Herpetology Notes, volume 6: 533-535 (2013) (published online on 21 November 2013)

# Documentation of terrestrial activity by the Peninsula Newt (*Notophthalmus viridescens piaropicola*) in southern Florida

Dean A. Croshaw[1,*], Joseph Bozzo[2], John R. Cassani[3], David W. Ceilley[3], Edwin M. Everham III[3], and Walter E. Meshaka, Jr.[4]

**Abstract.** The Peninsula Newt (*Notophthalmus viridescens piaropicola*) is a Florida endemic subspecies within the larger Eastern Newt lineage of North America. Although little is known about the habits of Peninsula Newts, they are thought to be mostly aquatic in southern Florida. However, we documented terrestrial activity in this species with three funnel trap captures (one in 2011, two in 1996) along dry drift fences in southwest Florida, USA. The newt caught in 2011, an extremely dry year, appeared quite dehydrated and emaciated. We speculate that this individual may have been migrating in search of water, food, or both. The two terrestrial captures in 1996 occurred during a wetter period, likely very close to standing water. Our observations verify that Peninsula Newts do venture into terrestrial habitats occasionally, but the data set shows this behavior to be quite rare. Finally, Peninsula Newt captures dropped precipitously between similar trapping efforts in the mid-1990s and in 2010-2011. This finding suggests either a possible population decline in the region or a local shift in habitat use, perhaps due to drought and/or altered hydrology.

**Keywords.** Peninsula Newt, terrestrial habitat use, amphibian, life cycle polyphenism, migration, population decline.

## Introduction

The Eastern Newt (*Notophthalmus viridescens*) is a polytypic and geographically widespread amphibian of eastern North America with four recognized subspecies (Conant and Collins, 1998). Its distribution ranges from boreal forests of Canada southward to subtropical regions of southern Florida. Not surprisingly, considerable intraspecific variation in ecology, behavior, morphology, and life cycle exists across regions and subspecies.

Eastern Newts have one of the most variable and multi-faceted life cycles of all amphibians, with three possible developmental pathways. Aquatic larvae may metamorphose to a terrestrial juvenile stage (i.e, the eft) that later transforms again into an adult morphology. The eft stage is skipped in many populations so that larvae transform directly into adults. Paedomorphosis is also common, in which animals maintain the larval morphology as sexually mature gilled adults. There is considerable subspecific and geographic variation in the potential to follow each of the three pathways, likely reflecting regional ecology (Takahashi and Parris, 2008) while certainly affecting terrestrial habitat use.

The Peninsula Newt (*N. v. piaropicola*) is the southernmost form of the four presently recognized subspecies and a Florida endemic whose geographic range extends as far as southern mainland Florida (Conant and Collins, 1998). The eft stage is thought to be skipped normally so that larvae transform into adults that remain aquatic. The paedomorphic condition is suggested to be relatively common (Schwartz and Duellman, 1952; Duellman and Schwartz, 1958; Mecham, 1967). Moreover, most accounts indicate aquatic habitat as most important (Duellman and Schwartz, 1958; Mecham, 1967; Bartlett and Bartlett, 1999), and in southern Florida this species is strongly associated with permanent sources of water (WEM, personal observation).

There is little documentation of terrestrial activity in the Peninsula Newt, although individuals reportedly were found "crossing roadways on rainy nights" (Bartlett and Bartlett, 1999) and "occasionally emerging to walk on floating vegetation" in aquatic habitats (Jacksonville Zoo

[1] Department of Biological Sciences, Florida Gulf Coast University, Fort Myers, FL 33965, USA.
[2] South Florida Water Management District, 23998 Corkscrew Road, Estero, FL 33928, USA.
[3] Department of Marine and Ecological Sciences, Florida Gulf Coast University, Fort Myers, FL 33965, USA.
[4] Section of Zoology and Botany, State Museum of Pennsylvania, 300 North Street, Harrisburg, PA 17120, USA.
*Corresponding author: dcroshaw@fgcu.edu.

