An Expanding Population of Italian Wall Lizards in New York

by Robert W. Mendyk

Podarcis sicula campestris

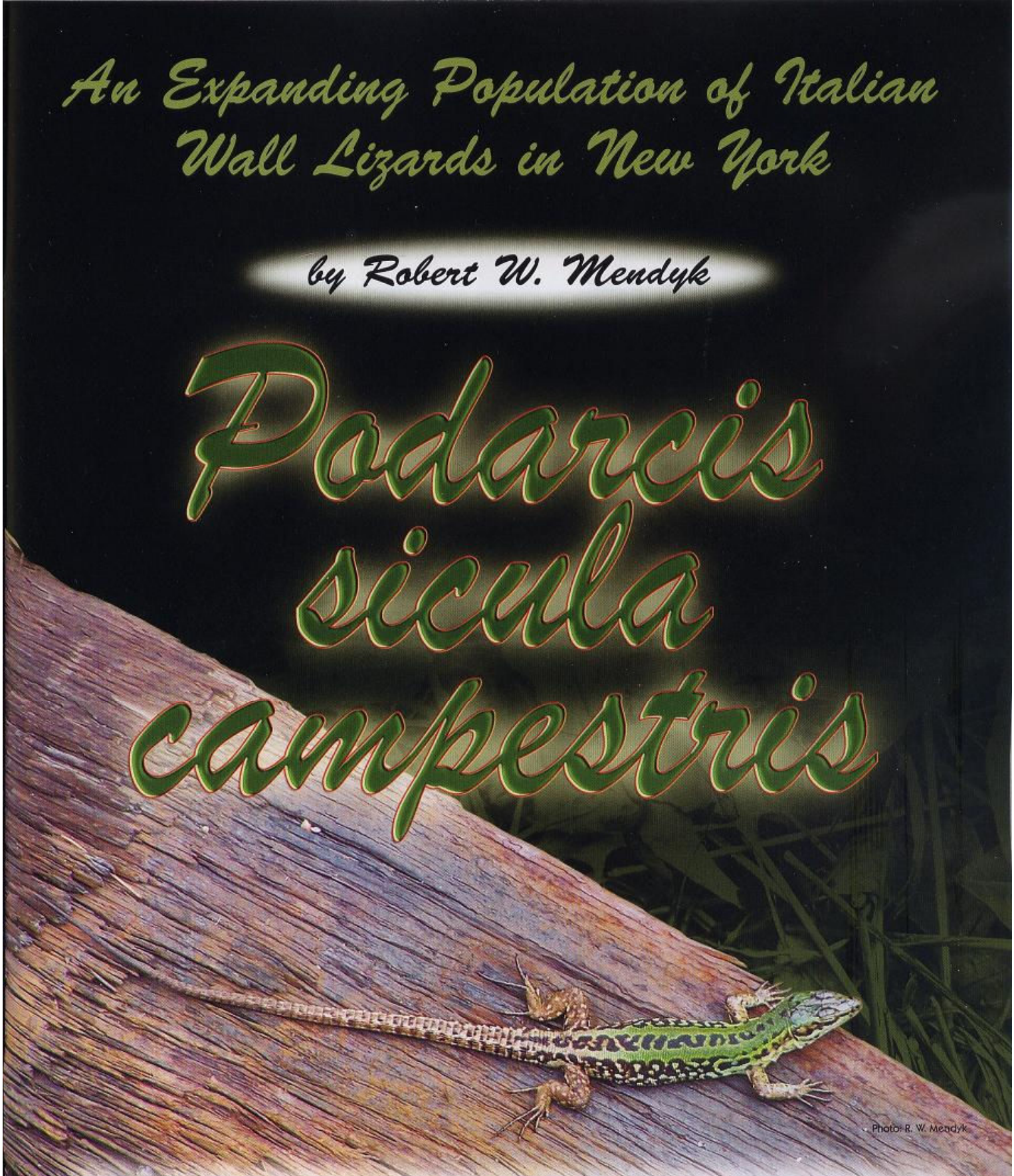


Photo: R. W. Mendyk

Over the past century numerous exotic species of herpetofauna have been introduced into North America. Most have been restricted to the subtropical southern United States, but species of European lacertid lizards have been able to successfully invade several locations in the temperate north. Lacertids are well known for their broad ecological tolerance and ability to inhabit colder northern latitudes — one species, *Zootoca vivipara*, even occurs within the Arctic Circle in northern Europe.

