Proceedings of the Zoological Institute RAS
Vol. 324, No. 3, 2020, pp. 364–370
10.31610/trudyzin/2020.324.3.364

УДК 598.11:591.9

Podarcis siculus (Reptilia: Sauria: Lacertidae), a new alien species for Russian fauna

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ABSTRACT

Podarcis siculus (Rafinesque-Schmaltz, 1810) or Italian wall lizard is one of the most invasive reptile-species. Recently, this lacertid lizard has been introduced to Mediterranean areas of southern Europe, South-West Asia (Turkey) and North America (USA). An abundant population of *P. siculus* was discovered on one of the sites of the Natural Ornithological Park in the Imeretinskaya Lowland, on an area of over 0.22 km^2 (Sochi, Russia). The data were collected in the May of 2020. in a strip survey method in the Imeretinskaya Lowland. To identify the colonization area of the invader, we examined all 8 sections of the Natural Ornithological Park in the Imeretinskaya Lowland and adjacent urbanized areas. More than 150 animals were observed. These Italian wall lizards, undoubtedly, belong to the northern-central Italian morphotype (presumably *P. s. campestris*). This is the first record of this species in the former USSR area and, also, this is the species' north-easternmost locality. The population inhabits secondary natural biotopes and urban area. Among them are the banks of artificial water bodies, areas with cultivated trees and shrubs, as well as parks, and house lawns in the urban area. Population density was estimated from eight to 40 specimens per 100 m of the transect. A moderate proportion of young specimens (more than a 40%) would indicate a healthy and continued growth of the emerging population. To determine the possible period of the species introduction, space images of the Imeretinskaya Lowland were analyzed beginning from the transformation of its landscape for the Winter Olympic Games of Sochi 2014 until the May of 2020. The introduction of the species presumably occurred with the delivery of large-sized ornamental trees and shrubs from Italy in 2012–2013. *Podarcis siculus* should be included in the list of herpetofauna of Russia and particularly of the Caucasus. This is an alien species with a proven ability to become an invasive species, what will lead to a greater undesirable and unavoidable contact with native small lizards of the genus *Darevskia* Arribas, 1997. On the other hand, as it is often observed with new invaders, a sudden rise in population abundance could be followed by a sharp decline. A continuous monitoring of the area in question and of the number of local Italian wall lizards is necessary to confirm or refute the assumed scenarios of further invasion of *P. siculus* on the Black Sea Coast of the Caucasus. Further action plans for this population should be developed depending on supposed future trends.

Key words: Imeretinskaya lowland, Italian wall lizard, Russia, Sochi

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Podarcis siculus (Reptilia: Sauria: Lacertidae) – новый адвентивный вид в фауне России

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РЕЗЮМЕ

Podarcis siculus (Rafinesque-Schmaltz, 1810), или итальянская стенная ящерица – один из наиболее инвазивных видов рептилий. Недавно этот вид был интродуцирован в ряде районов Средиземноморья, юго-западной Азии (Турция) и Северной Америки (США). Многочисленная популяция *P. siculus* была обнаружена на одном из участков Природного орнитологического парка в Имеретинской низменности, на площади более 0.22 км^2 (Сочи, Россия). Материал собран в мае 2020 года маршрутным методом на Имеретинской низменности. Для выяснения площади колонизации инвайдером, нами обследованы все 8 участков Природного орнитологического парка в Имеретинской низменности и сопредельная урбанизированная территория. Наблюдалось более 150 особей. Эти итальянские стенные ящерицы, без сомнения, относятся к северо-центральному морфотипу (предположительно *P. s. campestris*). Это первая находка данного вида на территории бывшего СССР и наиболее северо-восточный локалитет обитания. Популяция населяет вторичные природные биотопы и городскую территорию, в том числе берега искусственных водоёмов, посадки древесно-кустарниковой растительности, парки и придомовые территории в городской черте. Плотность популяции варьирует от 8 до 40 особей на 100 м маршрута. Относительно высокая доля молодых экземпляров (более 40%) свидетельствует о жизненности и продолжающемся росте новой популяции. Для определения возможного времени заноса вида анализу подверглись космоснимки Имеретинской низменности с момента трансформации её ландшафта под олимпийское строительство объектов зимней Олимпиады Сочи-2014 и до мая 2020 г. Вселение вида, по-видимому, связано с ввозом крупномерных экзотических деревьев и кустарников из Италии в 2012–2013 гг. *Podarcis siculus* следует включить в перечень видов герпетофауны России и, в частности, Кавказа. Это адвентивный вид с тенденциями стать инвазийным видом, поскольку плотность популяции высока, а площадь заселения может возрасти, что приведёт к неизбежному контакту с аборигенными мелкими представителями ящериц рода *Darevskia* Arribas, 1997. С другой стороны, как это часто наблюдается с новыми инвайдерами, после скачкообразного всплеска численности может наступить спад, вплоть до полного исчезновения. Для подтверждения, либо опровержения предполагаемых сценариев дальнейшего развития колонизации *P. siculus* Черноморского побережья Кавказа необходим постоянный мониторинг площади заселения и численности вида. Дальнейшая стратегия по отношению к *P. siculus* должна разрабатываться в зависимости от тенденций состояния популяции.

