



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Populacijska ekologija
Course title:	Population ecology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program Ekologija z naravovarstvom, 1. stopnja		3	5
Undergraduate university programme Ecology with Nature Conservation, 1st degree		3	5

Vrsta predmeta / Course type

Obvezni/Mandatory

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
30				15	135	6

Nosilec predmeta / Lecturer:

Damijan Denac

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:

- Pogoji in viri v populacijah in njihovi vplivi na lastnosti populacije
- Ekološka niša populacije
- Lastnosti populacij, populacijski znaki, populacijski procesi (rodnost, smrtnost, priseljevanje, odseljevanje) in populacijski parametri (spolna, starostna struktura, razširjenost, absolutna/relativna abundanca)
- Koncept metapopulacij (subpopulacije, donorske, ponorne populacije, ekološke pasti)
- Metode raziskovanja populacij (kvantitativne za absolutno/relativno velikost populacije, metode ugotavljanja populacijskih procesov in vplivov nanje, metode lova in ponovnega ulova, klasični modeli lova in ponovnega ulova v odprtih populacijah npr. Cormack Jolly-Seber)
- Dinamika populacij (generacija, kohorta, trendi, analiza viabilnost populacij)
- Modeli sprememb velikosti populacije
- Življenjske strategije (fitnes, nasprotja življenjskih strategij)
- Vloga interakcij na lastnosti populacije (intraspecifične, interspecifične, dvovrstni, mnogovrstni sistemi, neposredne, posredne interakcije)
- Upravljanje s populacijami za uresničevanje naravovarstvenih ciljev

Content (Syllabus outline):

- Conditions and resources in populations and their effects upon populations' characteristics
- The ecological niche of the population
- Population processes (fecundity, mortality, migrations) and parameters (sex, age structure, dispersion, abundance)
- Metapopulation concept (subpopulation, source, sink, ecological traps)
- Population study methods (estimating population size, determining population processes and influences upon them, classical open-population Capture-Recapture models, e.g. Cormack, Jolly-Seber Model)
- Population dynamics (generations, cohorts, trends, PVA – population viability analysis)
- Models of population size
- Components of life histories and trade-offs, fitness
- Interactions and their role in life histories of populations (intra-interspecific interactions, multiple species systems)
- Conservation management of endangered populations

Temeljni literatura in viri / Readings:

Williams, B.K., Nichols, J.D. & M.J. Conroy (2001): Analysis and Management of Animal Populations. Academic Press, London.

Amstrup, S.C., McDonald, T.L. & B.F.J. Manly (2005): Handbook of Capture-Recapture analysis. Princeton University Press, New Jersey.

Begon, M. & Townsend, C.R. (2021): Ecology from Individuals to Ecosystems. Fifth Edition. Wiley-Blackwell.

Burnham, K.P. & D.R. Anderson (2002): Model selection and multimodel inference. Springer, New York.

Tome, D. (2006): Ekologija. Organizmi v prostoru in času. Tehniška založba Slovenije, Ljubljana.

Morrison M.L., Brennan L.A., Marcot B.G., Block W.M., McKelvey K.S. (2021): Applications for Advancing Animal Ecology. Johns Hopkins University Press.

Cilji in kompetence:**Objectives and competences:**

Študentje spoznajo področje delovanja populacijske ekologije, njena temeljna raziskovalna vprašanja in metodološke pristope za raziskovalno delo v populacijski ekologiji. Spoznajo osnovne koncepte vpliva živega in neživega okolja na populacijo in nivoje vpliva na različne populacijske znake – lastnosti in procese. Spoznajo dinamiko znotraj metapopulacij in razumejo vplive na velikost populacije. Spoznajo metode za ugotavljanje populacijskih lastnosti in procesov in omejitve teh metod. Spoznajo sodobne pristope hkratnega obravnavanja množice dejavnikov na populacijske procese z uporabo informacijsko-teoretičnega pristopa. Spoznajo življenjske strategije populacij. Spoznajo pomen in vlogo populacijske ekologije za uresničevanje družbenih dogovorov in orodja za upravljanje z ogroženimi populacijami.