To date, only three lacertid species have become

A male *P. s. campestris* basks in safety amid a pile of rocks. Photo: R. W. Mendyk

Male on a railroad tie. Photo: R. W. Mendyk

established in North America. The western green lizard, *Lacerta bilineata*, is found in Topeka, Kansas (COLLINS, 1982). The other North American lacertid populations all belong to the genus *Podarcis*, commonly referred to as wall lizards. Although other lacertid introductions have also taken place, such as *Darevskia valentini* (DEICHSEL, 2004) and *Lacerta lepida* (now *Timon lepidus*) (CONANT, 1945), these species have failed to become established.

The common wall lizard, *Podarcis muralis*, has been introduced to North America in at least four locations: Cincinnati, Ohio, U.S.A. (VIGLE, 1977); Fort Thomas, Kentucky, U.S.A. (DRAUD and FERNER, 1994); Clarksville, Indiana, U.S.A. (WALKER and DEICHSEL, 2005); and Victoria, British Columbia, Canada (ALLAN et al., 1993). The Italian wall lizard, *Podarcis sicula*, has been introduced in at least three locations in the United States: Philadelphia, Pennsylvania (KAUFFELD, 1931); Topeka, Kansas (COLLINS, 1982); and Long Island, New York (GOSSWEILER, 1975). With the exception of the Philadelphia *P. sicula* colony, which has since been extirpated (SMITH and KOHLER, 1977), all North American *Podarcis* populations persist today and are growing in size.

Of the several North American wall lizard populations, the *P. sicula campestris* introduced to New York is perhaps the most studied and best understood. The following article reviews existing literature, and offers additional notes on the ecology, dispersal, and colonizing success of Italian wall lizards in New York.

Origin and dispersal

Podarcis sicula campestris was inadvertently introduced to Long Island, New York, around 1967 when an automotive accident resulted in the release of several individuals en route to a pet shop in Garden City (GOSSWEILER, 1975; ALVEY, 1993). The escaped lizards reached a nearby municipal yard where favorable environmental conditions allowed for the establishment of a reproducing population and dispersal (ALVEY, 1993). It is from this original location that *P. sicula campestris* has spread to many other areas of Long Island and New York City. Through molecular analysis, the origin of New York's wall lizards has been traced to the vicinity of Rome, Italy (OLIVERIO et al., 2001), from where most Italian reptile dealers were operating at the time of the U.S. introduction (BURKE and NER, 2005).

The New York Italian wall lizards have since substantially expanded their range, reaching as far as 105 kilometers from the point of their original release (BURKE and DEICHSEL, in press). The current distribution is highly

Photo: R. W. Mendyk

Podarcis sicula campestris basking. Photo: M. Grano

Dorsal view of *P. s. campestris*. Photo: M. Grano

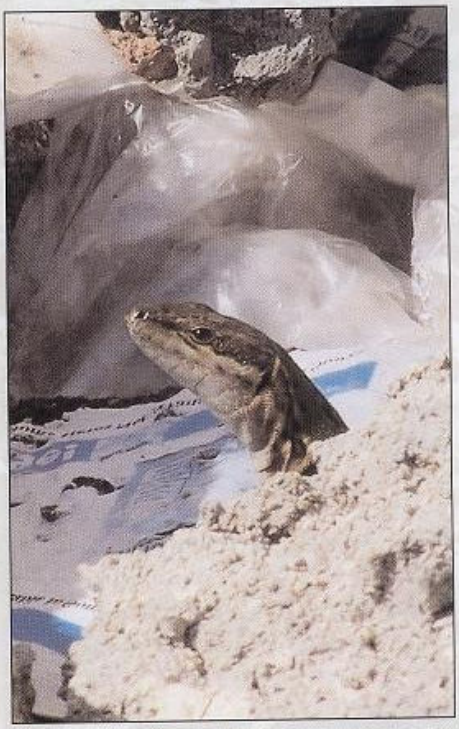
fragmented, with the largest and most continuous concentrations of the lizards occurring in suburban and industrial environments of central Long Island. There are reportedly more than 20 known populations of *P. sicula campestris* in New York, and additional populations will likely be found or become established in the future. Documented populations exist in both Nassau and Suffolk counties of Long Island, and in the New York City boroughs of Queens, the Bronx, and Brooklyn.

