

## MISDIRECTED AMPLEXUS BETWEEN A PACIFIC TREEFROG (*PSEUDACRIS REGILLA*) AND A WESTERN TOAD (*ANAXYRUS BOREAS*) IN A NORTHERN CALIFORNIA UPLAND

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**ABSTRACT**—Misdirected amplexus has been reported between conspecifics, congeners, between different amphibian families, and between amphibians and non-amphibian objects. We observed misdirected amplexus between a Pacific Treefrog and a Western Toad, wherein the treefrog amplexed the toad's leg. These types of events can result in reproductive interference and have also been considered an evolutionary trap for some species.

**Key words:** amplexus, evolutionary trap, misdirected, Pacific Treefrog, reproductive interference, Western Toad

Misdirected amplexus has been defined variously as amplexus between 2 individuals of similar species (for example, *Rana boylii* and *Rana catesbeiana*; Storm 1952; Lind and others 2003; Pearl and others 2005), 2 different genera (for example, *Bufo boreas* and *Rana draytonii*; Alvarez 2011; Machado and Bernarde 2011), 2 species of different families (for example, Caudata and Anura; Waterstrat and others 2008; Simovic' and others 2014), and amplexus between an anuran and inanimate objects (Storm 1960; Brown 1977). These types of amplexal behaviors are attributed to a strong drive for reproduction, often with a much larger available female (Schmeller and others 2005). Misdirected amplexus can also occur intraspecifically in that male-male amplexus has been reported by Bowcock and others (2008), as well as other researchers. In many anurans, release calls and other physical movements are used to reject unwanted or erroneous amplexus by unreceptive females or males, but these behavioral cues are likely only discouraging to conspecific males (Stebbins and Cohen 1995).

On 4 March 2019, while conducting a California Red-legged Frog (*Rana draytonii*) egg mass survey at the Mitsui Ranch (UTM: Zone 10S, 536751.9 m E, 4241885.4 m N; determined using Etrex handheld GPS unit, Garmin Limited, Lenexa, Kansas, USA) with numerous col-

leagues, a partially buried rock functioning as an upland cover object was lifted, and within a small cavity below was an adult Western Toad (*Anaxyrus boreas*). We removed the Western Toad for closer inspection and noted that a Pacific Treefrog (*Pseudacris regilla*) appeared to be clinging to the posterior portion of the toad. When inspected closely, it was clear that the Pacific Treefrog was in amplexus with the tibiofibula portion of the hind left leg (posterior portion) of the toad just above the tarsal bone (Fig. 1). The absence of nuptial pads on the toad helped us to identify it as a female, while the treefrog was clearly identified as a male due the skin folds of the relaxed vocal sacks. The treefrog remained amplexed with the Western Toad for several minutes while the toad was handled and photographed. Shortly before release, the treefrog loosened its grasp and remained in a resting position on the dorsum of the toad. Thereafter, both toad and treefrog were returned to the site of capture and the rock was replaced as found.

Misdirected amplexus events are not rare, but it is unusual in animals exhibiting such size dimorphism as in this observation. The difference in size between the 2 individuals almost certainly explains the location of the amplexus. Most amplexus is thoracic or axial, and species appear to utilize a specific type or place for amplexus (Duellman and Trueb 1994; Stebbins and Cohen 1995).

Generally, misdirected amplexus can create reproductive interference, which can reduce the fitness of individual animals at some locations (Pearl and others 2005; D'Amore and others 2009). Misdirected and intraspecific amplexus can also become an evolutionary trap for declining species (see D'Amore and others 2009), although in species that are not in decline the individuals may only lose a breeding season or, in some cases, increase their own exposure to predation (Alvarez 2011).



FIGURE 1. Adult female Western Toad (*Anaxyrus boreas*) amplexed by an adult male Pacific Treefrog (*Pseudacris regilla*), Sonoma County, California, 4 March 2019 (Photo by M. Olson).

We speculate that the likely result of an event such as the one described above is short-term sequestration of the individuals from reproductive activity. We can only assume that had we not interfered, the toad would have left the shelter of the rock and moved overland to a breeding site several meters away. We speculate that in the event the treefrog had been able to maintain amplexus during this short overland migration, once in the pond the treefrog may have been dislodged by 1 or more male toads attempting to amplex the female toad. However, this misdirected amplexus could also have resulted in increased predation potential for 1 or both individuals since natural movement could be impacted (Alvarez 2011). The true nature of the effects of these types of events has yet to be studied unambiguously, and their inconsistent frequency at most sites will likely contribute to difficulty in interpreting the effects of misdirected amplexus.

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