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INTRODUCED SPECIES

Spreading Holiday Spirit and Northwestern Salamanders, *Ambystoma gracile* (Baird 1859) (Caudata: Ambystomatidae), Across the USA

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Introduced species of amphibians and reptiles are of growing conservation concern (Bury and Luckenbach 1976; Krysko et al. 2011; Meshaka 2011). Unintentional introductions result largely from individuals escaping from enclosures or hitch-hiking in cargo or on vehicles, whereas intentional introductions occur primarily because a species is perceived to be of value to humans or from deliberately releasing sick or unwanted animals, including pets (Kraus 2009; Krysko et al. 2011). In Florida, most known introductions are directly related to the pet trade, but about 12% are related to the cargo pathway (Krysko et al. 2011). In this paper, we report the introduction of the Northwestern Salamander, *Ambystoma gracile* (Baird 1859), in Florida from Broward County, and in California from Fresno and San Diego counties, via the cargo pathway.

Ambystoma gracile is indigenous to the North American Cordillera of the Pacific Northwest. It occurs principally west of the hydrologic crest of the Cascades, including the Pacific Ranges and intervening lowlands, from extreme coastal southeastern Alaska, including Chichagof Island, southward, including Vancouver Island, to Sonoma County in northwestern California (Duellman and Sweet 1999; Hoffman et al. 2003; Shaffer 2005). This species may be pedomorphic or metamorphose to terrestrial adults (Snyder 1956). Neotenic larvae may reach 105 mm snout-vent length (SVL) and are commonly found in coniferous forests and meadows (Hoffman et al. 2003).

On 12 December 2014, Eli, Tommy, Anthony, and Erin Khouri collected one adult *Ambystoma gracile* (UF-Herpetology 174498; 7.8 cm SVL, 8.5 cm TL; Fig. 1) found in a Noble Fir (*Abies procera*) Christmas tree at their home in Fort Lauderdale, Broward County, Florida. This tree originated in Oregon and was purchased from Happy Holidays Christmas Trees, Fort Lauderdale, Broward

County, Florida (26.14753°N, 80.120498°W). This represents the first known voucher for this species in Florida.

On 14 December 2014, David Tobler obtained one adult *A. gracile* (UF-Herpetology 174922; 5.8 cm SVL, 11.1 cm TL) from a Christmas tree lot at The Home Depot, 3272 West Shaw Avenue, Fresno, Fresno County, California (36.80954°N, 119.850770°W). On 6 February 2015, JML received one adult *A. gracile* (UF-Herpetology 174919; 6.67 cm SVL, 12.83 cm TL; Fig. 2) that was recovered from a box of pine boughs shipped to the Walter Anderson Nursery, 12755 Danielson Court, Poway, San Diego County, California, in mid-December (32.94015°N, 117.046631°W). The box was shipped from Hiawatha Evergreens, 681 East Johns Prairie Road, Shelton, Mason County, Washington (47.24183°N, 123.10382°W). For three consecutive years beginning in about 2000, *A. gracile* was found in Christmas trees at The Home Depot, 12185 Carmel Mountain Road, San Diego, San Diego County, California (32.98467°N, 117.07501°W), and given to a nearby pet store (J.M. Jones, pers. comm.). Another *A. gracile* was collected in Santa Barbara, Santa Barbara County, California in about 2009 after falling out of a Christmas tree (S. Sweet, pers. comm.).



Fig. 1. Northwestern Salamander, *Ambystoma gracile* (UF-Herpetology 174498), from Fort Lauderdale, Broward County, Florida. Photograph Erin Khouri.



Fig. 2. Northwestern Salamander, *Ambystoma gracile* (UF-Herpetology 174919), from Walter Anderson Nursery, Poway, California. Photograph by J.M. Lemm.

However, no voucher has been deposited. Although *A. gracile* is native to California, these introductions occurred over 300 km from the southernmost part of its native range.

These records represent stage 2 (after Colautti and MacIsaac 2004) introductions. Given the late November and December distribution of conifers originating in the Pacific Northwest, *A. gracile* could be introduced to many areas across the continental USA. The Northern Pacific Treefrog, *Pseudacris regilla* (Baird and Girard 1852) was intercepted in Anchorage, Municipality of Anchorage, Alaska, USA, via inspected Christmas trees originating from Orting, Washington, USA, and biologists have expressed concern that these frogs may carry pathogens harmful to native amphibians elsewhere (Halpin 2009). Introduced salamanders could serve as a pathway for *Batrachochytrium salamandrivorans*, a virus lethal to salamanders (Martel et al. 2013). The Western Tiger Salamander, *Ambystoma mavortium* Baird 1850 (formerly *A. tigrinum mavortium*, and elevated to species status by Shaffer and McKnight [1996]), a congener of *A. gracile*, has invaded California where it negatively affects native amphibian species through predation and hybridization (Ryan et al. 2009). Controlling alien species early in the invasion process decreases costs and increases effectiveness and efficiency (Kraus 2009). Increased tree screening prior to shipment might prevent future introductions. Areas where *A. gracile* might be capable of establishing populations should consider sourcing conifers from regions where this species is absent to prevent similar ecological impacts.

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