Progress towards research and conservation of Georgian freshwater molluscs

Article · February 2019

CITATIONS
0

READS
133

9 authors, including:

Levan Mumladze
Ilia State University
68 PUBLICATIONS **350** CITATIONS
SEE PROFILE

Ani Bikashvili
Ilia State University
7 PUBLICATIONS **5** CITATIONS
SEE PROFILE

Nino Kachlishvili
Ilia State University
1 PUBLICATION **0** CITATIONS
SEE PROFILE

Jozef Grego
Independent Researcher
42 PUBLICATIONS **164** CITATIONS
SEE PROFILE

Kosovo is planning to join the European Natura 2000 Network and the first finding of *Vertigo moulinsiana* broadens the taxonomic scope of indicator species during a future site designation process.

Field work in 2018 was supported by the Kosovo Environmental Programme, and in 2014 and 2016 by the Austrian Science Fund (FWF P 26581-B25).

Cuttelod, A., Seddon, M. & Neubert, E. 2011. *European Red List of Non-marine Molluscs*. Publications Office of the European Union, Luxembourg. x + 97 p.

De Winter, A.J. & Maassen, W.J.M. 1992. Two new Hygromiidae from Crna Gora and Kosovo (Gastropoda Pulmonata), with a checklist of the hygromiid species described from western Balkan. *Basteria* 56: 173-192.

Fehér, Z. & Szekeres, M. 2016. Taxonomic revision of the rock-dwelling door snail genus *Montenegrina* Boettger, 1877 (Mollusca: Gastropoda: Clausiliidae). *ZooKeys* 599: 1-137.

Glöer, P. & Pešić, V. 2014. Two new species of the genus *Bythinella* Moquin-Tandon, 1856 (Mollusca: Gastropoda: Hydrobiidae) from the western Balkan peninsula. *Ecologica Montenegrina* 1(4): 249-255.

Grego, J., Glöer, P., Erőss, Z.P. & Fehér, Z. 2017. Six new subterranean freshwater gastropod species from northern Albania and some new records from Albania and Kosovo (Mollusca, Gastropoda, Moitessieriidae and Hydrobiidae). *Subterranean Biology* 23: 85-107.

Hoti, D. 2018. *Distribution and Habitat Specificity of Terrestrial Snails (Gastropoda) in Kosovo*. BSc Thesis, University of Konstanz, Konstanz. 72 p.

Jaeckel, S. 1954. Zur Systematik und Faunistik der Mollusken der nördlichen Balkanhalbinsel. *Mitteilungen aus dem Zoologischen Museum in Berlin* 30(1): 54-95.

Killeen, I., Moorkens, E. & Seddon, M. 2012. *Vertigo moulinsiana*. The IUCN Red List of Threatened Species 2012: e.T22939A128409258. Accessed 9 December 2018.

Nordsieck, H. 1971. Zur Anatomie und Systematik der Clausilien, IX. Dinarische Clausiliidae, III: das Genus *Herilla*. *Archiv für Molluskenkunde* 101(1/4): 39-88.

Nordsieck, H. 1972. Zur Anatomie und Systematik der Clausilien, XI. Neue Formen und taxonomische Revision einiger Gruppen der Alopiinae. *Archiv für Molluskenkunde* 102(1/3): 1-51.

Nordsieck, H. 1974. Zur Anatomie und Systematik der Clausilien, XV. Neue Clausilien der Balkan-Halbinsel (mit taxonomischer Revision einiger Gruppen der Alopiinae und Baleinae). *Archiv für Molluskenkunde* 104(4/6): 123-170.

Pintér, L. 1972. Die Gattung *Vitrea* Fitzinger, 1833 in den Balkanländern (Gastropoda: Zonitidae). *Annales Zoologici* 29(8): 209-315.

Radoman, P. 1983. Hydrobioidea a superfamily of Prosobranchia (Gastropoda) I. Systematics. *Pozebna Izdanja, Prirodnjatshku Muzej u Beogradu* 57: 1-256.