Ключевые слова: Имеретинская низменность, итальянская стенная ящерица, Россия, Сочи

INTRODUCTION

Podarcis siculus (Rafinesque-Schmaltz, 1810) or Italian wall lizard is one of the most invasive reptile species (Kraus 2009; Crnobrnja-Isailovic et al. 2009). The native range of *P. siculus* covers the Apennine Peninsula, including the extreme south of Switzerland, the northeastern coast and many islands of the Adriatic Sea, the islands of Sicily, Sardinia, and Corsica (Rivera et al. 2011). According to other data, Sardinia, Corsica and the Tyrrhenian Islands are the known source places of some historically introduced populations (Silva-Rocha et al. 2014) and eastern Adriatic area has mixture of both native and intro-

duced populations. The attractiveness of these lizards and the ease of keeping them in captivity made them a popular object of pet trade (Burke 2005). The high synanthropicity of *P. siculus* contributed to the colonization of a number of unintended invasion sites, both in connection with the pet trade, and with the export of large-sized planting material from Italy, mainly olive trees (*Olea europaea* L.) with nodose and full of holes trunks. Italy is one of the sale centers of subtropical trees and shrubs planted in large tubes with soil.

Recently, the species has been introduced to Mediterranean areas of southern Europe, South-West Asia (Turkey) and North America (USA). *Podarcis siculus* has formed natural populations in the vicinities of Barcelona, in Catalonia (north-east of the Iberian Peninsula) (Rivera et al. 2011), western Portugal, the Balearic Islands (Menorca), in several localities of northern and southern Spain (Silva-Rocha et al. 2012), in three localities in France (Gauthier 2007; Bruekers 2003), in the vicinities of Athens, Greece (Adamopoulou and Pafilis 2019), in Donji Štoj, Montenegro (Jovanović 2009), near the villages of Velipojë and Trush in Albania (Mizsei et al. 2016), in the vicinities of Istanbul and the Marmara Islands in Turkey (Basoglu and Baran 1977), on the Mediterranean coast of Tunisia and Libya (Arnold and Burton 1978), in United States of America (states California, Connecticut, Kansas, New Jersey, Pennsylvania, New York, Missouri) (Smith and Brodie 1982; Briggler et al. 2015; Taggart 2020) (Fig. 1).

The problem of competition and displacement of other native endemic lizard species by the invader, or introgression with them, is an experts' concern in a number of places, in particular in Greece (Adamopoulou and Pafilis 2019), on the Italian island of Vulcano (D'amico et al. 2018), in mainland Spain and on the Balearic Islands (Silva-Rocha et al. 2012). At the same time, genetic analysis confirmed the different origin of the invasive populations of *P. siculus* originated from different regions of Italy with different lizard morphotypes (Silva-Rocha et al. 2012, 2014).

Being the first discovered on the Black Sea Coast of the Caucasus, *P. siculus* is also the first record of the species in the former USSR and the most north-eastern locality of its secondary range (Fig. 1). Our paper presents preliminary results on current status and tendencies of introduced *P. siculus* population in the vicinity of Sochi, the Black Sea Coast of the Caucasus.

