Conservation Leadership Programme: Final Report

FINAL REPORT

CONSERVATION ACTIONS AND INVERTEBRATES INVESTIGATION IN SATAPLIA-TSKALTUBO KARST CAVES, GEORGIA

CLP ID: 04125220

FINAL REPORT

PROJECT NO – 04125220

CONSERVATION ACTIONS AND INVERTEBRATES INVESTIGATION IN SATAPLIA-TSKALTUBO KARST CAVES, GEORGIA

September 28, 2020 – September 24, 2021

The Aim of this Project was to collect accurate data on cave-dwelling invertebrates biodiversity and to assess the conservation status of Inotrechus kurnakovi

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August 2022

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Project Partners & Collaborators

- **Institute of zoology, Ilia State University**

Supported the project with laboratory resources for conducting the research and field equipment (for volunteer students and local communities).

- **Agency of Protected Area**

Gave us permission to collect invertebrate animals in the caves and provided us with data on changes in temperature, humidity, carbon dioxide, oxygen in the caves.

- **Imereti Caves Protected Areas**

Appointed one local ranger to help us with field work and to ensure safety in the caves. Allowed and helped us to present our project and provide information about cave invertebrate and their conservation issue for administration staffs. Also, helped us to communicate with the locals.

- **Staff of Imereti Caves Protected Areas**

Amiran Tkabladze;

Valeri Barbakadze;

Gigo Oniani;

Lasha Erbelidze;

Beto Mikadze

Provided invaluable assistance in field work, data collection and educational activities.

- **Local Government**

Provided some villages with trash bins to eliminate the possibility of household waste entering the caves.

Participated in cave invertebrates conservation discussions and awareness programs.

- **TV company Formula and Ajara Public Broadcaster**

TV companies Adjara and Formula helped us and prepared stories about the project and our activities in the caves.

- **Teachers and directors of local schools**

Helped us to present our project for local pupils and organize a one-day trip to the caves for them.

- **Volunteers:**

Mariam Gogshelidze - BSc student, Ilia State University

Naia Modebadze - BSc student, Ilia State University

Tamar Edisherashvili - PHD student, Ilia State University

Tamta Gognadze - BSc student, Tbilisi Open University

Nino Maghradze - BSc student, Ilia State University

Eleonora Kiria - BSc student, Ilia State University

Valeri Barbakadze – Ranger, speleologist and rescuer in the Imereti Caves Protected Areas

Lasha Erbelidze – Senior Natural Resources Specialist in the Imereti Caves Protected Areas

Mariam Bukia – Local pupil

Marina Goletiani – Local school teacher

- **Project Caucasus Barcode of Life (CaBOL)**

Helped us in DNA sequencing of cave invertebrates collected within our CLP project.

- **Project advisors: Shalva Barjadze and Irakli Macharashvili**

They gave us a lot of useful advice during the project, which helped to implement the project successfully.

Section 1:

Summary

Sataplia-Tskaltubo karst massif has been poorly investigated biopeleologically and we have a species data deficit. Accordingly, the aims of the project were: to investigate karst caves biospeleologically, to assess the conservation status of endemic species and to educate local communities about the biodiversity and threats facing cave biota.

As a result, invertebrate's species number recorded in caves in Sataplia-Tskaltubo karst massif have been increased from 80 species to 109 species. Of which 29 species are registered for the first time in the local caves, while 1 genus and 8 species are new to Science. Descriptions of 4

cave adapted species have been published in the peer-reviewed journals and manuscripts on 4 new species descriptions are under preparation. Local people were educated about the cave dwelling invertebrates and necessity for their conservation. Workshops and excursions decreased the impact of anthropogenic factors in some caves and stirred interest among local school pupils in the cave's biology and its associated disciplines. The conservation status of some rare species wasn't determined by the end of the project because a group of IUCN SSC Cave Invertebrate Specialist proposed to publish publication on distribution of rare, cave dwelling invertebrates prior to assessment of their conservation status.

Introduction

Cave-dwelling invertebrates in Sataplia-Tskaltubo karst massif, Imereti Region, Western Georgia, that includes 49 known caves, are poorly investigated. Only 34% the caves are studied biologically. Fifteen (out of 80 recorded species) invertebrate species are endemics of this karst massif from which only one beetle - *Inotrechus kurnakovi*, has a recognized conservation status - CR in the Georgian Red List.

As a result of the project the cave's invertebrates data, size of populations, distribution range and main threats are known. All of these are important primary steps for the success of future conservation actions.

Knowledge about caves and cave-dwelling animals in Imereti region was very limited among local communities and consequently, there was increased anthropogenic pressure in this region by means of pollution, quarrying and vandalism.

As a result of the project, the species of invertebrates in the cave, the size of the populations, the distribution caves, the main threats are known. All these are an important first steps to the success of future conservation actions.

Sataplia-Tskaltubo karst massif is located in Imereti region, Western Georgia, Caucasus. Karst massif covers 92 km2, including 49 known caves, 4 caves out of them are touristic and only 17 caves are studied biologically. The study area contains caves of special importance due to presence of 15 cave-inhabitant local-endemic species.

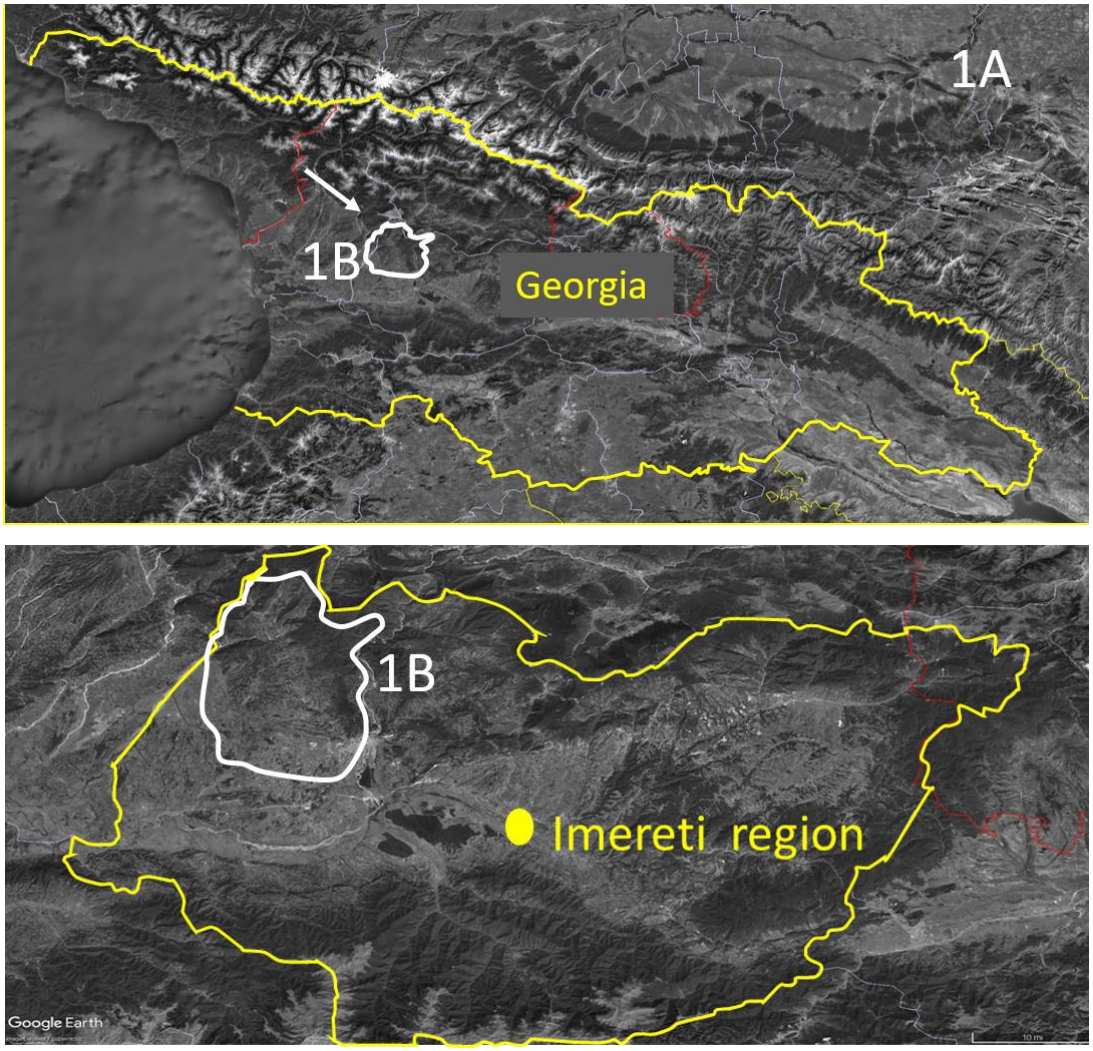
Staff/Rangers of Imereti Caves Protected Areas: monitoring, protecting and preventing illegal actions.