Schütt, H. 1960. Neue Höhlenschnecken aus Montenegro. *Archiv für Molluskenkunde* 89(4/6): 145-152.

Schütt, H. 1975. Die Formen der Gattung *Iglica* A.J. Wagner. *Archiv für Molluskenkunde* 106(1/3): 1-14.

Seddon, M.B. & Holyoak, D.T. 1993. Land Gastropoda of NW Africa: new distributional and nomenclatural data. *Journal of Conchology* 34(5): 321-332.

Sturany, R. & Wagner, A.J. 1915. Über schalentragende Landmollusken aus Albanien und Nachbargebieten. *Denkschriften der kaiserlichen Akademie der Wissenschaften, mathematisch-naturwissenschaftliche Klasse* 91: 19-138.

Tomić, V. 1959. Sbirka retsentikh puzheva P.S. Pavlovića, u Prirodnjatshkom Muzeju u Beogradu [P.S. Pavlovic's collection of the recent gastropods in the National History Museum in Belgrade]. *Pozebna Izdanja, Prirodnjatshku Muzej u Beogradu* 27: 1-74.

Veselaj, Z. & Mustafa, B. 2015. Overview of nature protection progress in Kosovo. *Landscape Online* 45: 1-10.

Zoltán Fehér, Hungarian Natural History Museum, Department of Zoology, Baross 13, 1088, Budapest, Hungary. feher.zoltan@nhmus.hu
Zoltán Péter Erőss, Bem 36, 1154 Budapest, Hungary. erosspeter@hotmail.com
Tamás Deli, Móricz Zs. 2., 5500 Gyomaendrőd, Hungary. dt.cono@gmail.com
Halil Ibrahimi, University of Prishtina "Hasan Prishtina", Faculty of Mathematics and Natural Sciences, Department of Biology, Mother Teresa p.n., 10,000 Prishtina, Kosovo. halil.ibrahimi@uni-pr.edu

PROGRESS TOWARDS RESEARCH AND CONSERVATION OF GEORGIAN FRESHWATER MOLLUSCS

By Levan Mumladze, Ani Bikashvili, Nino Kachlishvili, Jozef Grego, Bella Japoshvili, Katrin Schniebs, Maxim Vinarski, Andrzej Falniowski & Dmitry Palatov

According to WWF estimates, worldwide populations of freshwater species have declined by 76 % since 1970 and the rate of decline is two times faster than in land or marine ecosystems (McLellan *et al*., 2014). On the other hand, while freshwater ecosystems constitute less than 1 % of the world's surface area, they support around 10 % of its biodiversity, which makes them a top conservation priority (Strayer & Dudgeon, 2010). Some of the reasons for the high vulnerability of freshwater ecosystems are increasing demand for their services, pollution, habitat degradation, flow modification and biological invasions (Dudgeon *et al*., 2006). Among freshwater faunas, probably one of the most affected animal groups is the molluscs, which include many rapidly declining species as well as some of the most important invasive alien species. Saving vulnerable mollusc species on the one hand and mitigating the spread of aliens on the other requires a substantial knowledge of their biology, taxonomy and ecology. Unfortunately, there is yet much left to understand about freshwater molluscs.

The Republic of Georgia (Fig. 1) is rich with all kinds of freshwater habitats. It is a central part of the Caucasus biodiversity hotspot, though freshwater biodiversity was not considered when attributing this status to the region (Myers *et al*., 2000). The reason is clear since the freshwater fauna was and still is largely understudied in the Caucasus. Molluscs are no exception. In the 20th century, only a handful of papers on them were published (e.g. Lindholm, 1913; Zhadin, 1932, 1952; Starobogatov, 1962). Since the 1989 collapse of the Soviet Union no research paper on Georgian freshwater molluscs was published until Vinarski *et al*. (2014). Taking

Fig. 1. Location of Georgia between the Black and Caspian Seas, and showing the location of the Caucasus mountain ranges. www.freeworldmaps.net

into account that Georgian freshwater molluscs were scarcely studied during the Soviet time, knowledge of species diversity and distributions is miserable. Not surprisingly, there is no Red-listed or protected mollusc species in Georgia and they have never been taken into account during human alteration of freshwater habitats.

