



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Speleobiologija
Course title:	Speleobiology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Biologija 1. stopnja		3	3 ali 4
Biology 1 st level		3	3 or 4

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
15	10		4	16	135	6

Nosilec predmeta / Lecturer:

Tone NOVAK

Jeziki /
Languages:

Predavanja /
Lectures: slovenski/slovene

Vaje / Tutorial: Slovenski/slovene

Pogoji za vključitev v delo oz. za opravljanje
študijskih obveznosti:

Jih ni.

Prerequisites:

No.

Vsebina:

Content (Syllabus outline):

- Uvod v speleobiologijo.
- Jame, špranje, umetni rovi, podzemeljsko površinsko okolje, tla
- Izviri, intersticialno okolje, hipotelmioze, jezerske in morske globine, morske jame
- Troglomorfoze: velikost trupa in okončin, anoftalmija, depigmentiranost, apterizem, fizogastrija, psevdofizogastrija
- Troglobionti, troglofili, troglokseni; freatobionti; stigobionti
- Pregled organizmov v podzemlju: prokarioti; glive; rastline; živali
- Porifera, Protozoa, Cnidaria, Turbellaria, Nemertea, Nematoda, Mollusca, Polychaeta, Oligochaeta, Hirudinea, Chelicerata, Crustacea, Myriapoda, Insecta, Vertebrata
- Geografska razširjenost podzemeljskih živali
- Fiziologija in etologija podzemeljskih živali
- Evolucija podzemeljskih živali
- Slovenija kot država z največjo diverziteto podzemeljskih taksonov v svetovnem merilu
- Pregled najvažnejših podzemeljskih živali
- Vpliv turizma na podzemeljsko favno
- Zaščita in varovanje podzemeljskih habitatov

- Introduction into speleobiology
- Caves, fissures, artificial tunnels, shallow subterranean environments, soils
- Springs, interstitial environment, hypohelminthoic environment, deep lake and deep sea regions, marine caves
- Troglomorphoses: body and appendages size, anophthalmia, apterism, physogastry, pseudophysogastry
- Troglobionts, troglaphiles, troglonexes; freatobionts; stygobionts
- Review of organisms in the subterranean environments: Procaryota, Fungi, Plants, Animals
- Porifera, Protozoa, Cnidaria, Turbellaria, Nemertea, Nematoda, Mollusca, Polychaeta, Oligochaeta, Hirudinea, Chelicerata, Crustacea, Myriapoda, Insecta, Vertebrata
- Geographical distribution of the hypogean organisms
- Physiology and ethology of the subterranean organisms
- Evolution of the subterranean organisms
- Slovenia as the state with the highest diversity of the subterranean organisms in the World
- Review of the most prominent subterranean animals
- Impact of tourism on subterranean fauna
- Protection and conservation of subterranean fauna

Temeljni literatura in viri / Readings:

- Culver D. C., Christman M. C., Sket B., Trontelj P., 2004. Sampling adequacy in an extreme environment: species richness patterns in Slovenian caves. *Biodiversity and Conservation*, 13: 1209- 1229.
- Culver D. C., Pipan T., 2019. *The biology of caves and other subterranean habitats*, second edition. Oxford Univ. Press, Oxford, New York.
- Culver, D. C., W. B. White (eds.), 2012: *Encyclopedia of caves*. Elsevier/Academic Press, Amsterdam/Boston.
- Gunn, J., 2004: *Encyclopedia of caves and karst science*. Taylor & Francis Books Inc., New York/London.
- Juberthie, C. & V. Decu (eds.), 1992-1996: *Encyclopaedia biospeologica I-III*. Société de biospéologie, Moulis, Bukarest.
- Kozel, P., Pipan, T., Šajna, N., Polak, S., Novak, T. (2017) Mitigating the conflict between pitfall-trap sampling and conservation of terrestrial subterranean communities in caves. *International journal of speleology*, 46(3),359–368. doi: [10.5038/1827-](https://doi.org/10.5038/1827-)

[806X.46.3.2123.](#)