Agency of Protected Area: protection of the cave and cave fauna and promoting conservation projects.

Local Government: cooperating with the local people.

Environmental NGOs: conservation, cooperation with Imereti Caves Protected Areas, awareness raising campaigns in local people and training of caves administration staff.

Local people: cooperating with the Imereti Caves Protected Areas, with local government and with us.



Map 1. The location of the caves studied in the region of Imereti, Sataplia-Tskaltubo karst masif on the map of Georgia **(1A)**; the same zoomed in localities **(1B)**.

Project members

Eter Magradze – Team Leader, PhD student at Emil Racovita Institute of Speleology; Assistant Researcher, Institute of Zoology of Ilia State University.

Duties in the project: Project management, workshops organization, field-worker, education expert, data analysis, cave beetles taxonomist, articles/manuscripts and final report of the project writer.

Lado Shavadze – Master of Biology, laboratory assistant at Institute of Zoology, Ilia State University.
Duties in the project: Field-worker, community worker, communication with locals, reports reviser, Isopods taxonomist, manuscript writer.

Giorgi Bakuradze – Master student at Ilia State University, Faculty of Life Sciences.
Duties in the project: Field-worker, communication with locals, workshops organizer, determinant of species.

Teona Kutalia – Bachelor student at Ilia State University, Faculty of Biology.
Duties in the project: Field-worker, communication with locals, pseudoscorpion taxonomist, cooperation with Imereti Caves Protected Areas.

Section 2:

Aim and objectives

The aim of this project was collecting accurate data on cave-dwelling invertebrates biodiversity and assessing the conservation status of *Inotrechus kurnakovi* and some rare invertebrates in the Sataplia-Tskaltubo karst massif, according to the IUCN Red List categories and criteria.

The objectives of the Project were: 1) Determining and study of nematodes (Nematoda), earthworms and leeches (Annelida), mollusks (Gastropoda), springtails (Collembola), myriapods (Myriapoda), pseudoscorpions (Pseudoscorpionida), spiders (Araneae), harvestmen (Opiliones), crustaceans (Crustacea) and insects (Insecta) in 49% of caves in Sataplia-Tskaltubo karst massif. 2) Raising awareness based on provided detail information of the caves biodiversity and the deplorable results caused by the influence of anthropogenic factors. 3) Collecting of accurate invertebrates biodiversity data and to the assessment of the conservation status of rare invertebrates according to the IUCN Red List.

Changes to original project plan

There were unexpected changes in the assessment of the conservation status of *Inotrechus kurnakovi* and some rare invertebrates in the Sataplia-Tskaltubo karst massif, according to the IUCN Red List categories and criteria. The conservation status of some rare species couldn't be determined by the end of the project, because a group of IUCN SSC Cave invertebrate Specialist proposed to publish separate publication(s) on the distribution of rare, cave dwelling invertebrates prior to the assessment of their conservation status. We are currently working on a manuscript on the distribution of some rare endemic species. After the publication we will again apply to of the IUCN SSC Cave invertebrate Specialists group for species status.

Methodology

At the beginning of the project, for the first time, we selected the caves that were less studied biologically and we organized expeditions there (See photos: 1-9). The specimens were sampled with widely used cave sampling methodologies: by pitfall traps, aspirators and forceps. Pig liver containing pitfall traps were operated in caves during 24 hours for sampling the cave fauna. For morphological investigation invertebrates were stored in 70% ethyl alcohol, while they were kept in 96% or 99% ethyl alcohol in -20°C in the freezer for molecular investigation.

Photo 1. Eter Magradze and Giorgi Bakuradze access to a rock with ropes in a vertical part of a cave to collect invertebrates. Photo by Teona Kutalia

Photo 2. Eter Magradze shows the invertebrate material collected in the cave to project volunteer Tamar Edisherashvili. Photo by Adjara TV channel

Photo 3. Eter Magradze and Lado Shavadze are looking for an invertebrates during the expeditions in the cave. Photo by Mariam Gogshelidze

Photo 4. Eter Magradze, Lado Shavadze and our project advisor Shalva Barjadze are looking for an invertebrates during the expeditions in the cave. Photo by Giorgi Bakuradze

Photo 5. At the entrance of the cave, the leader of the group Eter Magradze and the volunteer students of the project Mariam Gogshelidze and Naia Naia Modebadze. Photo by Shalva Barjadze

Photo 6. *Leucogeorgia prometheus* Antić & Reip, 2020 from the Tetra Cave, Sataphlia-Tskaltubo karst massif. Photo by Lado Shavadze

Photo 7. *Inotrechus kurnakovi* Dolzhanskij et Ljovuschkin, 1989 from the Prometheus Cave, Sataphlia-Tskaltubo karst massif. Photo by Eter Magradze

Photo 8. Prometheus Cave. Photo by Eter Magradze

Photo 9. Eter Magradze and our project volunteers Mariam Gogshelidze and Naia Modebadze are looking for an invertebrates during the expeditions in the caves. Photo by Giorgi Bakuradze

During the expeditions, we also assessed the presence or absence of anthropogenic pressure on the local karst caves, utilizing use of caves as landfills and vandalism as indicators. We collected and analyzed for each caves information on the level of lighting and noise, temperature, humidity and CO2, due to fact that these parameters are used in the ecological investigations of cave invertebrates. For the species identification, we used relevant literature. For morphological investigations the following microscopes were used: compound (Accu–Scope–Exc–350), stereo - (UNITRON Z650HR) and scanning electron (JSM-6510lv) microscopes. In total, about 49% of the caves were studied on the karst massif. DNA barcoding of some cave-dwelling invertebrate groups, helped solving taxonomic issues. A reference database of cave invertebrates of Georgia was performed within the framework of the BMBF-funded project Caucasus Barcode of Life (CaBOL).

As part of the awareness raising campaign, we held the following events: a volunteer group working on the cave inhabitant invertebrates has been established on social media such as Facebook. Using social media, we shared photos and information about ecosystems of the cave-dwelling invertebrates and threats, which would cause extinction of some rare species. After the workshops our team organized expeditions in the caves for volunteers, we taught them on the cave's invertebrates research methods and introduced their threats caused by

anthropogenic factors. As a result of this activity, they received theoretical and practical knowledge on cave invertebrates by collecting and identification methods.

Project team organized workshops for the local communities, schools, local authorities, local protected areas (See photos: 10 – 18). We built their capacity on cave-associated invertebrates and threats caused by the anthropogenic factors. We had discussions and gave recommendations to the audience about how to participate in the conservation activities in the future.

Photo 10. Our group advisor Shalva Barjadze during a meeting with the staff of the touristic cave. Photo by Giorgi Bakuradze

Photo 11. The photo shows a meeting with the local authority. Photo by Lado Shavadze

Photos 12 - 18. The photo shows a meeting with the locals living near the caves on the Sataplia-Tskaltubo karst massif. Photos by Giorgi Bakuradze

Photo 13.

Photo 14.

Photo 15.

Photo 16.