To fill this gap, in 2017 we launched a project aimed at studying freshwater molluscs of Georgia and promoting their conservation. There are for main directions of our work, as follows.

Freshwater mollusc inventory

Apart from four recent articles (Vinarski *et al*., 2014; Grego *et al*., 2017; Mumladze *et al*., in review; Vinarski & Palatov, in review), there have been no other publications clarifying or updating the systematics or distributions of freshwater molluscs of Georgia during the last 40 years. The only check-list of Georgian freshwater molluscs was that of Javelidze (1973) in which the taxonomy was outdated and information on species distributions unreliable and unusable (for example western Georgia was indicated as an occurrence but without reference to more precise localities or to voucher specimens). A recent compendium of freshwater molluscs of Russia and adjacent countries by Vinarski & Kantor (2016) lists 91 species and subspecies of 14 families for Georgia (Lymnaeidae (12 (sub)species), Planorbidae (25 (sub)species), Physidae (4 (sub)species), Acroloxidae (1 species), Valvatidae (2 species), Neritidae (2 species), Hydrobiidae (8 species), Viviparidae (2 species), Bythinellidae (1 species), Bithyniidae (2 species), Melanopsidae (6 (sub)species), Sphaeridae (14 (sub)species), Cyrenidae (1 species), Unionidae (11 (sub)species)) and underlines some taxonomic uncertainties needing to be addressed. For instance, according to this list, some eight species of the superdiverse family Hydrobiidae are recognised in Georgia, which, based on our yet unpublished data, seems significantly underestimated (see also Grego *et al*., 2017). It should be noted that this compendium was based chiefly on already published sources and thus reflects the state of the art rather than providing a new taxonomy. We plan to update the freshwater mollusc species check-list

Fig. 2. Map of Georgia with sampling localities (circles) from which freshwater molluscs were collected in 2016-2018.

for Georgia with modern taxonomy and develop a thorough distributional database for each species, accessible freely on the internet. This will be based mainly on an extensive countrywide inventory of molluscs from all kinds of freshwater systems, landscapes and climatic zones. Unfortunately, two regions of Georgia (Abkhazia and South Ossetia) are currently inaccessible for regular field work (at least for non-Russian citizens) because of military conflict and much less information is expected to be obtained from these areas. During the last two years, we were able to sample a large part of Georgia (more than 400 localities) and collected many freshwater molluscs (Figs. 2, 3). These samples are under intensive study and we are preparing for additional sampling in the upcoming field seasons.

Environmental ecology of all freshwater mollusc species

Since knowledge of a species' environmental requirements is key information for its conservation, we are going to undertake thorough descriptions of species habitats in each locality. This will include geographic data, habitat structure, physico-chemical characteristics of the water and co-occurring communities. With basic ecological studies, we will develop a national red list of freshwater molluscs based on species distributions and habitat preferences.

Develop multilocus DNA barcodes

DNA barcoding is a powerful tool for resolving taxonomic problems, as a component of integrative taxonomy (Will *et al*., 2005) and for inferring evolutionary history (Hjibabaei *et al*., 2007). Since Georgia represents a Plio-Pleistocene refugium for freshwater fauna it is supposed to harbour a vast diversity of endemic or local lineages of species difficult to detect based only on morphology. For these reasons we will use at least two mitochondrial DNA markers (CO1, 16S) to develop barcodes for as many species as possible, especially range restricted or uncertain taxa, to aid in species identification and phylogenetic inference. Up to now, we were able to sequence different genetic markers for several species including *Ancylus* spp., several lymnaeids and hydrobiids, as well as *Theodoxus* spp. and *Viviparus* spp. The work is ongoing and we expect to generate much more data in the near future.