- Kozel, P., Pipan, T., Mammola, S., Culver, D. C., Novak, T. (v tisku) Distributional dynamics of a specialized subterranean community oppose the classical understanding of the preferred subterranean habitats. *Invertebrate biology*.
- Moldovan, O. T., Kováč, L., Halse, S. (Eds.) (2018). *Cave ecology*. Springer International Publishing. 545 str.
- Pipan, T., Culver, D. C., Papi, F., Kozel, P. (2018) Partitioning diversity in subterranean invertebrates : the epikarst fauna of Slovenia. *PloS ONE* 13(5), 1-19. doi: 10.1371/journal.pone.0195991.
- Sket B., Paragamian K., Trontelj P., 2004. A census of the obligate subterranean fauna of the Balkan peninsula. In: Griffiths H. I., B. Kryštufek (eds.): *Balkan Biodiversity. Pattern and Process in Europe's Biodiversity Hotspot*. Kluwer Academic Publishers: 309-322.

Cilji in kompetence:

- Podati pregled tipov in značilnosti podzemeljskih habitatov
- Podati pregled tipov in značilnosti podzemeljskih organizmov
- Predstaviti poseben status Slovenije glede diverzitete podzemeljskih taksonov

Objectives and competences:

- To give an overview of typology and characteristics of subterranean habitats
- To give an overview of typology and characteristics of subterranean organisms
- To present the prominent position of Slovenia for the diversity of the subterranean taxa

Predvideni študijski rezultati:

Znanje in razumevanje:

- Ekološke značilnosti podzemeljskih habitatov
- Biotske značilnosti podzemeljskih organizmov
- Zgodovina speleobiologije in trendi modernih znanstvenih raziskav
- Poznavanje osnovnih vzorčevalnih metod v podzemeljskih habitatih

- Prepoznavanje troglomorfoz in troglomorfoznih organizmov
- Usposobljenost za biološko raziskovalno delo v podzemeljskih votlinah

Intended learning outcomes:

Knowledge and understanding:

- Ecological characteristics of subterranean habitats
- Biotic characteristics of subterranean organisms
- The history of speleobiology and modern trends of scientific investigations
- Knowledge about the elementary sampling methods in subterranean habitats

- Recognition of troglomorphoses and troglomorphotic organisms
- Capability of biological investigations in cavities

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje
- Terenske vaje
- Seminar

Learning and teaching methods:

- Lectures
- Laboratory work
- Field work
- Seminar

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt) <ul style="list-style-type: none"> • Seminarska naloga • Pisni izpit 	20 80	Type (examination, oral, coursework, project): <ul style="list-style-type: none"> • Seminar • Written exam

Reference nosilca / Lecturer's references:

- Kozel P., Pipan T., Šajna N., Polak S., Novak T., 2017. Mitigating the conflict between pitfall-trap sampling and conservation of terrestrial subterranean communities in caves. *International Journal of Speleology* 46(3).
- Lipovšek, S., Janžekovič, F., Novak, T., 2017. Ultrastructure of fat body cells and Malpighian tubule cells in overwintering *Scoliopteryx libatrix* (Noctuoidea). *Protoplasma*, DOI 10.1007/s00709-017-1110-3
- Lipovšek, S., Novak, 2016. Autophagy in the fat body cells of the cave cricket *Troglophilus neglectus* Krauss, 1878 (Rhaphidophoridae, Saltatoria) during overwintering. *Protoplasma*. pp. 10. DOI 10.1007/s00709-015-0824-3
- Novak, T., Kozel, P., 2014. *Hadzinia ferrani*, sp. n. (Opiliones: Nemastomatidae), a highly specialized troglobiotic harvestman from Slovenia. *Zootaxa* 3841(1), 135–145. <http://biotaxa.org/Zootaxa/login?source=%2FZootaxa%2Farticle%2Fview%2Fzootaxa.3841.1.8%2F9353&loginMessage=reader.subscriptionRequiredLoginText>
- Novak, T., Šajna, N., Antolinc, E., Lipovšek, S., Devetak, D., Janžekovič, F., 2014. Cold tolerance in terrestrial invertebrates inhabiting subterranean habitats. *International Journal of Speleology* 43(3), 265–272. <http://scholarcommons.usf.edu/ijs/vol43/iss3/3>