Several factors have contributed to the dispersal of *P. sicula campestris* in New York. From their original point of release, wall lizards have spread through suburban and industrial environments of Long Island. Natural dispersal occurs as the lizards reproduce and spread gradually across a landscape over time and through multiple generations. Although wall lizards have been able to colonize residential neighborhoods, their movement through such areas is often limited or halted by roads, discontinuous habitat, or human activity. On Long Island, however, the lizards have been able to disperse freely along railroad and power-line rights-of-way and drainage ditches — these corridors provide near-continuous stretches of favorable habitat without many of the limitations or physical barriers associated with residential or industrial areas. The *P. sicula* that once occurred in Philadelphia also reportedly spread along railroad rights-of-way (KAUFFELD, 1931). Likewise, introduced populations of the closely related *P. muralis* have reportedly dispersed along railways in urban environments of Cincinnati (HEDEEN and HEDEEN, 1999), and along power-line rights-of-way in British Columbia (BERTRAM, 2004).

Natural dispersal does not, however, account for the numerous satellite populations of *P. sicula campestris* that have arisen throughout Long Island and New York City over the past 40 years. The most common means by which *P. sicula campestris* has reached new areas in New York is "jump dispersal," typically through lizards being captured and subsequently released into new areas. Deliberate human-assisted dispersal is likely responsible for the majority of satellite populations in New York, although lizards or their eggs may also have been inadvertently transported to new areas within landscaping mulch and compost (ALVEY, 1993).

Ecology

Podarcis sicula in southern Europe is known to inhabit both natural and disturbed environments (FOA et al., 1992; AVERY, 1993; VANHOOYDONCK et al., 2000). However, with the exception of a small population in a coastal area of eastern Long Island (BURKE and DEICHSEL, in press), the species has been unable to colonize natural habitat in New York,



Wall lizards utilize construction debris in industrial environments of New York. Photo: R. W. Mendyk

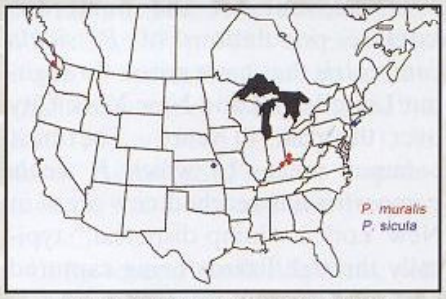
Female resting on a railroad tie. Photo: R. W. Mendyk

Female *P. s. campestris* in its natural habitat in Italy. Photo: M. Grano

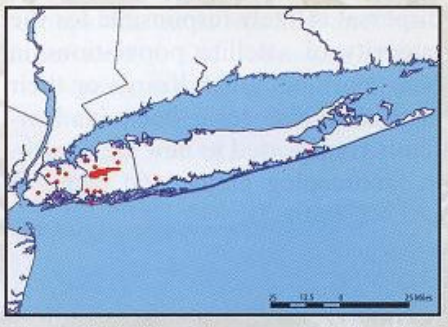
where it is restricted to anthropogenic environments. In suburban settings, *P. sicula campestris* occur in public parks, schoolyards, university campuses, and backyard gardens, where they take refuge in cracks and crevices of retaining walls, patios, sidewalks, decks, steps, planters, and landscaping rocks. Wall lizards are also abundant in industrial environments, favoring sites such as municipal yards, abandoned lots, cemeteries, along warehouses and other industrial buildings, and along railroad and power-line rights-of-way. These anthropogenic environments often contain an abundance of trash, construction debris, and low-growing vegetation dominated by exotic shrubs and herbaceous perennials. *Podarcis sicula campestris* prefers open sunlit environments, but only rarely occurs in areas that lack low-growing vegetation, debris, or a combination of the two.

Wall lizards are highly conspicuous, and, being heliotherms, are frequently seen basking or foraging in open sunlit patches — although they rarely stray far from vegetation or other areas of refuge. BURKE and DEICHSEL (in press) report that North American *Podarcis* populations tend to favor "woody" habitats such as railroad ties and wooden retaining walls, whereas European populations prefer "rocky" habitats such as rock outcrops, stone walls, and old building foundations. This disparity has been attributed to the difference in building materials commonly used in North America and Europe (BURKE and DEICHSEL, in press).