Students will recognize the scope of population ecology, basic research problems as well as methods for studies in population ecology. They will become aware of basic concepts and mechanisms of influence of biotic and abiotic environment upon populations – processes and parameters. Metapopulation dynamics and dependent population size will be studied. Methods for study of population processes and parameters will be discussed with their strengths and weaknesses. Modern information-theoretic approach using model inference after AIC criterion will be used on examples and students will gain basic knowledge of correct application of the approach. Different life strategies will be explored and trade-offs for populations. Students will gain knowledge of importance of population ecology studies for the society and their wellbeing and of management tools for conservation of endangered populations.

Predvideni študijski rezultati:

Študenti bodo:

- Znali razlikovati med pogoji in viri, ki vplivajo na populacije.
- Znali razlikovati med populacijskimi parametri in procesi in znali uporabiti osnovne metode za njihovo ugotavljanje in določanje.
- Znali uporabljati osnovne kvantitativne metode dela v populacijski ekologiji.
- Znali uporabljati modele (CJS) za ugotavljanje smrtnosti v odprti populaciji z metodo lova in ponovnega ulova (uporaba programa MARK).
- S pomočjo sklepanja iz modelov z uporabo AIC kriterija znali izvesti analizo vpliva habitata na distribucijo populacije (uporaba orodja R).
- Znali analizirati dinamiko populacije in izračunati populacijske trende (uporaba orodja R, RTrim).
- Znali izvesti analizo viabilnosti populacije (uporaba orodja Vortex)

Intended learning outcomes:

Students will:

- Know the differences between conditions and resources influencing populations
- Be able to distinguish population processes and parameters and use basic methods to determine them
- Know how to use basic quantitative methods in population ecology
- Learn to use classical open-population capture-recapture models to determine mortality (using MARK software)
- Learn to perform modelling and multimodel inference using information-theoretic approach and AIC criterion to select most parsimonious model (using R software)
- Be able to analyse population dynamics and calculate trends (using R software)
- Learn to carry out Population Viability Analysis on concrete example (using Vortex software)

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Metode poučevanja in učenja:

- Predavanja
- Terenske vaje

Learning and teaching methods:

- Lectures
- Field work

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Type (examination, oral, coursework, project):
• Seminarska naloga	20	• Seminar paper
• Pisni izpit	80	• Written exam

Reference nosilca / Lecturer's references:

SERRATOSA, Juan, OPPEL, Steffen, ROTICS, Shay, SANTANGELI, Andrea, BUTCHART, Stuart H.M., CANO-ALONSO, Luis S., TELLERÍA, Jose Luis, KEMP, Ryno, NICHOLAS, Aaron, KALVANS, Aigars, DENAC, Damijan, et al. Tracking data highlight the importance of human-induced mortality for large migratory birds at a flyway scale. *Biological conservation*. 2024, vol. 293, [article no.] 110525, ilustr. ISSN 1873-2917. <https://www.sciencedirect.com/science/article/pii/S0006320724000867>, DOI: [10.1016/j.biocon.2024.110525](https://doi.org/10.1016/j.biocon.2024.110525). [COBISS.SI-ID 194285571]

TOME, Davorin, DENAC, Damijan, VREZEC, Al. Mowing is the greatest threat to Whinchat *Saxicola rubetra* nests even when compared to several natural induced threats. *Journal for nature conservation*. Apr. 2020, vol. 54, [article] 125781, str. 1-8, ilustr. ISSN 1617-1381. DOI: [10.1016/j.jnc.2019.125781](https://doi.org/10.1016/j.jnc.2019.125781). [COBISS.SI-ID 40703749]

