Could a salamander forage inside your refrigerator?

The behavior and physiology of many animals (e.g., insects, amphibians and reptiles) can be greatly affected by changes in body temperature. For example, low temperature can reduce energy intake via effects on foraging behavior. Many insects and reptiles can offset such effects by choosing among thermally-diverse microhabitats to maintain body temperature within an optimal range. However, many amphibians occupy environments that do not allow them to control body temperature. Thus, the ability to minimize the effect of low temperature on feeding would provide a selective advantage for individuals. Adaptations allow some plethodontid salamanders (i.e., in the family Plethodontidae) to continue feeding at lower temperatures than other animals. For example, the quick release of energy stored in elastic tissue allows rapid tongue projection for prey capture below 5°C in some salamanders.

Spotted Dusky Salamander photograph from Project Noah (www.projectnoah.org)

The effect of low temperature on feeding in plethodontid salamanders of the genus *Desmognathus* (i.e., Dusky Salamanders) has been inferred from field studies of changes in activity and gut contents at different seasons. Because field studies could not determine whether feeding is more dependent on thermal conditions influencing salamander behavior or prey availability and movement, we examined the effect of short-term low temperature on feeding under controlled conditions in the lab. We performed two experiments to determine the effect of low temperature on predatory behavior and prey-capture efficiency in Spotted Dusky Salamanders (*Desmognathus conanti*), which live in seeps and streams of the south-central United States. These salamanders are ambush, generalist predators that mainly eat small, semiaquatic and terrestrial invertebrate animals. Our observations indicate that typical predatory behavior consists of turning the head toward moving prey, very slow movement toward the prey (i.e., prey stalking) until it is within capture distance (i.e., about ½ inch), and then capture of the prey with the tongue and jaws. Often during stalking, the salamander jumps toward the prey just before capture to quickly travel the remaining distance.

In the first experiment, we observed variation in the feeding responses of cold salamanders (at 1, 3, 5 and 7°C) to a video recording of a walking, warm (15°C) cricket to determine the low-temperature limit for predatory behavior. By using a video recording as the prey visual stimulus in all feeding trials, we kept the stimulus exactly the same. This technique enabled us to determine the effect of temperature on feeding behavior independent of any potential temperature effect on prey movement. Salamanders exhibited vigorous feeding responses at 5 and 7°C, large variation in feeding responses both among and within individuals (over time) at 3°C, and little to no feeding response at 1°C. Mean feeding responses at both 1 and 3°C were significantly less than at each higher temperature.

In the second experiment, we quantified feeding by cold salamanders (at 3, 5, 7 and 11°C) on live, warm crickets to examine thermal effects on prey-capture ability. The mean feeding response to live crickets was significantly less at 3°C than at higher temperatures, however 50% of salamanders captured and ingested prey with high efficiency at this temperature. We conclude that many individuals stalk and capture prey at very low temperatures (down to 3°C). Our results support a growing body of data that indicate many plethodontid salamanders feed at temperatures only a few degrees above freezing.

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Publication

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