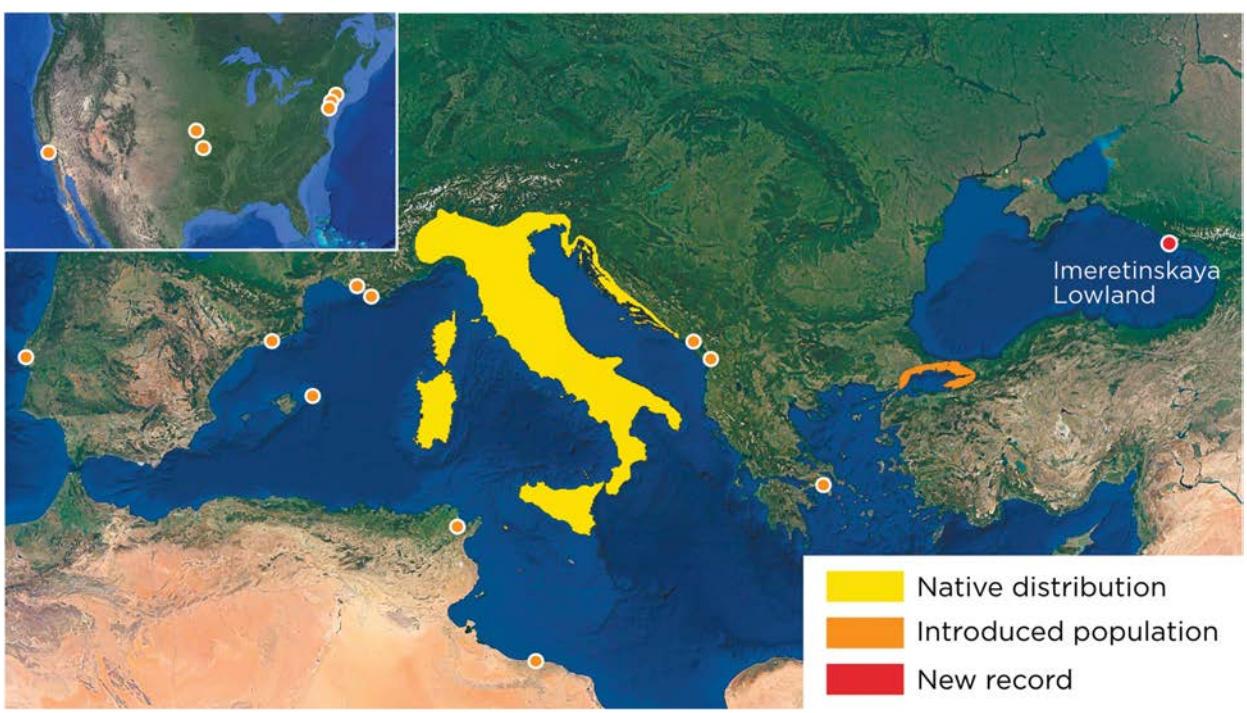

Fig. 1. Native range and introduced populations of *Podarcis siculus*.

MATERIAL AND METHODS

The material was collected in the May of 2020 in a strip survey method in the Imeretinskaya Lowland (Sochi, Russia). Preliminary population density calculations were performed using the transect method by two researchers in a strip 2 m wide around the itinerary, with a total length of three transects about 1 km. The transects crossed all identified biotopes of the species and included plantings of exotic tree and shrub vegetation, extensive grass lawns with shrub planting, water banks and urban development. To identify the colonization area of the invader, we examined all clusters of the Natural Ornithological Park in the Imeretinskaya Lowland and adjacent urbanized areas. The total area of 8 sections of the Park is about 1 km^2, the urbanized territory covers about 10 km^2. The identified population of the Italian wall lizard is just over 0.22 km^2. To determine the possible period of the species introduction, space images of the Imeretinskaya Lowland were analyzed beginning from the transformation of its landscape for the Winter Olympic Games of Sochi 2014 until the May of 2020.

RESULTS AND DISCUSSION

The species was first recorded on the Imeretinskaya Lowland in December 2017, but no one individual was captured. In the May of 2020, special field

Fig. 2. *Podarcis siculus* from the introduced population near Sochi: A – adult males, B – adult female (left) and two half-grown males (right).

Fig. 3. The map of Imeretinskaya Lowland. The arrows indicate the route of displacement of large-sized plants (especially *Olea europea* trees) for their temporary storage area (blue rectangle) to their definitive emplacements.

surveys revealed a large local *P. siculus* population on an area of more than 0.22 km^2 within the Natural Ornithological Park in the Imeretinskaya Lowland. More than 150 animals were observed. Of them, five specimens were captured, including two adult males, one adult female and two half-grown males (Fig. 2A, B). Captured animals were fixed in 96% ethanol after species identification using well known European field guides (Arnold and Burton 1978; Engelmann et al. 1985; Glandt 2015). The material is stored in the collection of the Sochi National Park (SNP No 1877).

Animals inhabited secondary natural biotopes, including the banks of artificial water bodies, areas with introduced trees and shrubs, as well as parks and house lawns within the city boundaries. The population density varied from eight to 40 specimens per 100 m of itinerary. It was higher in low-grass areas with introduced arboreal or arbustive vegetation and large-grass vegetation on the edges of the garden lawns, with *Olea europea*, *Viburnum tinus* L., *Cortaderia selloana* (Shult. et Schult.Fil.), and other less representative species. Lower densities appeared along trails in more shady forest biotopes formed by exotic trees (e.g. *Eucaliptus viminalis* Labill., *Acacia dealbata* Link., *Carya pecan* Engl. et Graebn., *Ligustrum japonicum* Thunb., *Wistaria sinensis* Sweet, *Phyllostachys aurea* A. et C. Riviere, *Lonicera japonica* Thunb.), as well as in the city, around apartments with their own individual gardens.

