

**NEW RECORDS OF *VERTIGO GEYERI* (GASTROPODA: VERTIGINIDAE) IN LITHUANIA**

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**Introduction**

*Vertigo geyeri* Lindholm, 1925 is considered to be a Boreo-Alpine and endemic European species (Kerney, 1999) with scattered and often localised range distribution from Ireland to Russia (Cameron *et al.* 2003; Bank *et al.* 2006; Killeen *et al.*, 2011).

The species according to IUCN red list category and criteria was firstly assessed as Vulnerable (1986 – VU) and later – Lower Risk and Conservation Dependant (1996 – LR/CD), especially in the southern and western part of the range, because of disturbance and drying habitats of these water demanding species (Killeen *et al.*, 2011). It was listed under Annex II of the Habitats and Species Directive [92/43/EEC]. The Directive requires surveillance of *V. geyeri* to determine whether Favourable Conservation Status has been achieved (Cameron *et al.*, 2003). The last European regional assessment made in 2011 gives Least Concern (LC) for species at the level of the 27 member States of the European Union (Killeen *et al.*, 2011).

Most probably *Vertigo geyeri* firstly was found in the southwestern Lithuania in 1937. One individual was found by M. Valius during an expedition on the south valley of Obelija lake, 6 km north of Seirijai (Alytus district) with P. Šivickis, J. Maniukas and malacological experts from abroad - Danish malacologist H. Schlesch and Estonian malacologist C. Krausp (Schlesch & Krausp, 1938). As previously *V. geyeri* and *V. genesii* were not separated as different species and it was named as “*Vertigo (Vertigo) genesii geyeri* Lindholm, 1925”, for a long time there was a doubt, which species has been found then. *Vertigo geyeri* was considered to be a subspecies of *V. genesii* or *V. parcedentata* until 1966 (Waldén, 1966). Occurrence of *V. geyeri* in Lithuania was doubtful until 2000 as later studies near the Obelija lake by P. Šivickis (1960), A. Gurskas (1997; 2002), P. Ivinskis, G. Vaivilavičius, G. Skujienė did not confirm the existence of this species in Lithuania.

In 2003, *Vertigo geyeri* was found in several localities of Lithuania quite far away from each other – in the Siberija transition mires (Plateliai, Plungė district) and in the transition mires near Vokšelis lake (Švenčionys district) (Lietuvos raudonoji knyga, 2007). One mire near Vokšelis lake, due to its small area (0.1 ha), was not suitable for Natura 2000 protection, although the abundance of *V. geyeri* was quite high (from 10 to 41 specimens in samples of 1 m<sup>2</sup>). In other place, a total of 6 specimens (from 0 to 3 specimens in samples of 1 m<sup>2</sup>) were found but covering area of Siberija transition mires was about 38 ha and it was included to Natura 2000 protection sites. After extensive research 5 years later, in 2008, the abundance was 17% lower and the probable cause –

the marsh succession – overgrowth was clearly observed. However during the same studies two new places of *V. geyeri* relatively close to Siberija were added – Velėnija and Paburgė transition mires and fens (Skujienė, 2008). During the same summer single specimens of *V. geyeri* were found in Dzūkija National Park (Vaivilavičius, 2008): three localities were less than 1.3-4.6 ha but one covered about 10 ha (transition mires by the Skroblus river near Kapiniškiai). The last one was included into Natura 2000 protection sites like the transition mires of Siberija. The latest monitoring of *V. geyeri* by P. Ivinskis, J. Rimšaitė (Arbačiauskas, 2015) provided the information on some new localities: 1 specimen of *V. geyeri* was found in Debesnas fens (Varniai Regional Park) and 5 specimens – in transition mires or fens by the Rūžas lake, near Birdekšniai village (Ignalina distr.).

*Vertigo geyeri* has been protected in Lithuania since 2003. It was included to Lithuanian Red data book (2007) to category 3(R), as rare species which populations are low due to their biological characteristics. In total there were nine isolated subpopulations of the species in Lithuania known prior to these studies. The species was considered to meet the threshold of a 17% population decline over the last 10 years. Species was threatened by habitat loss, lowering of water levels and drainage, lack of grazing, shrubs encroachment and succession.