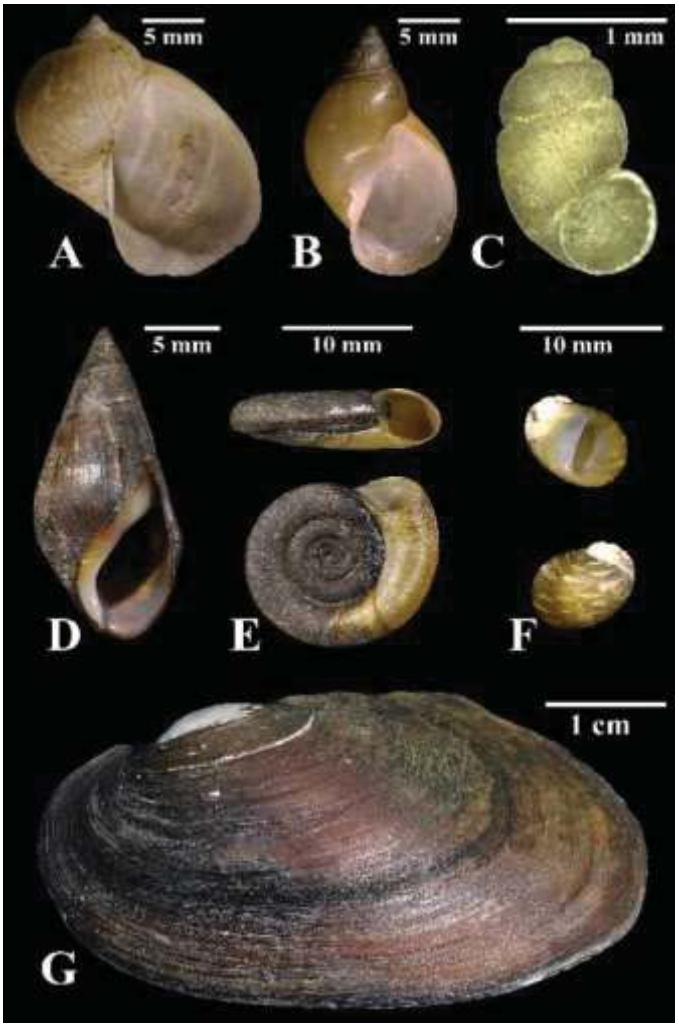

Fig. 3. A sample of recently collected freshwater molluscs from various localities in Georgia. A-B – *Radix* spp., C – *Agrafia* sp., D – *Melanopsis* sp., E – *Planorbis* sp., F – *Theodoxus* sp., G – *Unio* sp.

Develop internal expertise and an international collaborative network

One of the main obstacles to progress in molluscan research in Georgia is the lack of local malacologists in the country. Until recently there was no single local authority interested in freshwater molluscs. One of the primary goals is to support the younger generation in this respect. Currently one PhD and one MSc student are actively studying and working on freshwater molluscs at the Ilia State University and more are planned. By gaining experience of field and laboratory work locally, we are also trying to increase their skills via short term scholarships with external collaborators. To this end, we hope to build an international team to develop the research programme. Our group (the co-authors of this article) is not final and we are happily open to collaboration with as many interested experts worldwide as possible.

Finally, we thank the Shota Rustaveli National Science Foundation (Georgia, grant 217086) for supporting our work in Georgia. Maxim Vinarski thanks the Russian Fund for Basic Research (project no. 19-04-00270) for financial support of his taxonomic research.

Dudgeon, D., Arthington, A.H., Gessner, M.O., Kawabata, Z.I., Knowler, D.J., Lévêque, C., Naiman, R.J., Prieur-Richard, A.-H., Soto, D., Stiassny, M.L.J. & Sullivan, C.A. 2006. Freshwater biodiversity: importance, threats, status and conservation challenges. *Biological Reviews* 81(2): 163-182.

Grego, J., Hofman, S., Mumladze, L. & Falniowski, A. 2017. *Agrafia* Szarowska et Falniowski, 2011 (Caenogastropoda: Hydrobiidae) in the Caucasus. *Folia Malacologica* 25(4): 237-247.