Among the detected animals in the itinerary, the proportion of young specimens exceeded 40%. It indicates the health and continued growth potential of this emerging population. *Podarcis siculus* from the Imeretinskaya Lowland is similar to the central-northern Italian morphotype (*P. siculus campestris* De Betta, 1857), due to its characteristic dorsal pattern and their unpigmented white belly. It also distinguishes them from other taxa with yellow or orange pigmented bellies such as *P. waglerianus* Gistel, 1868, or *P. melisellensis* (Brown, 1877).

The introduction of *P. siculus* into this area very probably occurred with the importation of gardening material into the terrains of the hotel “Imeretinskiy”, which has been carried out continuously since the first half of 2012. During this period, large-sized plants were delivered in large tubs. Then they were quarantined in an open warehouse area and were finally planted on the mentioned place (Fig. 3). Additional

delivery of large-sized garden materials occurred at late 2013. The trees were planted immediately in the terrains of the coastal quarter of "Imeretinskiy" hotel. The 2012–2013 satellite images clearly showed rows of tubs with trees and shrubs that were standing for more than a year without any movement on the temporary storage site (Fig. 3). This period should be considered as the moment of the colonisation of the recorded group of *P. siculus* individuals. Later this gave rise to the "explosion" – a growing local population. Similar with number of other countries, in the Imeretinskaya Lowland, the main part of the gardening material came from Italy, including large-sized trees of *Olea europea*. Its import is associated with the introduction of the same lizard species in several places of Spain (Valdeon et al. 2010; Rivera et al. 2011), and even of some snakes (Ayllón 2015).

As mentioned above, the first animal was found in 2017. In seven consequent years, the lizards have colonized an area of over 0.22 km^2 and reached a high population density.

In the Imeretinskaya Lowland, the species sympatric with *P. siculus* were *Pelophylax ridibundus* (Pallas, 1777), *Emys orbicularis colchica* Fritz, 1994, *Trachemys scripta* (Schoepff, 1792), *Natrix natrix* L., 1758, *Natrix tessellata* Laurenti, 1768, and *Natrix megalocephala* Orlov et Tuniyev, 1986. Additionally, this local Italian wall lizard population is partly syntopic with *Anguis colchica* (Nordmann, 1840). Before the Olympic Games construction, *Darevskia pontica* (Lantz et Cyrén, 1919) lived in the shrubby thickets of the Imeretinskaya Lowland, while *Lacerta agilis grusinica* Peters, 1960 was known in the coastal sand and gravel rampart (Tuniyev 2008). In the habitat of *P. siculus*, these last two species are absent now due to presumable displacement, or they disappeared in the area of the lowlands, changed during the transformation during the Olympic construction.

CONCLUSIONS

Podarcis siculus should be included in the herpetofauna list of Russia and particularly of the Caucasus. This is an alien species with a proven ability to become an invasive species. Our field study confirmed high population density and high percentage of juveniles of this species, and we expect that it's area of occupancy can even increase. This will lead to a greater undesirable and unavoidable contact with native small lizards of the genus *Darevskia* Arribas, 1997, in particular with *D. brauneri* (Méhely, 1909), *D. pontica*, and possibly with *D. derjugini* (Nikolsky, 1898) at the lower altitudinal limits of the last species distribution.

The larger size of *Lacerta agilis grusinica* suggests its competitiveness with *P. siculus*, while small lizards of the genus *Darevskia* can be displaced or eaten by the larger *P. siculus*. The high population density reached by *P. siculus* can also negatively affect the rare *Lacerta a. grusinica* in terms of food competition, since one of the characteristics of successful colonization of new habitats by *P. siculus* is the wide range of feeding resources (Capula and Aloise 2011; Mačat et al. 2015; Adamopoulou and Pafilis 2019). On the other hand, as it is often observed with new invaders, after a sudden rise in population abundance a decline up to their complete disappearance could happen (Simberloff 2013). However, old introduction evidences of this species (for instance in Spain) are stable from decades ago (OA own observations).

To confirm or refute the assumed scenarios of further invasion of *P. siculus* on the Black Sea Coast of the Caucasus, constant monitoring of the inhabited area and the number of Italian wall lizards and molecular identification in the future research are desirable. Further action plans for this *P. siculus* population should be developed depending on future trends in the studied population.

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Submitted August 10, 2020; accepted August 25, 2020.