The inventory of the Geyer's whorl snail (*V. geyeri*) on the territory of Lithuania was carried out in the implementation of 2018 December 21<sup>st</sup> signed contract by the Lithuanian Fund for Nature with the State Service for Protected Areas under the Ministry of Environment of the Republic of Lithuania No. F4-2018-219 concerning the provision of an inventory and reporting service on a species of Geyer's whorl snail (*V. geyeri*). These studies are being carried out by the Ministry of Environment of the Republic of Lithuania implementing the LIFE Integrated Project "Optimization of Natura 2000 Network Management in Lithuania" No. LIFE16IPE/LT/016 (LIFE-IP PAF-NATURALIT), funded by the European Union for the Environment and Climate Policy Program (LIFE). This article provides data on the first year of inventory for *V. geyeri*.

## Material and Methods

The present study was approved by the Lithuanian Environment Protection Agency Permission on snail collecting and study (No. 51, 23 08 2019). All data have been entered to the Lithuanian Information system of protected species (SRIS) till the 1<sup>st</sup> of October, 2019. All collected material is deposited in the Zoological Museum of Vilnius University.

In total, 39 localities from Vilnius, Trakai, Švenčionys, Telšiai, Kelmė, Plungė, Mažeikiai, Skuodas districts were studied from the 26<sup>th</sup> of June to the 24<sup>th</sup> August of 2019.

Each locality was surveyed according to a standardised monitoring protocol (Moorkens & Killeen, 2011), adapted for Lithuanian conditions. This protocol included assessment of area of occupancy and quality of habitat, survey and sampling (0.25 x 0.25 x 0.05 m<sup>3</sup>) along linear transects or spot plots, and analysis of molluscan species (*V. geyeri* and other) from 1-10 (generally 3-5) samples taken from each locality. Field surveys in Lithuania included habitat assessment and data collection using QField – the mobile GIS app, followed by sieving and identification of mollusc species in the

laboratory, and adding all information to the QGIS project stored on the server at the State Service for Protected Areas under the Ministry of Environment.

#### List of localities

No.	Locality	Administrative mun.	Coordinates (LAT, LONG)
1.	Šilėnai	Vilnius dist.	54.731705, 25.032781
2.	Levonys	Vilnius dist.	55.00306, 25.427446
3.	Kiemeliškės	Vilnius dist.	54.679978, 25.03702
4.	Lieplaukė	Telšiai dist.	55.963608, 22.154816
5.	Survilai	Telšiai dist.	55.865666, 22.357988
6.	Varniai	Telšiai dist.	55.737416, 22.356557
7.	Jautmalkė	Kelmė dist.	55.79705, 23.02083
8.	Kunigiškė	Kelmė dist.	55.785469, 23.050601
9.	Juodlė	Kelmė dist.	55.81208, 22.933664
10.	Gudmoniškė	Kelmė dist.	55.869862, 22.937903
11.	Paburgė	Plungė dist.	56.021207, 21.931866
12.	Virkšai	Plungė dist.	56.059432, 21.869517
13.	Plateliai	Plungė dist.	56.055762, 21.828082
14.	Stirbaičiai	Plungė dist.	56.004869, 21.799667
15.	Velėnija	Plungė dist.	56.01662, 21.795187
16.	Laukagalys	Švenčionys dist.	55.254733, 25.744653
17.	Padumblė	Švenčionys dist.	55.244707, 25.769899
18.	Jusiai	Švenčionys dist.	55.196336, 25.947191
19.	Vajukiškė	Švenčionys dist.	55.254296, 26.154018
20.	Vaičiūkiškė	Švenčionys dist.	55.23406, 26.144956
21.	Vilūniškės	Trakai dist.	54.751054, 24.867997
22.	Gratiškės	Trakai dist.	54.71571, 24.88267
23.	Strazdiškės	Trakai dist.	54.69625, 24.88739

## Results

In 2019, during inventory, *V. geyeri* (Fig. 1) was found in 23 localities (Fig. 2): three localities (Paburgė, Varniai, Velėnija) were revised, other 20 – are new records for Lithuania.

*V. geyeri* was present in 23 surveyed localities, 74% of them had complexes of wetland habitats with the presence of 7230 habitat (Alkaline fens). *V. geyeri* was less abundant in localities, where only 7140 (Transition mires and quaking bogs) or 7160 (Fennoscandian mineral-rich springs and springfens) habitats were present, but not 7230 type of habitat. Of the 39 localities with wetlands that were investigated, 13 were rejected after habitat inspection on site. They were far different in plant species composition from 7230, 7140 or 7160 types of habitats and considered as unsuitable for *V. geyeri*.

More detail information about localities (Fig. 2) where transition mires and alkaline fens with *V. geyeri* were found is presented in the List of localities and description of specimens.