Photo 17. At the entrance to the Prometheus Cave, members of our group, with biology and ecology students. Photo by Giorgi Bakurazde

Photo 18. Project Advisor Shalva Barjadze talks to Biologist and Ecologist Students about cave invertebrates. Photo by Eter Magradze

We have published and distributed illustrated brochures for local people about the caves, cave-dwelling invertebrate animals and threats caused by anthropogenic factors to foster their ongoing interest and participation in cave protection activities. After workshops, we gave cups and T-shirts with cave invertebrates photo and logo of the CLP to the target groups (See photos: 19 – 24). Also, we displayed posters about the invertebrates living in the caves of Sataplia-Tskaltubo karst massif in the visitor centers of the Show Caves administrations.

In order to spread the information widely, also we used TV and web-database cbg.iliauni.edu.ge (Cave Biodiversity of Georgia).

Photo 19. The photo shows a meeting with local pupils that we held in nature. Photo by Eter Magradze

Photo 20. Local school pupils who are interested in cave animals are observing them under a microscope. Photos by Giorgi Bakuradze

Photos 21 – 24. After talking to the locals, expeditions are organized to the caves, where the locals have an opportunity to see the living organisms living in the cave in a natural ecosystem. Photos by Lado Shavadze

Photo 22.

Photo 23.

Photo 24.

Outputs and Results

Objective 1: Determining and study of nematodes (Nematoda), earthworms and leeches (Annelida), mollusks (Gastropoda), springtails (Collembola), myriapods (Myriapoda), pseudoscorpions (Pseudoscorpionida), spiders (Araneae), harvestmen (Opiliones), crustaceans (Crustacea) and insects (Insecta) in 49% of caves in Sataplia-Tskaltubo karst massif.

Result: We surveyed 49% of the caves in the karst massif, these caves are: Datvis, Didgele, Ghliana, Kvilishori tsikhe, Melouri, Opicho, Orpiri II, Patsristavi, Prometheus, Sakadzhia, Sakire, Sarkumali, Sataplia I, Sataplia II, Sataplia IV, Satevzia, Satsurblia, Semi, Solkota, Tetra, Khomuli and Zeda Kvilishori caves, where we found 109 species (See tables: 1;2 and photo: 25), of which 29 are new reported species for caves: 1 genus and 8 species are new for Science: 1 new genus belongs to millipede; new species: 2 - centipedes; 2 - harvestmen; 1-1 - diplura, beetle, leech and springtail respectively. The status of 9 local endemic species registered in the karst massif has changed and we have seen these species in various caves near the type location.

Photo 25. Some explored cave entrances. A – Datvi Cave; B – Solkota Cave; C – Xomuli Cave; D – Melouri Cave; E – Prometheus Cave and F - Orpiri II Cave.

Also, it changed the status of the target species - *Inotrechus kurnakovi*. Before the study it was a local endemic species for only one cave - Prometheus Cave and during the research we found it in several adjacent caves, thus today the *Inotrechus kurnakovi* is only endemic to the karst massif. Based on the material collected, 5 articles have been published (See articles abstract photo: 26 - 30) and 5 manuscripts are being prepared. The articles describe four new species for Science, define the taxonomic status of one false scorpion species and a new record shrimp has been discovered from previously unknown caves; Project results were presented in 25th

international conference on subterranean biology in Cluj-Napoca, Romania and in 18th International Congress of Speleology – UIS 2022 in Savoie, France.

Photos 26 - 30. Abstracts of articles which published on the basis of the material collected within the framework of our project

Photo 26. See the link to the article here: https://www.biotaxa.org/Zootaxa/article/view/zootaxa.4951.3.7

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Article

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Two new species of the genus *Nemaspela* Šilhavý from caves in Georgia (Opiliones: Nemastomatidae)

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Abstract

Two highly specialized endemic troglobiotic harvestman species of the genus *Nemaspela* Šilhavý, 1966 are described. *N. melouri* **sp. nov.** from Melouri Cave and *N. prometheus* **sp. nov**. from Prometheus Cave (Sataplia-Tskaltubo karst massif, Imereti region, western Georgia), respectively. Despite the fact that the entrances of the caves are positioned only 2.5 km apart, the new taxa differ from each other distinctly by presence *vs.* absence of male cheliceral apophysis, which is lacking in the second species. A key to the Caucasian species of the genus is provided. Relationships of *Nemaspela* species within the genus and with hypothetical epigean ancestors are discussed.

Key words: Arachnida, harvestman, new taxa, troglobites, Caucasus

Photo 27. See the link to the article here: https://europeanjournaloftaxonomy.eu/index.php/ejt/article/view/1567

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Research article

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A new Diplura species from Georgia caves, *Plusiocampa (Plusiocampa) imereti* (Diplura, Campodeidae), with morphological and molecular data

Alberto SENDRA[1,*], Ferran PALERO[2], Alba SÁNCHEZ-GARCÍA[3], Alberto JIMÉNEZ-VALVERDE[4], Jesús SELFA[5], Eter MAGHRADZE[6] & Shalva BARJADZE[7]

Abstract. A new dipluran species, *Plusiocampa* (*Plusiocampa*) *imereti* Sendra & Barjadze sp. nov., from the deep zone in three caves in the Imereti region, Georgia, is described. This new troglobitic *Plusiocampa* is an addition to four others known Diplura from around the Black Sea region, two *Dydimocampa* and two *Plusiocampa* s. str. The present study also provides the first CO1 sequences for the Plusiocampinae taxa and the first molecular data for cave-dwelling *Plusiocampa* species. Although bootstrap values were low, the maximum-likelihood phylogenetic tree grouped *Plusiocampa* (*P.*) *imereti* Sendra & Barjadze sp. nov. with two *Plusiocampa* s. str. species from Eastern Europe. Morphologically, *P.* (*P.*) *imereti* Sendra & Barjadze sp. nov. is closely related to two cave-dwelling species: *Plusiocampa* (*Plusiocampa*) *glabra* Condé, 1984 and *Plusiocampa* (*P.*) *chiosensis* Sendra & Gasparo, 2020. The new species can be distinguished by the presence of lateral anterior macrosetae on metanotum, more uneven claws, and the presence of 2+2 lateral anterior macrosetae on middle urotergites. The five species currently known for the Black Sea region inhabit caves located at low altitude but with no influence from former glacial or permafrost processes.

Keywords. Plusiocampinae taxonomy, phylogeny, cave-dwelling, biogeography.

Photo 28. See the link to the article here:

https://kmkjournals.com/journals/Inv_Zool/IZ_Index_Volumes/IZ_19/IZ_19_1_024_034?fbclid=IwAR0dLk_B28jVdhapQkeDqtQtWl-0J90Fo_6vusFMmwSOjGjMSU7qUHeU1wA

Invertebrate Zoology, 2022, 19(1): 24–34

A new species of stygobiotic atyid shrimps of the genus *Xiphocaridinella* (Crustacea: Decapoda: Atyidae) from the Racha-Lechkhumi and Kvemo Svaneti, with a new record of *X. kumistavi* from the Imereti, Western Georgia, Caucasus

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E-mails: coralliodecapoda@mail.ru[1], vanomarin@yahoo.com[1], shalva.barjadze@yahoo.com[2]

ABSTRACT: An integrative approach resulted in a description of a new species of stygobiotic shrimps of the genus *Xiphocaridinella* Sadowsky, 1930 (Crustacea: Decapoda: Atyidae) from the southern part of the Racha-Lechkhumi and Kvemo Svaneti Region of the Western Georgia (SW Caucasus). The area and caves, from which this species is recorded will be flooded during the construction of the Tvishi hydroelectric power plant and it is unknown whether it will be possible to find the species again. *Xiphocaridinella lechkhumensis* sp.n. is easily separated from the other species of the genus both morphologically and genetically, as evidenced by barcoding segments of the mitochondrial COI gene marker (barcoding). In addition, we discovered a new population of *X. kumistavi* Marin, 2017 in the Satevzia Cave from Imereti Region. This population genetically diverged from the type series from the Prometheus Cave by the barcoding gap of 2.4%. The genus *Xiphocaridinella* in the Colchis Valley of the SW Caucasus now encompasses 15 species.
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KEY WORDS: Barcoding, COI mtDNA, Stygobiotic shrimps, Hydrogeology, Caucasus.

