

Potential predation by a carabid beetle (*Catadromus* sp.) larva on an adult Spotted Marsh Frog, *Limnodynastes tasmaniensis* Günther, 1858, in western Victoria, Australia

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Beetles (Order *Coleoptera*) are the most speciose group in the world, boasting around 400,000 described species, comprising approximately 40% of described insects and 25% of described animals (Stork, 2018). Beetles play incredibly diverse and essential roles in ecosystems worldwide including decomposers, prey for other species, ecosystem engineers, pollinators and predators controlling pest populations (Nichols et al., 2008; Muinde and Katumo, 2024).

Despite their ubiquity, little is known about many beetle species. For instance, even for the Green-lined Ground Beetle (*Catadromus lacordairei*), one of the few beetles well enough known to garner conservation attention (listed as a threatened species in Tasmania, Australia), almost nothing is known about the pupal and larval life stages (Richards and Spencer, 2019). *C. lacordairei* is a terrestrial beetle, occupying a range of habitats from grasslands to floodplain forests across Australia (Spencer and Richards, 2014). Like most other carabid (ground) beetles, *Catadromus* larvae have been assumed to mainly predate other invertebrates, with a smaller number of species feeding on decomposing wood (Spencer and Richards, 2010). However, the adults of *Catadromus* have been reported feeding on frogs (Hobler, 1921; Littlejohn and Wainer, 1978), and there are at least two accounts of the larvae doing the same (Froggatt, 1907; M. Campbell pers. obs.).

We report the novel field observation of a *Catadromus* larva potentially preying on an adult Spotted Marsh Frog, *Limnodynastes tasmaniensis* Günther, 1858. On 4 December 2024, herpetofauna surveys were conducted by searching underneath grids of terracotta roof tiles in native grassland near the township of Cressy in western Victoria, Australia (38.0331°S, 143.6346°E). At 09:04 h, on a clear sunny day (16.8°C at the time of observation), an adult Spotted Marsh Frog (*L. tasmaniensis*) was observed under a tile with a *Catadromus* larva (either *C. lacordairei* or *C. australis*) attached to its left gluteal region (Fig. 1). The observation was made within the known distributions of both *C. lacordairei* and *C. australis*, although which of these species the larva belonged to was unable to be identified due to the larva of *C. lacordairei* being the only one that is described (i.e., the larvae of *C. australis* and other *Catadromus* species are currently unknown or remain undescribed).

The larva was identified as likely being a first instar by its size and uniform charcoal colour, compared to the more yellow, banded appearance of the third instar (Richards and Spencer, 2019). The larva had pierced the skin of the frog and was moving its mandibles in a pinching or cutting motion. Despite this, the frog seemed relatively unencumbered by the presence of the larva, displaying normal movement and in seemingly good health. The larva remained firmly attached by its mouthparts for five minutes while both animals were handled for further inspection and photographs, before being returned beneath the tile. It is unclear how long the larva had been attached or what the fate of the frog was. Future observations might benefit from collecting specimens to determine the progression of the interaction over time.

Beetles and other insects are a primary prey item for anurans (Frost, 1924). However, this relationship can switch, especially for early life-stage anurans (eggs and tadpoles). For example, diving beetle (Family *Dytiscidae*) larvae are exclusively carnivorous, and