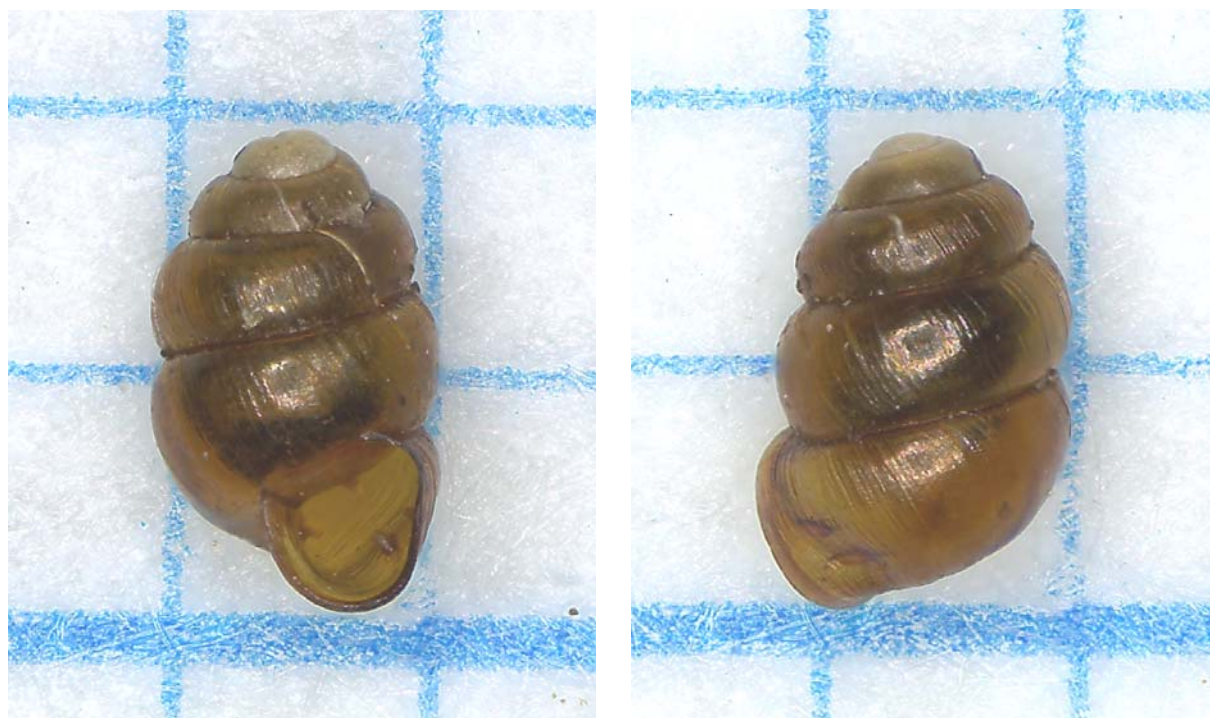


Figure 1. *Vertigo geyeri* Lindholm, 1925 (front and profile views) from Strazdiškės, Trakai district, Lithuania. Species identification was confirmed by dr. Ian Killeen (Ireland, County Wicklow, Greystones, Malacological Services). Scale bar of the grid – 1 mm. Photo: S. Juzėnas.

***Vertigo geyeri* Lindholm, 1925** (Fig.1, 2)

1. Šilėnai mire, 7230 habitat, 04 07 2019, 7 samples, 33 ad., 3 juv. (G. S.)
2. Siaurukai mire, 7140 habitat, 24 07 2018, 5 samples, 1 ad., 1 juv. (G. S.)
3. Didžiulis lake mire, 7230 habitat, 26 06 2019, 5 samples, 17 ad., 6 juv. (G. S., V. K.)
4. Užgiriai village mire, 7230 habitat, 21 08 2019, 5 samples, 21 ad., 10 juv. (G. S., A. P.)
5. Sydeklis mire, the complex of 7140 and 7230 habitats, 24 08 2019, 5 samples, 35 ad., 37 juv. (G. S., A. P.)
6. Debesnas mire, the complex of 7230 and 7140 habitats, 21 08 2019, 10 samples, 25 ad., 32 juv. (G. S., A. P.)
7. Smirdėlė mire, 7230 habitat with fragments of 7140, 23 08 2019, 3 samples, 17 ad., 16 juv. (G. S., A. P.)
8. Lygė mire, the complex of 7140 and 7230 habitats, 23 08 2019, 5 samples, 11 ad., 1 juv. (G. S., A. P.)
9. Juodlė mire, 7230 habitat with fragments of 7140, 23 08 2019, 5 samples, 28 ad., 24 juv. (G. S., A. P.)
10. Gudmoniškė mire, 7230 habitat, 23 08 2019, 3 samples, 16 ad., 4 juv. (G. S., A. P.)
11. Burgalis lake mire, 7140 habitat with fragments of 7230, 07 08 2019, 3 samples, 8 ad., 3 juv. (G. S., V. K.)
12. Briedinė mire, 7230 habitat, 06 08 2019, 4 samples, 48 ad., 44 juv. (G. S., V. K.)
13. Gaudupis (Šeirė) mire, the complex of 7230 and 7140 habitats, 06 08 2019, 5 samples, 16 ad., 3 juv. (G. S., V. K.)
14. Stirbaičiai mire, 7140 habitat, 08 08 2019, 1 sample, 3 ad. (G. S., V. K.)