Photo 29. See the link to the article here: https://www.tandfonline.com/doi/full/10.1080/09397140.2021.1965072

Zoology in the Middle East, 2021
http://dx.doi.org/10.1080/09397140.2021.1965072

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The taxonomic status of the Caucasian cave-dwelling pseudoscorpion *Chthonius satapliaensis* (Arachnida: Pseudoscorpiones)

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Globochthonius satapliaensis (Schawaller & Dashdamirov, 1988) (**n. comb.**) originally described as *Chthonius (Chthonius) satapliaensis* from a single female collected in the Sataplia II Cave, Imereti Region (Georgia) is redescribed and depicted based on specimens of both sexes from caves of Sataphlia-Tskaltubo karst massif and Zemo Imereti Plateau. Information on all cave recorded pseudoscorpion species from Georgia is given.

Keywords: False scorpions; cave fauna; taxonomy; new combination; Caucasus

Photo 30. See the link to the article here: https://www.mapress.com/zt/article/view/zootaxa.5205.5.2

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Article

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The first troglobiotic cryptopid centipede (Chilopoda: Scolopendromorpha: Cryptopidae) from the Caucasus

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Abstract

Cryptops (*Cryptops*) *datviensis* **sp. nov.** from Datvi Cave in Georgia, is the first troglobiotic species of the genus *Cryptops* Leach, 1814 to be described from the Caucasus. The new species morphologically resembles the common epigean Caucasian species *Cryptops caucasius* Verhoeff, 1934, but differs in typical troglomorphic features, such as elongation of antennae and legs. A key to species of the genus *Cryptops* from the Caucasus is presented. A list of the invertebrates inhabiting Datvi Cave is provided.

Objective 2: Raising awareness based on provided detail information of the caves biodiversity and the deplorable results caused by the influence of anthropogenic factors.

Result: Analysis of anthropogenic factors in the caves revealed that the high anthropogenic impact is in the Prometheus Cave, but it do not affect the cave fauna. As a result of faunal analysis, the karst massif caves are numerically dominated by three genus: *Leucogeorgia, Laemostenus* and *Plutomurus.*

Within the awareness-raising campaign we prepared 200 informational brochures and distributed in the local community; 100 cups and t-shirts with cave invertebrates photo and logo of the CLP were distributed in local schools and volunteers, 4 informational poster installed in the visitor centers of the Show caves administrations.

We arranged three workshops for local communities: Tourist cave administrations staff, schools, local authorities, local protected areas, local nature protected NGOs; to provide information on project activities and findings. One Workshop was attended by the natural resource management specialist and 9 administrations staff from Imereti Caves Protected Areas; director and 1 member of the NGO "Union of speleologists"; 2 advisors of our project; 3 researchers from the institute of zoology of Ilia State University; 6 ecology and biology students and 10 local young volunteers. Total of 33 people.

Objective 3: Collecting of accurate invertebrates biodiversity data and to the assessment of the conservation status of rare invertebrates according to the IUCN Red List.

Result: As I mentioned above, accurate data on the biodiversity of invertebrate animals were collected during the implementation of the project but the conservation status of some rare species wasn't determined by the end of the project because a group of IUCN SSC Cave Invertebrate Specialist proposed to publish publication on the distribution of rare, cave-dwelling invertebrates prior to the assessment of their conservation status.

Communication & Application of results

The outcomes of the project addressed directly the conservation problem of *Inotrechus kurnakovi* and some rare endemic species in the Sataplia-Tskaltubo karst caves.

The following actions include all those activities disseminated to a wide audience on the project issues, results and lesson learnt.

Information brochures: We have used information brochures and posters to communicate on the project's results to the locals. The brochures and posters contained information about the cave dwellers conservation, the threats that are affecting them, and the ways on how local people can contribute to the reduction of these threats.

Workshops: We arranged workshops to provide information on the project activities and findings to stakeholders. As a result, all stakeholders have information about the invertebrates in Sataplia-Tskaltubo karst caves.

Media communication: TV companies Adjara and Formula prepared stories about the project and our activities in the caves. Media work helped to disseminate information about the project among wider audience, inform local stakeholders and gear attention towards general environmental protection issues and threatened species.

Conference participation: Project results were presented in 25th international conference on subterranean biology in Cluj-Napoca, Romania and in 18th International Congress of Speleology – UIS 2022 in Savoie, France. Currently we are working on long-term conservation plan based on the results of our research (See photo: 31)

Photo 31. Participants of the 25th international conference on subterranean biology in Cluj-Napoca, Romania

Monitoring and Evaluation

To assess the acquired knowledge of local communities and caves administration staff after the educational talk and presentations we used survey questions, that represented the effectiveness of the meetings. We developed a questionnaire with 6 questions to assess the impact of our project on awareness of local communities about ecosystems of the cave-dwelling invertebrates and threats which should cause extinction of some rare species. Over 30 people were interviewed (See Table 3). The results of the survey shows that most of the locals increased their awareness about cave-dwelling invertebrates. As a result of the activities performed during our project, they have information about the cave invertebrates in the Sataplia-Tskaltubo karst caves and major threats affecting the species.

Achievements and Impacts

One of the biggest achievements of this project is that in total we collected 109 species, of which 29 are new reported species for caves: 1 genus and 8 species are new for Science. The status of 9 local endemic species registered in the karst massif has changed and we have seen these species in various caves near the type of location. Also, the changed status of the target species - *Inotrechus kurnakovi* Before the study it was a local endemic species for only one cave - Prometheus Cave and during the research we found it in several caves, thus today the *Inotrechus kurnakovi* is only endemic to the karst massif. Based on the material collected, 5 (See photos: 26-30) articles have been published and 5 manuscripts are being prepared. The articles describe four new species for Science and define the taxonomic status of one false scorpion species. Finally, we have detailed biodiversity data, regarding invertebrate species.

As a result of the project, the size of populations, distribution range and main threats for the cave adapted invertebrates are known. All of these are important and necessary steps for the success of conservation actions.

All stakeholders became aware of the existence of cave-dwelling invertebrates and threats which should cause extinction of some rare species in Sataplia-Tskaltubo karst caves. As a result, stakeholders offered us assistance in the conservation activities of cave-dwelling invertebrates.

DNA barcoding of some cave-dwelling invertebrate groups, to solve taxonomic issues, and build a DNA barcode reference library of cave invertebrates of Georgia was performed within the framework of the BMBF-funded project Caucasus Barcode of Life (CaBOL) (coordinated by Ilia State University).

Capacity Development and Leadership capabilities

This project provided the project team members with experience in planning and executing conservation project, team organisation and public relation skills. Now our team is qualified in conducting various research about cave-dwelling invertebrates.

We are always proud of being a CLP alumni and it would be a great honour if we are selected for follow-up award. In consideration with previous experience we are able to plan our project to contribute to the threatened species of cave-dwelling invertebrates in Georgia.

Section 3:

Conclusion

One of the biggest achievements of this project is that we have discovered 29 newly recorded species in the caves of Sataplia-Tskaltubo karst massif and 1 genus and 8 new species for science. Based on the material collected, 5 articles have been published and 5 manuscripts are being prepared. The articles describe four new species for Science and define the taxonomic status of one false scorpion species. Analysis of anthropogenic factors in the caves revealed that the high anthropogenic impact is in the Prometheus Show Cave.

All stakeholders and local people became aware of the existence of the cave adapted invertebrates, principles for the sound management and conservation of cave ecosystems. As a result, stakeholders offered us assistance in the Conservation activities of cave adapted invertebrates. Local people, schools and students have been actively involved in various activities of the project. A volunteer group was formed from ten local young people and six ecologist and biologist students.

We measured the resources and determined that one year is not enough to fully study the caves biologically and to carry out active conservation measures.