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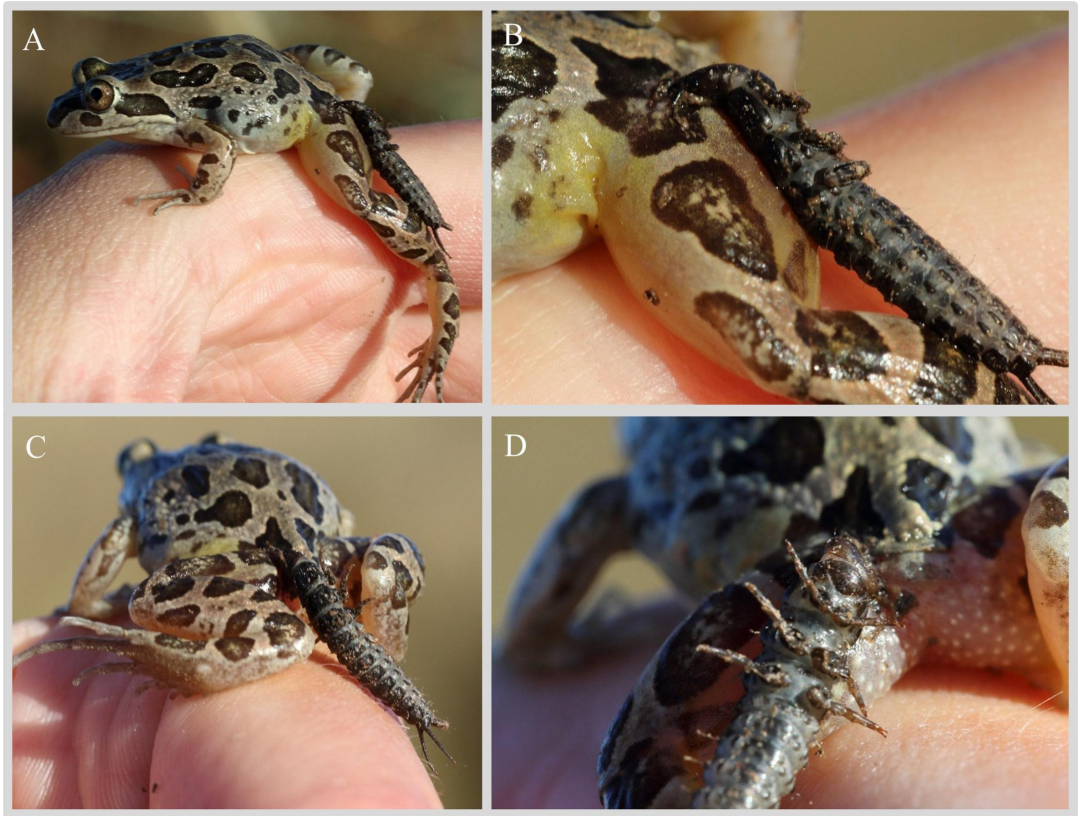


Figure 1. Photographs showing a predatory ground beetle (*Catadromus*) larva attached to the left gluteal region of an adult Spotted Marsh Frog (*Limnodynastes tasmaniensis*). Photos by Dylan Westaway.

some species can eat up to 12 free-swimming tadpoles in a single day (Kruse, 1983; Gould et al., 2019). Beetle predation of adult anurans is rarer but does occur (Toledo, 2005). Littlejohn and Wainer (1978) report two instances of *C. lacordairei* adults predating upon *L. tasmaniensis* and southern brown tree frog (*Litoria ewingii*) respectively. Another species of beetle, *Chlaenius darlingensis*, was similarly observed to predate two small species of Australian frog, smooth toadlet (*Uperoleia laevigata*) and common froglet (*Crinia signifera*; Robertson, 1989). In these instances, the adult beetles are described to immediately clasp the frogs upon encounter and begin eating through the body wall, in each case leading to the death of the frog in less than an hour (often in just a few minutes), presumably due to blood loss or damage to vital organs.

Fewer records of beetle larvae feeding on adult frogs exist. However, several species of the subgenus *Epomis* (within the genus *Chlaenius*), distributed across the

Holarctic and Afrotropical regions, are known to feed on frogs throughout the beetle life cycle (Scholtz and Ralston, 2017). In each case, the beetle larvae start out as an obligate blood-feeding ectoparasite of multiple frog species, transitioning to generalist predators capable of killing and consuming frogs as adults (Wizen and Gasith, 2011a; Scholtz and Ralston, 2017). Incredibly, the larvae may lure frogs into attack with unique movements of antennae and mandibles, then avoid the predator’s protracted tongue and attach themselves to the attacker’s body by their mouthparts (Wizen and Gasith, 2011b).

Froggatt (1907) briefly mentions that *Catadromus australis* and *C. lacordairei* may be found “along the edges of swamps and lagoons in the Murray country living under dead logs where their black banded larvae may also be found, sometimes feasting on small frogs.” A larva belonging to *Catadromus* was also observed feeding on an adult *C. signifera* along the edge of a

pool in a minor drainage line in Bundoora, Victoria, Australia (37.7276°S, 145.0441°E), between 1957 and 1962 (M. Campbell, pers. obs.). Our observation of potential predation by a *Catadromus* larva on an adult spotted marsh frog adds to these few records of beetle larvae feeding upon adult anurans. If *Catadromus* larvae are frequent predators of frogs, conservation efforts for these species may be linked to frog conservation. In any case, our observation adds to the very little currently known about the larval stage of *Catadromus*.

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