15. Velėnija mire, the complex of 7230 and 7140 habitats, 08 08 2019, 5 samples, 88 ad., 45 juv. (G. S., V. K.)
16. Dumblynė mire, 7230 habitat with fragments of 714, 09 07 2019, 5 samples, 5 ad., 2 juv. (G. S.)
17. Padumblė mire, 7230 habitat, 09 07 2019, 5 samples, 38 ad., 35 juv. (G. S.)
18. Sirgelis lake mire, 7140 habitat, 28 07 2019, 4 samples, 6 ad., 1 juv. (G. S.)
19. Kretuonykštis lake mire, 7230 habitat, 28 07 2019, 3 samples, 17 ad., 18 juv. (G. S.)
20. Vaičiūkiškė mire, 7230 habitat, 28 07 2019, 2 samples, 14 ad., 11 juv. (G. S.)
21. Bražuolė river mire, 7140 habitat, 04 07 2019, 3 samples, 3ad. (G. S.)
22. Bražuolė river mire, 7140 habitat, 26 06/ 04 07 2019, 9 samples, 7 ad., 1 juv. (G. S., V. K.)
23. Bražuolė river mire, the complex of 7140 and 7160 habitats, 04 07 2019, 3 samples, 7 ad., 2 juv. (G. S.)

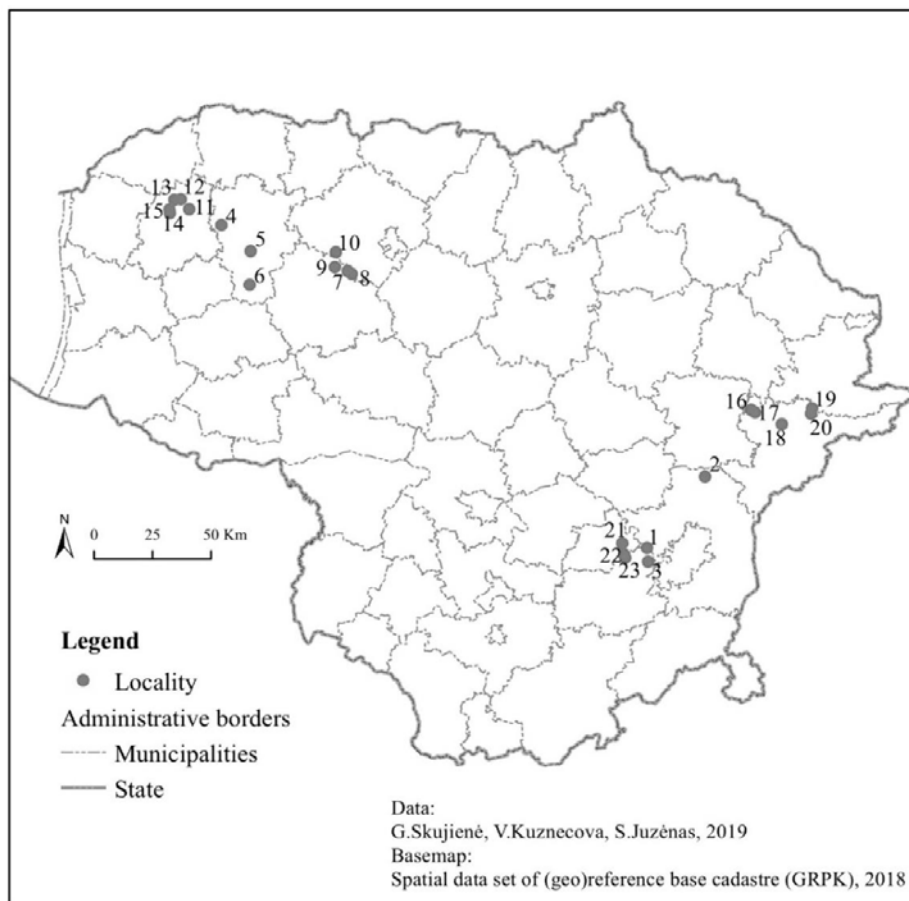


Figure 2. Distribution of 23 localities where *V. geyeri* was found during inventory in 2019. More detailed information on numbers is provided in the List of localities and description of specimens.

