Reproductive Strategies and Adaptive Evolution of Japanese Newts

Okubo, Ami (School: Yamawaki Senior High School)

Most species of newts in the genus Cynops live in southern China, while two species in Japan. One Japanese species is the Japanese fire-bellied newt (Cynops pyrrhogaster), which is the northernmost species in the genus and lives on the main islands of Japan. The other is the Sword-tail newt (Cynops ensicauda), which lives on the Nansei Islands at the same latitude as southern China, and is thought to have a Reproductive ecology similar to that of Chinese newts. Last year, our group compared the breeding seasons of Sword-tailed newt with those of the Japanese fire-bellied newt by examining the annual changes in their reproductive organs. Using data and temperature-based spawning induction experiments, I investigated why Japanese fire-bellied newt developed a unique reproductive ecology. Females store sperm in the spermatheca and the egg is fertilized in the cloaca. Thus, females with fertilized eggs have both mature eggs and viable sperm. If a female is hormone-induced to lay eggs without male contact after sperm storage, fertilized egg production determines breeding timing. Spawning experiments showed that females collected during the breeding season could maintain sperm viability for over seven months at low temperatures. Mating and spawning were observed in adults kept at 23 °C for over five years, even outside the believed breeding season. My research suggests that the Japanese fire-bellied newt has adapted to its northernmost range by storing sperm in the fall, maintaining its fertilization ability over winter, and laying eggs in response to rising spring temperatures.

Awards Won: