

Saul Scheinbach

*House finches are an invasive species east of the Rockies. Their spread in the East began in 1939 when pet store owners on Long Island released their stocks of "Hollywood" finches after raids by the U.S Fish & Wildlife Service.