The distribution of *P. sicula campestris* in New York is at the same latitude as the area of origin of the lizards in the vicinity of Rome, Italy, but winters in New York are substantially colder than winters in Rome. In central Italy, *P. sicula campestris* remains active year round (FOA et al., 1992). In New York, wall-lizard activity appears to be restricted to between March and November (BURKE and NER, 2005), although the lizards also often emerge and are active during periods



Extant exotic populations of *Podarcis* in North America



Current distribution of *P. s. campestris* in New York

of relatively warm weather throughout the winter — when temperatures go above 7°C (45°F). *Podarcis sicula campestris* is unable to tolerate subfreezing temperatures (BURKE et al., 2002), and must therefore seek out hibernacula that provide protection from the cold, presumably in compost piles or below the frost level underground. During the summer months, wall lizards avoid the hottest part of the day, restricting their activity to mornings and late afternoons (BURKE and NER, 2005).

Podarcis sicula campestris is territorial, and during the spring and summer months can be seen engaging in vigorous combat between adults. Although home-range size and other aspects of spatial ecology have yet to be determined for *P. sicula campestris* in New York, introduced *P. muralis* in Ohio has been shown to occupy smaller home ranges and occur in greater densities than European conspecifics (BROWN et al., 1995). On Long Island, lizards of different sexes and ages live in close proximity to one another, with several individuals often sharing the same rock or railroad tie. The areas used by individuals in their daily movements may be smaller than what has been reported for European *P. sicula* populations by FOA et al. (1992) and AVERY (1993).

The diet of wall lizards in New York is composed of a variety of invertebrates, including beetles, aphids, moths, flies, wasps, bees, ants, spiders, crickets, and isopods (BURKE and MERCURIO, 2002) — comparable to the food habits reported for the species in Europe (AVERY, 1978). The wall lizards typically forage among leaf litter and vegetation, darting to capture prey. They also climb to feed on insects on the flowers, stems, and leaves of certain plants. Lizards in industrial environments of Long Island have been observed hunting around discarded

Basking on a roadside in a Long Island residential neighborhood. Photo: R. W. Mendyk

Rigorous combat between males is common in spring and summer. Photo: R. W. Mendyk

beverage cans and bottles for for invertebrate prey that is attracted to the sugary residues in the containers (MENDYK, in press).

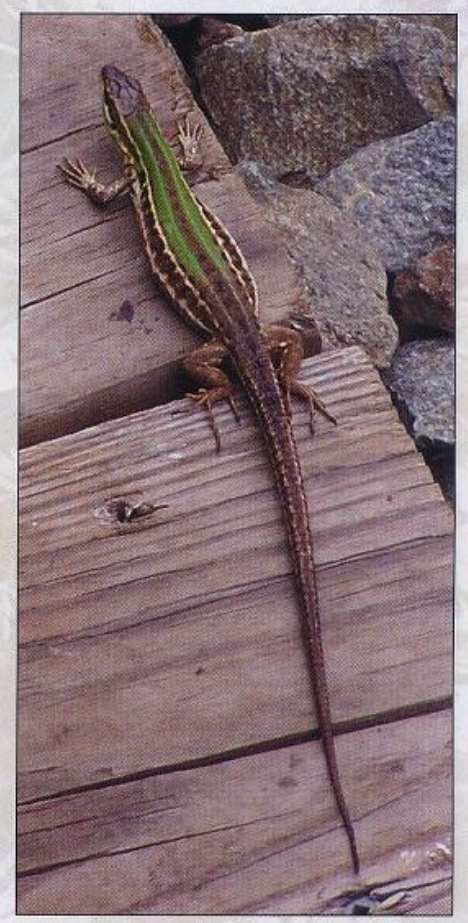
Little is known about the reproductive ecology of *P. sicula campestris* in New York. Although European *P. sicula* females have been reported to produce multiple clutches of eggs in a year (CAPULA et al., 1993), it is not known whether females in New York are able to produce more than a single clutch due to their shorter activity period. Eggs are likely laid beneath objects such as logs, railroad ties, and rocks, as was reported by GUBYANI (2001) for *P. sicula* in Topeka, Kansas. Eggs incubate for about 2 months (GUBYANI, 2001); hatchlings emerge in late summer, and are most abundant during August and early September.