Problems encountered and lessons learnt*:*

- *Which project activities and outcomes went well and why?*

Arranging expeditions in caves, sampling invertebrates and finding out species were not difficult, because of prior experience in this matter. It was really pleasant and joyful for our team members to meeting the local population, and disseminate the brochures, posters, T-shirts and cups.

- *Which project activities and outcomes have been problematic and in what way, and how has this been overcome?*

The species for which we wanted to evaluate the conservation status and which were local endemics to the cave, our studies showed that these species are living in different adjacent caves. Based on this situation the IUCN SSC Cave invertebrate Specialist Group members suggested to prepare and publish publications on the distribution of rare cavernicolous taxa prior to assessing their conservation status. To date of this report, we are preparing manuscripts on the distribution of species and their taxonomic status. We will then be able to assess the conservation status of invertebrates according to the IUCN Red List.

- *Briefly assess the specific project methodologies and conservation tools used.*

The specimens were sampled with widely used cave sampling methodologies: by pitfall traps, aspirators and forceps. Pig liver containing pitfall traps were operated in caves during 24 hours for sampling the cave fauna. For morphological investigation invertebrates were stored in 70% ethyl alcohol, while they were kept in 96% or 99% ethyl alcohol in -20°C in the freezer for molecular investigation. During expeditions, we also assessed the presence or absence of anthropogenic pressure on the local karst caves. We collected and analyzed for each caves information on level of lighting and noise, temperature, humidity and CO2. For species identification, we used relevant literature. For morphological investigations the following microscopes were used: compound (Accu–Scope–Exc–350), stereo - (UNITRON Z650HR) and scanning electron microscope (JSM–6510lv) microscopes.

In order to disseminate information and raise awareness with locals, we spread informational brochures, installed posters and hold presentations about cave invertebrates. Also, we use social networks and other media to spreading information.

- *Please state important lessons which have been learnt through the course of the project and provide recommendations for future enhancement or modification to the project activities and outcomes.*

My team members and I learnt that in order to fulfill some conservation activities in the project successfully it is necessary to involve the local people.

It was a real challenge for our group to carry out the activities planned by the project during the COVID-19 pandemic as cities were often closed, public transport was restricted, however our group always found an alternative way out of a difficult situation.

In the future

The project was completed, however, one of the objective of the project: "to assess conservational status for rare species according to the IUCN categories and criteria" could not been determined at the end of the project. The reason why this activity was not completed, is because the species for which we wanted to evaluate the conservation status and which were local endemics to the cave are living in different adjacent caves. Based on this situation the IUCN SSC Cave invertebrate Specialist Group members (Arnaud Faille, Shalva Barjadze) suggested to prepare and publish publications on the distribution of rare cavernicolous taxa prior to assessing their conservation status. Right now, we are preparing manuscripts on the distribution of species and their taxonomical status. Then we will be able to assess the conservation status of invertebrates according to the IUCN Red List categories and criteria.

Further contribution to the conservation of cave invertebrates in the Sataplia-Tskaltubo karst caves will be more intense public awareness. We need more resources to make big interest in locals and stakeholders. Therefore, we are writing a new project proposal to continue study cave invertebrates in Sataplia-Tskaltubo caves in order to conduct needed conservation activities to ensure long term conservation of the population.

Financial Report

Itemized expenses	Total CLP Requested (USD)*	Total CLP Spent (USD)	% Difference	Details & Justification (Justification must be provided if figure in column D is +/- 25%)
PHASE I - PROJECT PREPARATION				
Communications (telephone/internet/postage)	400.00	400.27	0%	
Field guide books, maps, journal articles and other printed materials	350.00	312.80	-11%	
Insurance	240.00	239.23	0%	

Visas and permits				
Team training				
Reconnaissance				
Other (Phase 1)				
EQUIPMENT				
Scientific/field equipment and supplies	1,540.00	1500.29	-3%	
Photographic equipment	500.00	564.61	13%	
Camping equipment				
Boat/engine/truck (including car hire)	3,500.00	3510.94	0%	
Other (Equipment)	386.00	375.08	-3%	
PHASE II - IMPLEMENTATION				
Accommodation for team members and local guides	2,800.00	2778.58	-1%	
Food for team members and local guides	2,240.00	2315.51	3%	
Travel and local transportation (including fuel)	540.00	523.87	-3%	
Customs and/or port duties				
Workshops	900	859.45	-5%	
Outreach/Education activities and materials (brochures, posters, video, t-shirts, etc.)	780.00	792.52	2%	
Other (Phase 2)				
PHASE III - POST-PROJECT EXPENSES				
Administration				
Report production and results dissemination				
Other (Phase 3)				
Total	**14,176.00**	**14,173.15**		

Section 4:

Appendices

Output	Number	Additional Information
Number of CLP Partner Staff involved in mentoring the Project		Rosen Leala Christina Imrich Sherilyn Bos Kate Tointon

Number of species assessments contributed to (E.g. IUCN assessments)	-	-
Number of site assessments contributed to (E.g. IBA assessments)	-	-
Number of NGOs established	-	-
Amount of extra funding leveraged ($)	-	-
Number of species discovered/rediscovered	109	See tables 1 and 2
Number of sites designated as important for biodiversity (e.g. IBA/Ramsar designation)	-	-
Number of species/sites legally protected for biodiversity	6	Prometheus, Melouri, Sataflia I, Satsurblia, Tetra, Ghliana caves
Number of stakeholders actively engaged in species/site conservation management	5	Agency of Protected Areas of Georgia; Imereti Caves Protected Areas; Local government; NGO "Union of speleologists"; Ilia State University; Schools
Number of species/site management plans/strategies developed	1	The long-term conservation plan is in the process of development now
Number of stakeholders reached	8	Ministry of Environmental Protection and Agriculture of Georgia; Agency of Protected Areas of Georgia; Imereti Caves Protected Areas; NGO "Union of speleologists"; Ilia State University; Local government; The locals; The local schools
Examples of stakeholder behaviour change brought about by the project.	4	The locals do not longer throw garbage in the caves; Pollution, quarrying and vandalism in the caves have largely been eliminated; TheImereti Caves Protected Area control a certain part of the

		caves; Institute of zoology at Ilia State University continues supporting the conservation of cave invertebrates after the end of this Project as well.
Examples of policy change brought about by the project	2	The locals and the staff of the Imereti Caves Protected Areas did not have complete information about the cave invertebrates. Now, as a result of our project, they know more how to reduce threats to the cave invertebrates.
Number of jobs created	-	-
Number of academic papers published	5	1) DOI:10.1080/09397140.2021.1965072 2) DOI:https://doi.org/10.5852/ejt.2021.778.1567 3) DOI:https://doi.org/10.11646/zootaxa.4951.3.7 4) DOI:10.15298/invertzool.19.1.04 5) DOI: 10.11646/zootaxa.5205.5.2
Number of conferences where project results have been presented	2	25th international conference on subterranean biology in Cluj-Napoca, Romania and 18th International Congress of Speleology – UIS 2022 in Savoie, France.

Appendix 4.1 CLP M&E measures

Table 1. List of the cave invertebrates (5 new species about which we are preparing publications are not included in the table) in Sataplia-Tskaltubo karst massif (Imereti Region, Western Georgia). Remark: all local endemic species are marked by asterisk. Nss/Nts – stygobitic vs troglobitic species.

N	species	Invertebrate group	Cave Name	Nss/Nts
1	*Bergrothia barbakadzei* Maghradze, Faille, Barjadze & Hlaváč, 2019	**ARTHROPODA,** INSECTA Staphylinidae	Prometheus Cave, Melouri and Datvi caves	-
2	*Troglocimmerites imeretinus* (Dolzhanskij et Ljovuschkin, 1985)	**ARTHROPODA,** INSECTA Carabidae	Prometheus Cave, Sataplia IV cave, Datvi caves, Khomuli cave. Melouri and Tetra caves	Nts
3	*Troglocimmerites* sp. 1	**ARTHROPODA,** INSECTA	Melouri cave	Nts

		Carabidae		
4	*Inotrechus kurnakovi* Dolzhanskij et Ljovuschkin, 1989	**ARTHROPODA,** INSECTA Carabidae	Prometheus Cave, Melouri cave, Tetra cave, Datvi cave, Satevzia and Solkota caves	Nts
5	*Laemostenus (Antisphodroides) ljovushkini* Vereschagina, 1985	**ARTHROPODA,** INSECTA Carabidae	Prometheus Cave, Sakadzhia Cave, Solkota Cave, Melouri cave, Datvi cave, Khomuli cave. Tetra cave, Ghliana cave, Sataplia I cave, Satsurblia and Satevzia caves	-
6	*Aedes vexans* (Meigen, 1830)	**ARTHROPODA,** INSECTA Culicidae	Patsristavi and Tetra caves	-
7	*Dolichopoda euxina* Semenov, 1901	**ARTHROPODA,** INSECTA Rhaphidophoridae	Patsristavi Cave, Sataplia I and Tetra caves	-
8	*Agabus bipustulatus* (Linnaeus 1767)	**ARTHROPODA,** INSECTA Dytiscidae	Prometheus Cave	-
9	*Dryops lutulentus* (Erichson 1847)	**ARTHROPODA,** INSECTA Dryopidae	Prometheus Cave	-
10	**Geyeria* sp. 4 *sensu* Palatov, Sokolova 2016	**ARTHROPODA,** INSECTA Castniidae	Prometheus Cave	Nts
11	*Leuctra* sp. 1	**ARTHROPODA,** INSECTA Leuctridae	Prometheus Cave	-
12	*Limnius colchicus* Delève 1963	**ARTHROPODA,** INSECTA Elmidae	Prometheus Cave	-
13	*Lype phaeopa* (Stephens 1836)	**ARTHROPODA,** INSECTA Psychomyiidae	Prometheus Cave	-
14	*Chthonius (Chthonius) satapliaensis* Schawaller and Dashdamirov, 1988	**ARTHROPODA,** ARACHNIDA Chthoniidae	Prometheus Cave, Sataplia II Cave, Melouri and Datvi caves	Nts
15	**Neobisium (Heoblothrus) sakadzhianum* Krumpál, 1984	**ARTHROPODA,** ARACHNIDA Neobisiidae	Sakadzhia Cave	Nts
16	*Neobisium (Neobisium) labinskyi* Beier, 1937	**ARTHROPODA,** ARACHNIDA Neobisiidae	Tetra Cave	-
17	**Neobisium (Ommatoblothrus) achaemenidum* Nassirkhani & Mumladze, 2018	**ARTHROPODA,** ARACHNIDA Neobisiidae	Tetra Cave	-
18	*Neobisium verae* (Lapschoff, 1940)	**ARTHROPODA,** ARACHNIDA Neobisiidae	Sataplia I Cave, Datvi and Prometheus caves	Nts
19	*Carpathonesticus borutzkyi* (Reimoser, 1930)	**ARTHROPODA,** ARACHNIDA Nesticidae	Patsristavi Cave, Satsurblia cave, Prometheus cave, Melouri cave, Didgele cave, Qvilishori tsikhe cave, Solkota cave, Sakire cave, Khomuli cave, Sataplia I and Tetra Caves	-

20	*Hoplopholcus longipes* (Spassky, 1934)	**ARTHROPODA,** ARACHNIDA Pholcidae	Patsristavi Cave, Qvilishori tsikhe cave, Datvi cave, Sataplia I and Tetra caves	-
21	*Parasitus (Vulgarogamasus) modestus* Tikhomirov & Zelia, 1975	**ARTHROPODA,** ARACHNIDA Parasitidae	Sarkumali and Sataplia IV caves	-
22	**Hypoaspis aculeifer* (Canestrini, 1883)	**ARTHROPODA,** ARACHNIDA Dermanyssoidae	Ghliana Cave	-
23	*Tegenaria* sp.	**ARTHROPODA,** ARACHNIDA Agelenidae	Tetra Cave	-
24	*Macrocheles penicilliger* (Berlese, 1904)	**ARTHROPODA,** ARACHNIDA Macrochelidae	Ghliana and Prometheus Caves	-
25	**Nemaspela prometheus* Martens, Maghradze & Barjadze, 2021	**ARTHROPODA,** ARACHNIDA Nemastomatidae	Prometheus Cave	Nts
26	**Nemaspela melouri* Martens, Maghradze & Barjadze, 2021	**ARTHROPODA,** ARACHNIDA Nemastomatidae	Melouri cave	Nts
27	**Giljarovia redikorzevi* (Charitonov 1946)	**ARTHROPODA,** ARACHNIDA Nemastomatidae	Sataplia I Cave	-
28	*Graptoppia foveolata* Paoli, 1908	**ARTHROPODA,** ARACHNIDA Oppiidae	Prometheus Cave	-
29	*Oribella* sp.	**ARTHROPODA,** ARACHNIDA Oribellidae	Prometheus Cave	-
30	*Leptonetela caucasica* Dunin, 1990	**ARTHROPODA,** ARACHNIDA Leptonetidae	Datvi cave, Melouri cave, Facristavi and Tetra caves	-
31	*Colchidoniscus kutaissianus* Borutzky, 1974	**ARTHROPODA,** MALACOSTRACA Trichoniscidae	Orpiri II Cave, Prometheus Cave, Sakadzhia Cave, Solkota Cave, Tetra Cave, Melouri and Datvi caves	Nts
32	*Colchidoniscus kutaissianus kutaissianus* Borutzky, 1974	**ARTHROPODA,** MALACOSTRACA Trichoniscidae	Orpiri II Cave, Sakadzhia Cave, Solkota Cave, Melouri cave, Satsurblia cave, Satevzia cave, Patsristavi Cave, Sakire cave, Didgele Cave, Tetra and Prometheus caves	Nts
33	*Buddelundiella cataractae* Verhoeff, 1930	**ARTHROPODA,** MALACOSTRACA Trichoniscidae	Sataplia IV Cave	-
34	**Parabathynella stygia* Chappuis, 1926	**ARTHROPODA,** MALACOSTRACA Parabathynellidae	Kvilishori tsikhe Cave	-
35	*Asellus* cf. *monticola fontinalis* Birstein 1936	**ARTHROPODA,** MALACOSTRACA Asellidae	Prometheus Cave	-
36	*Xiphocaridinella kumistavi* (Marin, 2017)	**ARTHROPODA,** MALACOSTRACA Atyidae	Prometheus and Satevzia caves	Nss

37	*Gammarus komareki* Schaferna, 1923	**ARTHROPODA,** MALACOSTRACA Gammaridae	Prometheus Cave	-
38	**Niphargus amirani* Marin, 2020	**ARTHROPODA,** MALACOSTRACA Niphargidae	Prometheus Cave	Nss
39	*Niphargus cf. borutzkyi* Birstein 1933	**ARTHROPODA,** MALACOSTRACA Niphargidae	Prometheus Cave	Nss
40	*Niphargus borutzkyi* Birstein, 1933	**ARTHROPODA,** MALACOSTRACA Niphargidae	Sataplia I Cave	Nss
41	*Trachysphaera fragilis* Golovatch, 1976	**ARTHROPODA,** DIPLOPODA Doderiidae	Ghliana Cave, Orpiri II Cave, Prometheus Cave, Sataplia I Cave, Sataplia II Cave, Sataplia IV Cave, Solkota and Tetra caves	-
42	*Trachysphaera solida* Golovatch, 1976	**ARTHROPODA,** DIPLOPODA Doderiidae	Prometheus Cave	-
43	*Trachysphaera radiosa* (Lignau, 1911)	**ARTHROPODA,** DIPLOPODA Doderiidae	Sataplia I Cave	-
44	*Leucogeorgia prometheus* Antić & Reip, 2020	**ARTHROPODA,** DIPLOPODA Julidae	Orpiri II Cave, Prometheus Cave, Sakire Cave, Sataplia I Cave, Sataplia II Cave, Solkota Cave, Tetra Cave, Melouri and Datvi caves	Nts
45	*Plusiocampa imereti* Sendra & Barjadze, 2021	**ARTHROPODA,** ENTOGNATHA Campodeidae	Melouri and Datvi caves	Nts
46	* *Willowsia nigromaculata* (Lubbock, 1873)	**ARTHROPODA,** ENTOGNATHA Entomobryidae	Sakadzhia Cave	-
47	*Lepidocyrtus* sp.	**ARTHROPODA,** ENTOGNATHA Entomobryidae	Tetra Cave	-
48	*Heteromurus nitidus* (Templeton, 1835)	**ARTHROPODA,** ENTOGNATHA Entomobryidae	Tetra Cave	-
49	*Plutomurus revazi* Barjadze, Baquero, Soto-Adames, Giordano & Jordana, 2016	**ARTHROPODA,** ENTOGNATHA Tomoceridae	Orpiri II Cave, Prometheus and Satsurblia caves	-
50	*Plutomurus* sp. 6	**ARTHROPODA,** ENTOGNATHA Tomoceridae	Tetra Cave	-
51	*Tomocerus minor* (Lubbock, 1862)	**ARTHROPODA,** ENTOGNATHA Tomoceridae	Orpiri II Cave	-
52	*Plutomurus birsteini* Djanashvili & Barjadze, 2011	**ARTHROPODA,** ENTOGNATHA Tomoceridae	Sakire and Sataplia IV caves	-
53	*Plutomurus kelasuricus* Martynova, 1969	**ARTHROPODA,** ENTOGNATHA Tomoceridae	Sataplia IV and Solkota caves	-
54	*Plutomurus* sp. 3	**ARTHROPODA,**	Solkota Cave	-

