

## Predation of a waterfrog (genus *Pelophylax*) by the freshwater crab *Potamon fluviatile* in Sicily, Italy

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Palaearctic waterfrogs of the genus *Pelophylax* are widely distributed throughout Europe, Asia, and North Africa and are among the most widespread anurans in Eurasia (Dufresnes and Mazepa, 2020; Amin and Borzée, 2024; Dufresnes et al., 2024). Waterfrogs are prey to many vertebrates and invertebrates. The main predators of their larvae and eggs include fish (even small-sized species), natricid snakes, other amphibians (such as newts and frogs), and insects such as backswimmers, dragonflies, and diving beetles (Capula et al., 2007). Adult *Pelophylax*, on the other hand, are primarily preyed upon by vertebrates. These include birds (especially herons, storks, ibises, and rails and, to a lesser extent, owls and falcons), other frogs (including instances of cannibalism), reptiles (e.g., terrapins and natricid snakes), predatory fish (such as trout and pike), and mammals (including wild boars, mustelids, and brown rats) (Günther, 1990, 1996; Mastroianni et al., 2000; Capula et al., 2007; Díaz-Paniagua et al., 2007; Egea-Serrano, 2014).

Another group that includes generalist predators capable of preying on anurans at various life stages is decapod crustaceans, and numerous experimental studies have demonstrated the predation of anuran eggs and larvae by crayfish (e.g., Axelsson et al., 1997; Gherardi et al., 2001; Renai and Gherardi, 2004; Wilson and Williams, 2014; Chandler et al., 2016; Luong et al., 2024). Knowledge of predation by crabs is more limited and primarily based on isolated observations, although these include cases involving anurans at various life stages (e.g., Hayes, 1983; Gray and Christy, 2000; Tsuji, 2005; Affonso and Signorelli, 2011; Andrade et al., 2012;

Pyke et al., 2013; Pérez-Sorribes and Gil-Climent 2021; Sichieri et al., 2021; Abraham and Hutter, 2022; Christopoulos et al., 2024). To date, only two of these studies have addressed waterfrog predation by crabs. One involved a non-native marine crab (*Callinectes sapidus*) consuming an unidentified waterfrog species in Spain (Pérez-Sorribes and Gil-Climent, 2021), while the other documented a native freshwater crab (*Potamon karpathos*) preying on *Pelophylax ridibundus* (Pallas, 1771) in Greece (as *Pelophylax cerigensis*; Christopoulos et al., 2024).

In Italy, native *Pelophylax* occur from the Po Valley to Sicily and are currently ascribed to *P. lessonae* (Camerano, 1882) or the hybridogenetic *Pelophylax* kl. *esculentus*<sup>3</sup> (Bellati et al., 2023). Non-native taxa are also present in various mainland regions and in Sardinia, including *P. ridibundus* and *P. shqipericus* (as *P. kurtmuelleri* – Bisconti et al., 2019; as *P. bedriagae* – Bellati et al., 2019, 2023; Bruni et al., 2020; Di Nicola et al., 2022). However, there are no confirmed records of introduced *Pelophylax* species in Sicily. Since it is not always possible to base *Pelophylax* species identification on morphology and bioacoustics, molecular analyses are often required (Bellati et al., 2019).

In Sicily, waterfrogs are abundant and occupy a wide range of habitats across almost the entire main island, from coastal areas to elevations of up to 1770 m (Turrisi and Vaccaro, 1998; Lo Valvo et al., 2017), although they are absent from the smaller surrounding islands. Temporary habitats, such as puddles and seasonal ponds, are also colonised, but only in proximity to permanent water sources, which are critical for survival during dry periods (Lo Valvo et al., 2017). However, there is a lack of data regarding potential anthropogenic factors that could directly and negatively impact their populations,