2011). Extensive fieldwork has revealed no terrestrial movements by this species on wet roads by day or night in extreme southern (WEM, personal observation) and west-central (P.R. Delis, personal communication) Florida. Thus, although terrestrial activity in Peninsula Newts has been mentioned, the rarity of these accounts suggests the behavior is genuinely uncommon. Herein, we use drift fence data to quantify terrestrial habitat use by this species in southwest Florida, USA, and report changes in capture frequency over a 16-year period.

**Methods**

As part of a local effort to monitor changes in herpetofauna composition and abundance in southwest Florida, we established drift fence arrays at nine sites on a large reserve of protected land in Collier County (Corkscrew Regional Ecosystem Watershed, CREW). The site is comprised of about 243 km$^2$, much of the watershed leading to the Corkscrew Swamp Sanctuary. The mission of CREW is to preserve and manage the water resources and natural heritage of this important watershed. CREW contains diverse habitats common and typical of the region: cypress domes, sawgrass marshes, pine-palmetto flatwoods, oak hammocks, and popash sloughs.

Drift fences made of buried silt fencing were placed in a cross configuration (each arm 7.6 m long) in varying habitat types (mesic flatwoods, n=3; oak hammocks, n=3; wet prairie, n=1; and depression marshes, n=2). We set homemade funnel traps of stapled aluminum screen at the end of each fence line. Each trap was shaded with palm fronds, and a damp cloth was placed inside to further inhibit desiccation. Traps were deployed for seven-day periods and checked daily in both wet and dry seasons. To test for changes in herpetofaunal populations and communities, we performed two rounds of sampling, first in the 1990s (1995-97) and again more than a decade later (2010-11). We report full details of methodology elsewhere (JRC et al., unpublished manuscript).

**Figure 1.** A severely dry and emaciated Peninsula Newt captured by a terrestrial drift fence trap in June 2011 at Corkscrew Regional Ecosystem Watershed, Collier County, Florida, USA. Photo credit: J.R. Cassani.

**Results and Discussion**

On 29 June 2011, a small Peninsula Newt displaying adult morphology (29.5 mm SVL, 0.36 g) was caught at an array placed near the edge of a drying sawgrass marsh wetland (Figure 1). This period of 2011 was extremely dry in southwest Florida. Rainfall in the 12 months leading up to this capture was 172 mm below average (1250 vs. 1422 mm). The cumulative total for the first half of 2011 was 79 mm below average (480 vs. 559 mm). The water table, as measured at a nearby well (~1.5 km from site of capture), was at its lowest over the six-year period for which data have been collected (April 2007-April 2013). All of the more shallow wetlands in the immediate area had dried down earlier that year (JRC, personal observations).

During a wetter period in the fall of 1996, two other Peninsula Newts were caught in terrestrial traps at a nearby CREW site (North Flint Pen Strand, Lee County) on 27 September and 8 November. In this sampling period at Flint Pen, many newts (N=51) were caught in traps that were under water (usually > 150 mm) at additional drift fence arrays within 1.5 km. Standing water was probably near these terrestrial traps at the time of capture. Elevation was similar, and the other arrays where newts were common had underwater traps on those days. Only these three out of 113 total newt captures occurred on land (2.7%), and the upland arrays never had newts.

These terrestrial captures are notable because Peninsula Newts have never been reported on land in the Everglades and southwestern flatwood ecoregions of southern Florida despite intense herpetological sampling in the modern era (WEM, personal observation; though we note a terrestrial capture in Dade County communicated to us during manuscript preparation by R.D. Bartlett). Duellman and Schwartz (1958) reported examination of a specimen collected in Monroe County (southeast of our study site) in 1932 and concluded that it was an eft. However, no additional efts have been reported since, and these combined observations suggest that both the eft stage and terrestrial habitat use by adults is extremely rare, if not absent, in the region.

Our data corroborate the rarity of terrestrial habitat use by Peninsula Newts in southern Florida and raises the question of why individuals occasionally venture onto land. The newt we trapped in 2011 was clearly stressed, displaying extreme emaciation and poor body condition. It may have been forced into unusual terrestrial behavior by drought, searching for suitable aquatic habitat or food. The two terrestrial captures in 1996 were likely lingering toward the edge of a gradually drying wetland, similar to the individual taken under moist cover near water at the Rodman Reservoir in Alachua County (R.D. Bartlett, personal communication).