		ENTOGNATHA Tomoceridae		
55	*Plutomurus jordanai* Barjadze & Soto-Adames, 2020	**ARTHROPODA,** ENTOGNATHA Tomoceridae	Zeda Kvilishori Cave	-
56	*Plutomurus eristoi Barjadze, Baquero, Soto-Adames, Giordano & Jordana, 2016*	**ARTHROPODA,** ENTOGNATHA Tomoceridae	Satevzia Cave	Nts
57	*Folsomia candida* Willem, 1902	**ARTHROPODA,** ENTOGNATHA Isotomidae	Prometheus Cave, Sataplia I Cave, Tetra and Zeda Kvilishori caves	-
58	*Folsomides parvulus* Stach, 1922	**ARTHROPODA,** ENTOGNATHA Isotomidae	Prometheus Cave	-
59	*Folsomia fmetaria* (Linnaeus, 1758)	**ARTHROPODA,** ENTOGNATHA Isotomidae	Sataplia IV and Tetra caves	-
60	*Proisotoma minuta* (Tullberg, 1871)	**ARTHROPODA,** ENTOGNATHA Isotomidae	Ghliana Cave, Prometheus and Zeda Kvilishori caves	-
61	*Desoria trispinata* (MacGillivray, 1896)	**ARTHROPODA,** ENTOGNATHA Isotomidae	Sataplia IV Cave	-
62	*Mesogastrura ojcoviensis* (Stach, 1919)	**ARTHROPODA,** ENTOGNATHA Hypogastruridae	Sakadzhia Cave and Tetra Cave	-
63	*Pseudacherontides zenkevitchi* Djanaschvili, 1971	**ARTHROPODA,** ENTOGNATHA Hypogastruridae	Prometheus and Melouri caves	Nts
64	*Ceratophysella armata* (Nicolet, 1842)	**ARTHROPODA,** ENTOGNATHA Hypogastruridae	Prometheus Cave	-
65	*Hypogastrura viatica* (Tullberg, 1872)	**ARTHROPODA,** ENTOGNATHA Hypogastruridae	Prometheus and Sataplia IV Caves	-
66	**Neelus murinus* Folsom, 1896	**ARTHROPODA,** ENTOGNATHA Neelidae	Tetra Cave	-
67	*Megalothorax* sp.	**ARTHROPODA,** ENTOGNATHA Neelidae	Sataplia I Cave	-
68	*Pseudachorutes dubius* Krausbauer, 1898	**ARTHROPODA,** ENTOGNATHA Neanuridae	Prometheus Cave	-
69	*Micranurida pygmaea* Borner, 1901	**ARTHROPODA,** ENTOGNATHA Neanuridae	Sakire Cave	-
70	*Sphaeridia* sp.	**ARTHROPODA,** ENTOGNATHA Sminthurididae	Prometheus Cave	-
71	*Pygmarrhopalites principalis* Stach, 1945	**ARTHROPODA,** ENTOGNATHA Arrhopalitidae	Sataplia I Cave, Solkota and Tetra caves	-
72	*Pygmarrhopalites pygmaeus* (Wankel, 1860)	**ARTHROPODA,** ENTOGNATHA	Sakire Cave	-

		Arrhopalitidae		
73	*Arrhopalites caecus* (Tullberg, 1871)	**ARTHROPODA,** ENTOGNATHA Arrhopalitidae	Solkota Cave	-
74	*Deuterosminthurus* sp.	**ARTHROPODA,** ENTOGNATHA Bourletiellidae	Ghliana Cave	-
75	*Deuteraphorura sp.*	**ARTHROPODA,** ENTOGNATHA Onychiuridae	Melouri cave	-
76	**Ptenothrix kuraschvilii* Djanaschvili, 1970	**ARTHROPODA,** ENTOGNATHA Dicyrtomidae	Sataplia IV Cave	-
77	* *Nitocrella colchica* Borutzky & Mikhailova-Neikova, 1970	**ARTHROPODA,** MAXILLOPODA Ameiridae	Kvilishori tsikhe Cave	Nss
78	*Nitocrella* sp.	**ARTHROPODA,** MAXILLOPODA Ameiridae	Zeda Kvilishori Cave	-
79	*Attheyella crassa* (Sars, 1863)	**ARTHROPODA,** MAXILLOPODA Canthocamptidae	Ghliana and Kvilishori tsikhe caves	-
80	*Pilocamptus pilosus* (Douwe, 1910)	**ARTHROPODA,** MAXILLOPODA Canthocamptidae	Ghliana Cave	Nss
81	*Bryocamptus zschokkei* Kiefer, 1978	**ARTHROPODA,** MAXILLOPODA Canthocamptidae	Kvilishori tsikhe and Zeda Kvilishori caves	-
82	*Ceuthonectes serbicus* Chappuis, 1924	**ARTHROPODA,** MAXILLOPODA Canthocamptidae	Kvilishori tsikhe and Sakire Caves	-
83	* *Moraria colchica* Borutzky & Mikhailova-Neikova, 1970	**ARTHROPODA,** MAXILLOPODA Canthocamptidae	Kvilishori tsikhe Cave	Nss
84	*Bryocamptus innominatus* Borutsky, 1940	**ARTHROPODA,** MAXILLOPODA Canthocamptidae	Zeda Kvilishori Cave	Nss
85	*Lithobius portchinskii* Sseliwanoff, 1881	**ARTHROPODA,** CHILOPODA Lithobiidae	Sataplia I Cave	-
86	*Lithobius reconditus* Zalesskaja, 1972	**ARTHROPODA,** CHILOPODA Lithobiidae	Sataplia I Cave	-
87	*Lithobius stuxbergi* Seliwanoff, 1881	**ARTHROPODA,** CHILOPODA Lithobiidae	Sataplia I Cave	-
88	*Cryptops (Cryptops) datviensis* Tuf, Barjadze & Maghradze, 2022	**ARTHROPODA,** CHILOPODA Cryptopidae	Datvi Cave	Nts
89	*Eisenia* sp. 3	**ANNELIDA,** CLITELLATA Lumbricidae	Kvilishori tsikhe Cave	-
90	*Eisenia fetida* (Savigny, 1826)	**ANNELIDA,** CLITELLATA	Sakire and Sataplia I caves	-