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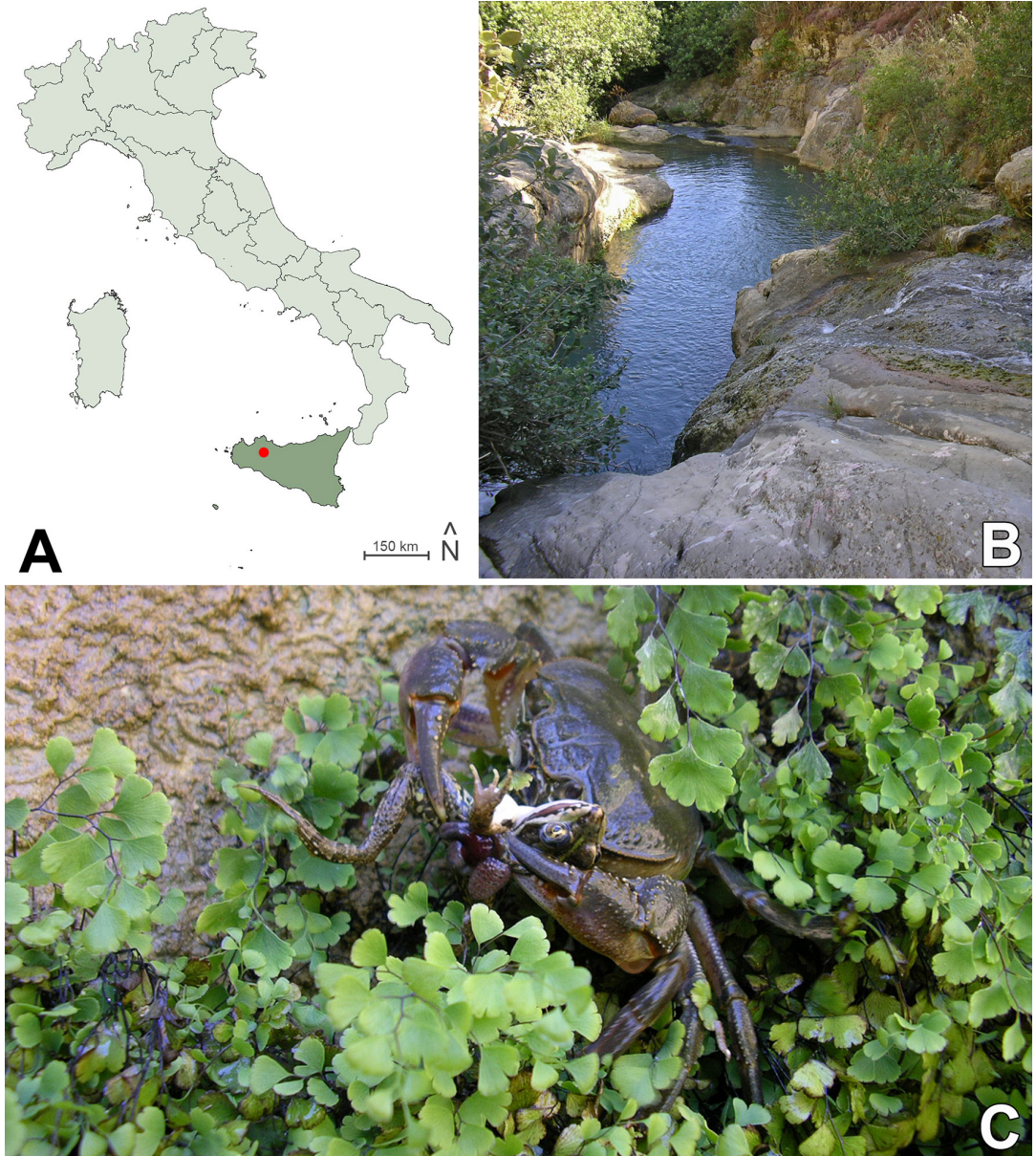
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<sup>3</sup> While *Rana esculenta* was described by Linnaeus (1758), this taxon has long been identified as a hybridogenetic associate (Berger, 1968). Each individual of "*P. esculenta*" is actually a hybrid with a composite genome derived from *P. lessonae* and *P. ridibundus*. Thus, these frogs should be considered a pattern class in the *P. ridibundus*-*P. lessonae* hybridogenetic complex.

apart from significant habitat changes (Lo Valvo et al., 2017). A potential threat is the presence of non-native fish species (Lanza et al., 2009), while one of the few documented threats is the introduced frog *Xenopus laevis* in a specific area of western Sicily (Lillo et al., 2011; Lo Valvo et al., 2017).

Since reports of poorly described trophic interactions (Barbo et al., 2009; Di Nicola et al., 2020) are important

for better understanding the biology of herpetofauna, we here report on the predation on a metamorphosed waterfrog by the freshwater crab *Potamon fluviatile* in Sicily, Italy. The observation occurred on 26 May 2020 at the gorges of the Frattina Stream (37.8620°N, 13.3029°E; elevation 372 m; Fig. 1). Weather conditions were partly cloudy, with a mean air temperature of 19°C (minimum 14°C, maximum 24°C).



**Figure 1.** (A) Map of Italy, with Sicily highlighted in darker green and the observation site marked by a red dot. (B) Habitat of the Frattina Torrent Gorge, Palermo, where the predation was recorded. (C) *Potamon fluviatile* preying on a waterfrog, genus *Pelophylax*.

The event took place in a shaded area near the streambank. The crab was observed feeding on the frog while it was still alive, firmly gripping the frog's left hind leg with its right claw and holding the back, just above the left foreleg, with its left claw. The interaction lasted several minutes, indicating the crab's capacity to capture and handle relatively large prey, and we moved away while it was still feeding to minimise interference. Hence, the animals were not captured, and it was not possible to determine their sex and size with certainty.

*Potamon fluviatile* is the only freshwater crab native to Italy, and it is widely distributed across Sicily, colonising rivers, streams, and vegetation-rich lakes at elevations ranging from 16–1200 m, primarily in areas with slow-moving water. Its presence on the island, likely established through natural dispersal during the Late Pleistocene, demonstrates remarkable resilience, although populations are increasingly threatened by pollution, habitat alteration, and other anthropogenic disturbances (Giacobbe and Restivo, 2014; Vecchioni et al., 2017, 2022).

Dietary studies on the closely related *Potamon algeriense* highlight the omnivorous and opportunistic feeding behaviour of these freshwater crabs, with a preference for animal matter such as insects, molluscs, and small vertebrates, as well as plant material (Fadlaoui and Melhaoui, 2022). Predation on amphibians (and also reptiles; Jablonski et al., 2024), although less commonly reported, expands our knowledge of the ecological interactions of *P. fluviatile* with sympatric fauna, and emphasises the crab's ability to prey on vertebrates within its habitat. Further research on the dietary niche of this species could shed more light on the role that freshwater crabs play in the trophic ecology of amphibians.

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