## Discussion

After reviewing of the results of the first year of inventory of *V. geyeri* in Lithuania, we realized that situation is far from the worst for this species, and 20 new localities documented here show that distribution of *V. geyeri* throughout Lithuania is much wider



than previously thought. A similar increase in the number of known sites for the species occurred in Slovakia, Poland and Great Britain as a result of new expert surveys (Cameron & Killeen, 2001; Schenková *et al.*, 2012).

Initially, the inventory of snails was focused on 7140 Transition mires and quaking bog habitats, as previously findings of *V. geyeri* were recorded only in those habitats (e.g. Siberija transition mire near Plateliai lake in Plungė district or Kapiniškės transition mire in Varėna district). However, an analysis of the literature (Moorkens & Killeen, 2011; Schenková *et al.*, 2012) had shown that optimal habitats for *V. geyeri* include 7230 Alkaline fens which are found in Lithuania and our results confirmed this tendency.

Previous studies showed that *V. geyeri* possesses rather broad ecological amplitude along the gradient of mineral richness (Horsák & Hájek, 2005; Vavrová *et al.*, 2009) and needs constancy of hydrogeological conditions, but with enough variations in wetness through slope and vegetation height to provide refuges for the meteorological extremes that the habitat must endure (Moorkens & Killeen, 2011). Although the greatest indicator of optimal habitat for *V. geyeri* in Ireland was the presence of tufa-forming spring, majority of habitats with tufa-forming springs in Lithuania are on slopes or in forests. Therefore, a much better criterion for selecting study sites was site openness, humidity, and vegetation height with specificity of low herbaceous plants (as *Carex viridula* subsp. *brachyrhyncha* (Celak.) B. Schmid (synonym *Carex lepidocarpa* Tausch), *Eleocharis quinqueflora* (Hartmann) O. Schwarz) and cover of mosses, especially *Campylium stellatum* (Hedw.) C.E.O. Jensen.

*V. geyeri* was present in almost all purposefully sampled mosses and this could explain why earlier such low abundance of specimens was observed. Previous searches of molluscs were limited to the direct search in the field or sampling of litter with plant falls or plant cuts (Balčiauskas, 2016). Our studies have shown that even while absent in direct searching in the field, *V. geyeri* could be quite abundant in the laboratory after sieving typical mosses and picking out molluscs.

## Acknowledgements

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We thank the staff of the Žemaitijos National Park, Kurtuvėnų Regional Park and Varnių Regional Park who showed interest and provided information regarding the study sites or helped with accommodation, namely, the specialists-ecologists-biologists Gitana Sidabrienė, Saulius Sidabras and Vidmantas Lopeta and additional gratitude to the director of Varniai regional park, Irena Zimblienė.

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### **Naujos *Vertigo geyeri* (Gastropoda: Vertiginidae) radimvietės Lietuvoje**

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#### **Santrauka**

2019 metais ištyrus 39 potencialiai tinkamas *V. geyeri* gyventi teritorijas Vilniaus, Trakų, Švenčionių, Kelmės, Plungės, Mažeikių ir Skuodo rajonuose, *V. geyeri* buvo rasta 23-jose pelkėse, iš kurių 20 teritorijų – naujos Lietuvai. Sėkminga inventorizacija siejama su pastarojo dešimtmečio mokslinės literatūros analize, malakologo iš Airijos dr. I. Killeen konsultacijomis, galimybe pasinaudoti BIGIS duomenų baze, botaniko-eksperto dalyvavimu atrenkant tipingas *V. geyeri* buveines ir augalus/ samanias Lietuvoje, ir moliuskų rinkimo metodikos pakoregavimu. 2019 metų rezultatai patvirtino, kad *V. geyeri* optimaliausias buveinės Lietuvoje – 7230 Šarmingos žemapelkės; rekomenduotini indikatoriniai induočiai augalai ir samanos – *Carex viridula* subsp. *brachyrhyncha* (sin. *Carex lepidocarpa*), *Eleocharis quinqueflora* ir *Campyllum stellatum*; tinkamiausias rinkimo metodas – ne tiek tiesioginis rinkimas gamtoje, bet samanų paklotės mėginių, surinktų linijine transekta ar taškiniu būdu, paėmimas ir išrinkimas laboratorijoje.

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