

Quality, not quantity, of diet is key to health of baby birds

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Tree swallow. Credit: Lily Twining/Provided

In a new study that upends the way ornithologists think about a young

bird's diet – but won't shock parents used to scanning the nutritional profile of their children's food – Cornell researchers have found that when it comes to what chicks eat, quality trumps quantity.

In recent decades, many aerial insectivores, such as tree swallows, have undergone steep population declines. Cornell researchers have demonstrated for the first time that the fatty acid composition in the tree swallow diet plays a key role in chick health and survival rates, potentially pointing to new ways to protect fragile bird species.

"This study really reforms the way ecologists see the [food](#) of wild animals," said senior author David Winkler, professor of ecology and evolutionary biology in the College of Agriculture and Life Sciences. "From a preoccupation with how much food is available, we need to turn our eyes to what kind of food is available."

For the study, researchers manipulated the ratio of long-chain omega-3 fatty acids [the good fat present in fish oil] to short-chain omega-3 fatty acids [the good fat in flax seeds] as well as the amount of food. Chicks given diets rich in long-chain omega-3 polyunsaturated fatty acids (LCPUFA) grew faster, were in better condition, exhibited stronger metabolisms and had more active immune systems compared with chicks on a low LCPUFA diet.

The researchers found that chicks had higher growth rates and better body condition when they were fed a small amount of high-quality food than if they were fed a large amount of low-quality food.

In addition, chicks fed a small amount of high-quality food had similar immune responses and metabolic rates as those fed a large amount of low-quality food.

In the wild, tree swallows and other aerial insectivores typically forage

on a mixture of aquatic and terrestrial insects. Aquatic insects are much richer in LCPUFA than insects that live on land.

"We found that aquatic insects are likely a far more important food source than previously thought due to their high-quality fats," said lead author Lily Twining, a doctoral student in the field of ecology and evolutionary biology. "The destruction and degradation of aquatic habitats that produce insects with long-chain [omega-3 fatty acids](#) may be having important negative impacts on tree swallows and other declining aerial insectivores.

"This study provides new clues into how nutrition and food webs impact the decline of prominent species, and provides further incentive to protect freshwater habitats not only for aquatic animals like fish, but also for terrestrial animals like the songbirds in our study," she added.

Tree swallow populations have declined 36 percent in the past three decades, a circumstance explained at times by reduced insect populations, ecological fragmentation and the effects of climate change. Other North American aerial insectivores – like nighthawks and chimney swifts – have also undergone similar major disruptions in populations.

This study suggests that the mismatch between the fatty acid composition of insects and the nutritional needs of aerial insectivores could be a crucial driver of fitness and reproductive potential for these birds.

Furthermore, the researchers said [tree swallows](#) may be timing breeding to coincide with the peak abundance of high-LCPUFA [aquatic insects](#).

The paper published Sept. 16 in the *Proceedings of the National Academy of Sciences*.

More information: Cornelia W. Twining et al. Omega-3 long-chain polyunsaturated fatty acids support aerial insectivore performance more than food quantity, *Proceedings of the National Academy of Sciences* (2016). [DOI: 10.1073/pnas.1603998113](https://doi.org/10.1073/pnas.1603998113)

Provided by Cornell University

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