Hajibabaei, M., Singer, G.A., Hebert, P.D. & Hickey, D.A. 2007. DNA barcoding: how it complements taxonomy, molecular phylogenetics and population genetics. *Trends in Genetics* 23(4): 167-172.

Javelidze, G. 1973. Freshwater molluscs. In: *Animal Worlds of Georgia, Vol. IV*. (ed. Kurashvili, B.E.), p. 6-19. Tbilisi, Georgia.

Lindholm, W.A. 1913. Beschreibung neuer Arten und Formen aus dem Kaukasus-Gebiete. *Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft* 45: 17-23, 62-69.

McLellan, R., Iyengar, L., Jeffries, B. & Oerlemans, N., Grooten, N., Guerraoui, M. & Sunters, P. 2014. *Living Planet Report 2014. Species and Spaces, People and Places*. WWF International, Gland.

Mumladze, L., Bikashvili, A. & Japoshvili, B. In review. *Mytilopsis leucophaeata* in Georgia – a first dreissenid record for south Caucasus and notes for other invasive non-marine molluscan species. *Vestnik Zoologii*.

Myers, N., Mittermeier, R.A., Mittermeier, C.G., da Fonseca, G.A.B. & Kent, J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403(6772): 853-858.

Starobogatov, Y.I. 1962. Contribution to knowledge of mollusks from subterranean waters of the Caucasus. *Byulleten' Moskovskogo Obshchestva Ispytateley Pripody, otdel biologicheskiy* 67(6): 42-54. [In Russian]

Strayer, D.L. & Dudgeon, D. 2010. Freshwater biodiversity conservation: recent progress and future challenges. *Journal of the North American Benthological Society* 29(1): 344-358.

Vinarski, M.V., Palatov, D.M. & Glöer, P. 2014. Revision of '*Horatia*' snails (Mollusca: Gastropoda: Hydrobiidae sensu lato) from South Caucasus with description of two new genera. *Journal of Natural History* 48(37-38): 2237-2253.

Vinarski, M.V. & Kantor, Y.I. 2016. *Analytical Catalogue of Fresh and Brackish Water Molluscs of Russia and Adjacent Countries*. KMK Scientific Press, Moscow.

Vinarski, M.V. & Palatov, D.M. In review. A survey of the *Belgrandiella*-like gastropods of the northern Black Sea region (Mollusca: Gastropoda: Hydrobiidae s. lato): morphological variation and morphospecies. *Zoologicheskiy Zhurnal*.

Will, K.W., Mishler, B.D. & Wheeler, Q.D. 2005. The perils of DNA barcoding and the need for integrative taxonomy. *Systematic Biology* 54(5): 844-851.

Zhadin, V.I. 1932. Die Süsserwassermollusken aus der Rion-Höhle bei Kutais. *Archiv für Molluskenkunde* 64: 12-14.

Zhadin, V.I. 1952. Mollusca of fresh and brackish waters of the USSR. *Opredeliteli po faune SSSR, izdavaemye Zoologicheskim institutom AN SSSR. Sovetskaya Nauka, Moscow-Leningrad* 43: 1-346.

Levan Mumladze, Ani Bikashvili, Nino Kachlishvili & Bella Japoshvili, Institute of Ecology and Institute of Zoology, Ilia State University, Kakutsa Cholokashvili st. 3/4, 0162 Tbilisi, Georgia.
lmumladze@gmail.com bela_japoshvili@iliauni.edu.ge
ani.bikashvili.1@iliauni.edu.ge nino.kachlishvili.1@iliauni.edu.ge