		Lumbricidae		
91	**Daudebardia nivea* Schileyko, 1988	**MOLLUSCA,** GASTROPODA Oxychilidae	Opicho Cave	Nts
92	*Oxychilus koutaisianus* (Mousson, 1863)	**MOLLUSCA,** GASTROPODA Oxychilidae	Orpiri II Cave	-
93	*Oxychilus sucinaceus* (Bottger, 1883)	**MOLLUSCA,** GASTROPODA Oxychilidae	Orpiri II Cave, Satsurblia Cave, Solkota and Tetra caves	-
94	*Vitrinoxychilus suturalis* (Boettger, 1881)	**MOLLUSCA,** GASTROPODA Oxychilidae	Prometheus cave	-
95	*Lesticulus nocturnus* Schileyko, 1988	**MOLLUSCA,** GASTROPODA Trigonochlamydidae	Opicho and Prometheus caves	Nts
96	*Elia derasa* (Mousson, 1863)	**MOLLUSCA,** GASTROPODA Clausiliidae	Orpiri II Cave	-
97	**Caucasogeyeria ignidona* Grego & Palatov, 2020	**MOLLUSCA,** GASTROPODA Hydrobiidae	Prometheus cave	Nss
98	**Imeretiopsis prometheus* Grego & Palatov, 2020	**MOLLUSCA,** GASTROPODA Hydrobiidae	Prometheus Cave	Nss
99	*Cochlicopa lubricella* (Rossmässler, 1834)	**MOLLUSCA,** GASTROPODA Cochlicopidae	Prometheus Cave	-
100	*Codiella* sp.	**MOLLUSCA,** GASTROPODA Bithyniidae	Prometheus Cave	-
101	*Bythinella* sp.	**MOLLUSCA,** GASTROPODA Bithyniidae	Sataplia I Cave	-
102	**Paladilhiopsis* sp. 5 *sensu* Palatov, Sokolova 2016	**MOLLUSCA,** GASTROPODA Moitessieriidae	Prometheus Cave	Nss
103	*Physella acuta* (Draparnaud, 1805)	**MOLLUSCA,** GASTROPODA Physidae	Prometheus Cave	-
104	*Ancylus fluviatilis* (Müller, 1774)	**MOLLUSCA,** GASTROPODA Planorbidae	Sataplia I Cave	-
105	*Euglesa (Casertiana)* sp. 2	**MOLLUSCA,** BIVALVIA Sphaeriidae	Prometheus cave	-

Table 2. The distribution of invertebrate species in caves of Sataplia-Tskaltubo karst massif, Georgia, Caucasus. Nss/Nts – number of stygobitic vs troglobitic species. * total species number in this animal group is lower than the sum of species numbers in all caves, because some invertebrate species are recorded from more than one caves.

Phylum	ANNELIDA	MOLLUSCA		ARTHROPODA																*** TOTAL**
Nss/Nts	0/0	3/2		8/12																**11/18**
Class and/or order	Clitellata	Gastropod	Bivalve	Maxillopoda Harpacticoida	Malacostraca Amphipoda	Malacostraca Isopoda	Malacostraca Bathynellacea	Malacostraca Decapoda	Arachnida Pseudoscorpione	Arachnida Mesostigmata	Arachnida Opiliones	Arachnida Araneae	Arachnida Sarcoptiformes	Chilopoda	Diplopoda Glomerida	Diplopoda Julida	Collembola	Insecta	Diplura	
Datvi Cave	-	-	-	-	-	1	-	-	2	-	-	2	-	1	-	1	-	4	1	**12**
Didgele Cave	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	**2**
Ghliana Cave	-	-	-	2	-	-	-	-	-	2	-	-	-	-	1	-	2	1	-	**8**
Melouri Cave	-	-	-	-	-	2	-	-	1	-	1	2	-	-	-	1	3	5	1	**16**
Orpiri II Cave	-	3	-	-	-	2	-	-	-	-	-	-	-	-	1	1	2	-	-	**9**
Patsristavi Cave	-	-	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-	2	-	**6**
Prometheus Cave	-	8	1	-	3	3	-	1	2	1	1	1	2	-	2	1	9	10	-	**45**
Kvilishori tsikhe Cave	1	-	-	5	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	**9**
Sakadzhia Cave	-	-	-	-	-	2	-	-	1	-	-	-	-	-	-	-	2	1	-	**6**
Sakire Cave	1	-	-	1	-	1	-	-	-	-	-	1	-	-	-	1	3	-	-	**8**
Sarkumali Cave	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	**1**
Sataplia I Cave	1	2	-	-	1	-	-	-	1	-	1	2	-	3	2	1	5	2	-	**19**
Sataplia II Cave	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-	**3**
Sataplia IV Cave	-	-	-	-	-	1	-	-	-	1	-	-	-	-	1	-	6	1	-	**10**
Satevzia Cave	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	1	2	-	**5**
Satsurblia Cave	-	1	-	-	-	1	-	-	-	-	-	1	-	-	-	-	1	1	-	**5**
Solkota Cave	-	1	-	-	-	2	-	-	-	-	-	1	-	-	1	1	4	2	-	**12**
Tetra Cave	-	1	-	-	-	2	-	-	2	-	-	4	-	-	1	1	8	5	-	**24**
Khomuli Cave	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2	-	**3**
Opicho Cave	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
Zeda Kvilishori Cave	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	**6**

Table 3. The Results of the Survey

N	Village	Gender	Age	Have you ever been in a cave?	Have you ever heard of cave adapted animals?	Where did you know/hear about cave invertebrates	Have you ever seen cave-dweller invertebrates in cave?	Do you know the invertebrates living in your local cave?	Do you know the threats that can lead to the extinction of cave animals?
1	Tskaltubo	Male	18	Yes	Yes	From brochure	Yes	Yes	Yes
2	Tskaltubo	Female	52	Yes	Yes	From brochure	No	Yes	Yes
3	Tskaltubo	Female	26	No	Yes	From TV program	No	No	Yes
4	Chuneshi	Female	45	No	Yes	from her daughter	No	Yes	Yes
5	Chuneshi	Male	78	Yes	No	-	No	No	No
6	Chuneshi	Male	62	Yes	No	-	No	No	No
7	Kumistavi	Male	32	No	Yes	From brochure	No	Yes	Yes
8	Kumistavi	Female	28	Yes	Yes	From poster	Yes	Yes	Yes
9	Kumistavi	Female	15	No	Yes	From Brochure	No	Yes	Yes
10	Kvilishori	Male	49	Yes	No	-	No	No	No
11	Kvilishori	Male	28	Yes	Yes	From TV program	Yes	Yes	Yes
12	Kvilishori	Female	19	No	Yes	From brochure	No	Yes	Yes
13	Tskhunkuri	Male	34	Yes	Yes	From poster	Yes	Yes	Yes
14	Tskhunkuri	Female	29	Yes	Yes	From poster	Yes	Yes	Yes
15	Tskhunkuri	Female	27	Yes	Yes	From brochure	Yes	No	Yes
16	Melouri	Female	60	No	No	-	No	No	No
17	Melouri	Male	23	No	Yes	From brochure	No	No	Yes
18	Melouri	Male	20	Yes	Yes	From brochure	yes	Yes	Yes
19	Zemo Chuneshi	Male	40	No	Yes	From brochure	No	Yes	Yes

20	Zemo Chuneshi	Male	21	Yes	Yes	From brochure	Yes	Yes	Yes
21	Zemo Chuneshi	Female	30	No	Yes	From brochure	No	No	Yes
22	Gvishtipi	Male	33	Yes	Yes	From brochure	No	Yes	Yes
23	Gvishtipi	Male	27	Yes	Yes	From poster	Yes	Yes	Yes
24	Gvishtipi	Female	50	No	No	-	No	No	No
25	Banoja	Female	38	Yes	Yes	From poster	Yes	Yes	No
26	Banoja	Male	15	Yes	Yes	from school	Yes	Yes	Yes
27	Banoja	Female	70	No	No	-	No	No	No
28	Dzezileti	Female	67	No	No	-	No	No	No
29	Dzezileti	Female	19	Yes	Yes	From brochure	No	Yes	Yes
30	Dzezileti	Male	23	Yes	Yes	From brochure	Yes	Yes	Yes

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