Peninsula Newt captures at the same drift fence sites using similar methods declined from 60 in 1995-97 (1.05/trap-day) to just 1 in 2010-11 (0.02/trap-day). This finding could be a result of drought, as traps and fences were in standing water more often during the 1990s sampling (JB, personal observations). If newts avoid terrestrial movements, lower water levels may have caused a similar population to go undetected because animals were restricted to underground refugia near the last areas of moisture in the lowest microhabitats. However, a local population decline for this species remains a possibility, as is suggested for many North American amphibians (Adams et al., 2013). Peninsula Newts are dependent on relatively shallow, yet semi-permanent wetlands such as those found in hydric pine flatwoods, a habitat type that has been severely impacted by altered hydrology as a result of continued land use changes and increasing development in the growing region of southwest Florida (SFWMD, 2008; Ceilley and Bortone, 2000).

Unlike its northern relatives, the Peninsula Newt appears much less inclined to use terrestrial habitat at any life history stage. Such ecological information is critical for management plans aiming to conserve this wetland species. In the face of climate change induced periods of severe drought, a nearly exclusive reliance on aquatic systems coupled with poor dispersal over land could place this endemic species at a dangerous disadvantage in a profoundly changing aquascape. We hope our observations highlight the dearth of information about this important animal and stimulate interest, concern, and support for south Florida's only newt.

**Acknowledgements.** Thanks to Richard Bartlett and Pablo Delis for sharing unpublished notes on newt captures. We also thank the numerous volunteers who helped to implement our herpetofauna monitoring efforts at CREW. These are too many to name here but we wish to recognize those who spent the most time: Brenda Brooks, Don Doggett, Lucas Everham, John Ferlita, Deb Hanson, Bob Harris, Brent Jackson, and Kory Ross. Funding for traps and fences was provided by the Florida Fish and Wildlife Conservation Commission.

## References

Adams, M.J., Miller, D.A.W., Muths, E., Corn, P.S., Grant, E.H.C., et al. (2013): Trends in amphibian occupancy in the United States. PLoS ONE **8**: e64347. doi:10.1371/journal.pone.0064347

Bartlett, R.D., Bartlett, P.P. (1999): A Field Guide to Florida Reptiles and Amphibians. Houston, USA, Gulf Publishing.

Ceilley, D.W., Bortone, P.A. (2000): A survey of freshwater fishes in the hydric flatwoods of Flint Pen Strand, Lee County, Florida. In: Cannizzaro, P.J., Ed. Proceedings of the Twenty-Seventh Annual Conference on Ecosystems Restoration and Creation: May 2000. Hillsborough County, Florida, USA, Hillsborough Community College.

Conant, R., Collins, J.T. (1998): Reptiles and Amphibians of Eastern/Central North America, 3rd ed. New York, Houghton Mifflin.

Duellman, W.E., Schwartz, A. (1958): Amphibians and reptiles of southern Florida. Bulletin of the Florida State Museum **3**: 181-324.

Jacksonville Zoo. (2011): Bio Facts: Newt, Peninsula. http://www.jacksonvillezoo.org/animals/amphibians/Peninsula_Newt/

Mecham, J.S. (1967): *Notophthalmus viridescens*. Catalogue of American Amphibians and Reptiles **53**: 1-4.

Schwartz, A., Duellman, W.E. (1952): The taxonomic status of the newts, *Diemictylus viridescens*, of peninsular Florida. Bulletin of the Chicago Academy of Sciences **9**: 219-227.

South Florida Water Management District. (2008): Lower Charlotte Harbor surface water improvement and management plan. West Palm Beach, South Florida Water Management District.

Takahashi, M.K., Parris, M.J. (2008): Life cycle polyphenism as a factor affecting ecological divergence within *Notophthalmus viridescens*. Oecologia **158**: 23-34.

*Accepted by Zoltán Nagy*