Podarcis sicula campestris. Photo: M. Grano

Colonizing success

Several factors have contributed to the overwhelming colonizing success of *P. sicula campestris* in human-altered environments of New York. Both Long Island and New York City lack indigenous lizards, so the introduced wall lizards have been able to fill a previously unexploited ecological niche. *Podarcis sicula campestris* has no direct competitors for preferred habitat or resources. Similar scenarios have existed in the establishment of other North American *Podarcis* colonies. Although many areas with introduced wall lizards do have native lizards such as *Eumeces* spp., *Sceloporus* spp., and *Aspidoscelis sexlineata*, few indigenous species are capable of inhabiting the urban and industrial environments colonized by the wall lizards. Thus, most North American wall lizard populations have avoided direct competition in their establishment and dispersal (HEDEEN, 1984; BURKE and DEICHSEL, in press).

Due to their lack of indigenous lizards, Long Island and New York City may also lack lizard predators. BURKE and NER (2005) suggest that the only likely predators of wall lizards in New York are Northern Mockingbirds, American Crows, Blue Jays, and feral house cats. An earlier report by GOSSWEILER (1975) suggests seagulls and "one species of snake" (species not specified) as being potential predators of *P. sicula campestris* in New York. Predators that have been observed to prey on wall lizards in New York include feral cats, mantids, spiders (BURKE and DEICHSEL, in press), American Crows (MENDYK, 2007), Starlings (FARRELL, pers. comm.; SHERMAN, pers. comm.), and small hawks (SPERLING, pers. comm.). Observed predation attempts on wall



Female basking in Long Island. Photo: R. W. Mendyk

Specimen in its natural habitat. Photo: M. Grano

Hatchlings have longitudinal stripes that fade with age. Photo: R. W. Mendyk

Cryptic coloration helps camouflage the lizard in its natural habitat. Photo: M. Grano

lizards in urban and industrial environments of New York have been made by rats (SPERLING, pers. comm.) and by an eastern garter snake, *Thamnophis sirtalis sirtalis* (MENDYK, 2007).

The future of *P. sicula campestris* in New York

Although there have been several studies reporting on *P. sicula campestris* in New York (BURKE et al., 2002; BURKE and MERCURIO, 2002; BURKE and NER, 2005), further research is needed to fully understand the possible ecological consequences of their presence. Fortunately, *P. sicula* has been used as a model taxon for numerous ecological and physiological studies, providing background for further comparative studies on their invasion biology. There is no evidence suggesting that *P. sicula campestris* has had a detrimental effect on the local environment, but there is still a large void in what is known about their ecology.

It is likely that Italian wall lizards will continue to spread through Long Island and New York City, by both natural and human-assisted means of dispersal. As more of New York undergoes commercial development and suburbanization, new favorable habitat will become available for future colonization by *P. sicula campestris*. In light of the remarkable colonizing success that *P. sicula campestris* has demonstrated over the past 40 years in anthropogenic environments of New York, it is of great interest to predict the limits of future dispersal, and whether the species is capable of spreading to adjacent areas of the northeastern United States, where it could threaten indigenous species such as the eastern fence lizard, *Sceloporus undulates*, and the northern coal skink, *Eumeces anthracinus*.

As the terrarium hobby expands, more reptile and amphibian species will become available on the market. Since most North American lacertid introductions have originated from the pet trade (KAUFFELD, 1931; GOSSWEILER, 1975; COLLINS, 1982; ALLAN et al., 1993), it follows

A wall lizard basks on top of a garter snake (*Thamnophis sirtalis*). Photo: R. W. Mendyk

A pair of *Podarcis sicula campestris* on a railroad tie. Photo: R. W. Mendyk

that new feral populations may arise through accidental or deliberate release of pet lizards. Although the novelty of releasing and observing exotic herpetofauna in one's own backyard may be enticing to the amateur herp enthusiast, this practice is strongly discouraged, as exotic species jeopardize the biodiversity and sustainability of native local environments and ecosystems. ■

Photo: R. W. Mendyk

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