

# Predation on a metamorphosing tadpole of the American bullfrog, *Aquarana catesbeiana* (Shaw, 1802), by the fishing spider *Dolomedes sulfureus* in the Republic of Korea

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The American Bullfrog, *Aquarana catesbeiana* (Shaw, 1802), is one of the most destructive invasive species worldwide (Lowe et al., 2000; Jancowski and Orchard, 2013). *Aquarana catesbeiana* has adapted to various local environmental conditions in over 40 countries (Ficetola et al., 2007; Jancowski and Orchard, 2013) and caused severe damage to native ecosystems by acting as voracious predators, competitors for prey, and carriers of infectious pathogens (Kupferberg, 1996; Park et al., 2018; Roh et al., 2022). In the 1950s and 1970s, *A. catesbeiana* was intentionally introduced to the Republic of Korea from Japan for commercial frog farming, and subsequently this species has spread across the country via intentional release and accidental escape from farms (Kim, 1971; Park et al., 2018; Groffen et al., 2019). Due to the ecological disturbances caused by *A. catesbeiana* in the Republic of Korea, many studies have been conducted to improve effective capture methods and management plans for this species (No et al., 2017; Groffen et al., 2019). Therefore, understanding the ecological niche of *A. catesbeiana* in the Korean ecosystem should be prioritized but, little is still known about its endemic predators. Here, we report an observation of a newly recorded native predator of this invasive species in the Republic of Korea.

The observation was made on 28 July 2023 at 12:38 h in Shinan, Republic of Korea (35.0940°N, 126.1049°E, elevation 6 m). We observed a fishing spider, *Dolomedes sulfureus*, feeding on a metamorphosing tadpole of *A. catesbeiana* within a concrete ditch adjacent to an artificial pond (Fig. 1A–C). The spider bit the tadpole

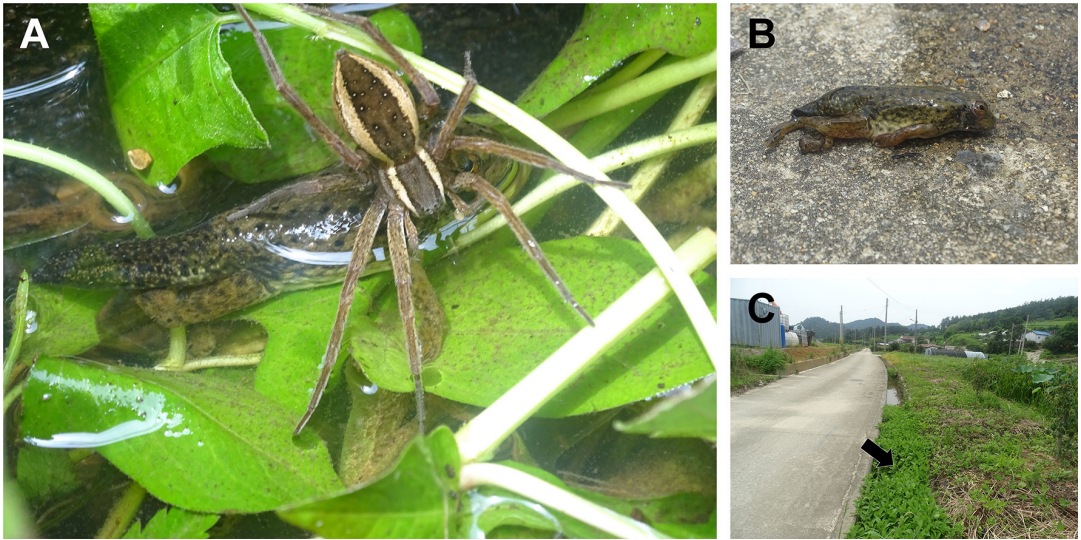
behind its right eye while placing it on an aquatic plant (*Persicaria thunbergii*), which grows in the ditch. The Gosner stage of the tadpole was 44 (Gosner, 1960). The tadpole had a reduced tail, with already developed forelimbs and hindlimbs.

Although native fish species (e.g., *Channa argus*) are known to be predators of *A. catesbeiana* in the Republic of Korea (No et al., 2017), this is the first record of predation of *A. catesbeiana* by a spider species in the country. The *A. catesbeiana* tadpole observed was undergoing metamorphosis. At this Gosner stage, the tadpoles have emerging forelimbs and show reduced activity in aquatic environments, thus, the risk of predation by terrestrial predators is enhanced (Wassersug and Sperry, 1977; Touchon et al., 2013). As fishing spiders predate on frogs that are undergoing or have just completed metamorphosis (Vonesh, 2005), we assume that other fishing spiders in the Republic of Korea (e.g., *D. raptor*) could also consume metamorphosing tadpoles and juveniles of *A. catesbeiana*. Additionally, our observations show an inversion of the typical predator-prey relationship between *D. sulfureus* and *A. catesbeiana*. In a previous dietary study conducted in the Republic of Korea, adult *A. catesbeiana* fed on *D. sulfureus* in a wetland (Park et al., 2018). Usually, ecological niches of amphibians shift owing to their biphasic life histories (Sih and Moore, 1993; Bissattini et al., 2019), which can result in differences in ecological interactions with sympatric species throughout the life stages of amphibians. This is a case of an organism, possibly, newly adapting to an invasive species, *A. catesbeiana*; previously, a similar shift was observed in the relationship between *A. catesbeiana* and water snakes (Heo et al., 2014). Spider predation on anurans is frequently reported from the Neotropics, whereas it is very rarely observed in temperate zones such as northern Asia (Menin et al., 2005; Nakajima, 2014; Nyffeler and Altig, 2020; Valdez, 2020). This is the first report on spider predation on any frog, especially *A. catesbeiana*, in the Republic of Korea.

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**Figure 1.** (A) Predation on a tadpole of the American Bullfrog, *Aquarana catesbeiana*, by the fishing spider *Dolomedes sulfureus*, observed on 28 July 2023 in Shinan, Republic of Korea. (B) The dead tadpole, showing that it was undergoing metamorphosis and had forelimbs, hindlimbs, and a reduced tail. (C) The concrete ditch covered by aquatic vegetation where the observation was made, with the specific area indicated by the black arrow. Photos by Il-Kook Park.

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