Jozef Grego, Horná Mičiná 219, 97401 Banská Bystrica, Slovakia. jozef.grego@gmail.com
Katrin Schniebs, Senckenberg Natural History Collections Dresden, Museum of Zoology, Königsbrücker Landstraße 159, 1109 Dresden, Germany. Katrin.Schniebs@senckenberg.de
Maxim Vinarski, Laboratory of Macroecology and Biogeography of Invertebrates, Saint-Petersburg State University, Universitetskaya Emb. 7–9, 199034 Saint-Petersburg, Russian Federation. radix.vinarski@gmail.com
Andrzej Falniowski, Department of Malacology, Institute of Zoology, Jagiellonian University, Cracow, Poland. afalniowski@o2.pl
Dmitry Palatov, Department of Hydrobiology, Biological Faculty, M.V. Lomonosov Moscow State University, Leninskie Gory 1/12, Moscow, 119234 Russia. triops@yandex.ru

MOLLUSCS ASSESSED BY COSEWIC IN 2018

By Dwayne A.W. Lepitzki & Joseph P. Carney

Two molluscs were assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2018: a species not previously assessed, and a species that was reassessed. COSEWIC is an independent body of experts that assigns conservation status of species using IUCN criteria and recommends listing and legal protection under the Canadian Species at Risk Act (SARA; see *Tentacle* 21 for details). The *Act* requires at-risk species to be reassesssed every ten years. *Webbhelix multilineata* (striped whitelip) is a large terrestrial snail (Fig. 1) present on Pelee Island in Lake Erie and at three sites on the mainland in Ontario, including Point Pelee National Park. It appears to have been extirpated from four other historically known mainland sites and from at least one additional site on Pelee Island. Human-driven habitat loss and alteration led to population isolation and decline. Extreme weather events such as droughts, prescribed burns to restore more natural vegetation regimes, human disturbance and introduced wild turkeys are all threats. COSEWIC assessed this species as Endangered in April 2018.

Physella johnsoni (Banff Springs snail), an endemic confined to thermal springs in Banff National Park, Alberta, Canada

Fig. 1. *Webbhelix multilineata* (striped whitelip), Pelee Island, Lake Erie, Canada, August 2016. (Photo: R. Forsyth)

Fig. 2. A cluster of *Physella johnsoni* (Banff Springs snail), Upper Middle Springs, Banff National Park, Alberta, Canada, June 2017. This subpopulation was re-established in November 2002 after being extirpated. Note the size of snails in contrast to the spruce needles. (Photo: D. Lepitzki)

(Fig. 2), was assessed for the fourth time. In 1997 it made history by being the first extant mollusc to be assessed by COSEWIC. When COSEWIC adopted IUCN criteria in 2000 it was uplisted from Threatened to Endangered, a status reassigned again in 2008 and April 2018. Reasons for this status include an extremely small range, fewer than five locations, continuing decline in habitat quality and annual subpopulation fluctuations of one or two orders of magnitude. While major strides have been made in protecting its habitat from human disturbance, including prohibiting human use of the thermal springs, climate change and drying of thermal springs continue to be major threats.

Status reports for these two wildlife species should be posted soon; follow the links at the COSEWIC website.

Dwayne Lepitzki, Wildlife Systems Research, P.O. Box 1311, Banff, Alberta, Canada T1L 1B3. Co-chair, Molluscs Species Specialist Subcommittee of COSEWIC. lepitzki@telusplanet.net
Joseph Carney, Associate Professor, Biology Department, Lakehead University, Thunder Bay, Ontario, Canada P7B 5E1. Co-chair, Molluscs Species Specialist Subcommittee of COSEWIC jcarney@lakeheadu.ca

PYRGULOPSIS ROBUSTA (WALKER, 1908) IN THE COLUMBIA RIVER: AN INTRODUCTION

By Edward J. Johannes

There has been much concern about the introductions of *Potamopyrgus antipodarum* (New Zealand mudsnail, NZMS) in the Columbia River and elsewhere, as there should be for this extremely invasive species. Another snail thought to have been introduced in the Columbia River drainage before the NZMS is *Radix auricularia* (big-ear radix). Of course, we cannot forget *Corbicula fluminea* (Asian clam), the first introduced mollusc in the Columbia River, which was the