IVAJNSIČ, Danijel, DENAC, Damijan, DENAC, Katarina, PIPENBAHER, Nataša, KALIGARIČ, Mitja. The Scops owl (*Otus scops*) under human-induced environmental change pressure. *Land use policy*. [Print ed.]. Dec. 2020, vol. 99, str. 1-8, ilustr. ISSN 0264-8377. DOI: [10.1016/j.landusepol.2020.104853](https://doi.org/10.1016/j.landusepol.2020.104853). [COBISS.SI-ID 21112579]

HORVAT, Eva, DENAC, Damijan. Dinamika populacije in raba habitatov pribe *Vanellus vanellus* v kmetijski krajini na Dravskem in Ptujskem polju (SV Slovenija) = Population dynamics and habitat use by Northern Lapwing *Vanellus vanellus* in agricultural landscape of Dravsko and Ptujsko polje (NE Slovenia). *Acrocephalus : glasilo Društva za opazovanje in proučevanje ptic Slovenije*. [Tiskana izd.]. 2019, letn. 40, št. 182/183, str. 3-22, ilustr. ISSN 0351-2851. DOI: [10.1515/acro-2019-0009](https://doi.org/10.1515/acro-2019-0009). [COBISS.SI-ID 45360131]

BOŽIČ, Luka (avtor, fotograf), DENAC, Damijan (avtor, fotograf). Population dynamics of five riverbed breeding bird species on the lower Drava River. NE Slovenia = Populacijska dinamika petih gnezdičk struge spodnjega dela reke Drave (SV Slovenija). *Acrocephalus : glasilo Društva za opazovanje in proučevanje ptic Slovenije*. [Tiskana izd.]. 2017, letn.38, št. 174/175, str. 85-126, ilustr. ISSN 0351-2851. [COBISS.SI-ID 5263439]

DENAC, Katarina, KMECL, Primož, DOMANJKO, Gregor, DENAC, Damijan. Trendi ptic kmetijske krajine na Goričkem = Population trends of Goričko agricultural landscape birds. *Acrocephalus : glasilo Društva za opazovanje in proučevanje ptic Slovenije*. [Tiskana izd.]. 2017, letn.38, št. 174/175, str. 127-159, ilustr. ISSN 0351-2851. [COBISS.SI-ID 5263695]

PODLETNIK, Mojca (avtor, fotograf), DENAC, Damijan. Izbor prehranjevalnega habitata in prehrana smrdokavre *Upupa epops* v mozaični kulturni krajini na Goričkem (SV Slovenija) = Selection of foraging habitat and diet of Hoopoe *Upupa epops* in a mosaic-like cultural landscape of Goričko (NE Slovenia). *Acrocephalus : glasilo Društva za opazovanje in proučevanje ptic Slovenije*. [Tiskana izd.]. 2015, letn. 36, št. 166/167, str. 109-132, ilustr. ISSN 0351-2851. [COBISS.SI-ID 285968640]

RADOVIČ, Andreja, KATI, Vassiliki, PERČEC TADIĆ, Melita, DENAC, Damijan, KOTROŠAN, Dražen. Modelling the spatial distribution of White Stork *Ciconia ciconia* breeding populations in Southeast Europe. *Bird study* :

the journal of the British trust for ornithology. 2015, vol. 62, no. 1, str. 106 -114. ISSN 0006-3657. DOI: [10.1080/00063657.2014.981502](https://doi.org/10.1080/00063657.2014.981502). [COBISS.SI-ID [3324751](#)]

TOME, Davorin, DENAC, Damijan. Survival and development of predator avoidance in the post-fledging period of the Whinchat (*Saxicola rubetra*) : consequences for conservation measures. *Journal für Ornithologie* = : *Journal of ornithology* (1853. Print). 2012, vol. 153, no. 1, str. 131-138. ISSN 0021-8375. <http://dx.doi.org/10.1007/s10336-011-0713-2>, DOI: [10.1007/s10336-011-0713-2](https://doi.org/10.1007/s10336-011-0713-2).

DENAC, Damijan. Population dynamics of the White stork *Ciconia ciconia* in Slovenia between 1999 and 2010 = Populacijska dinamika bele štorke *Ciconia ciconia* v Sloveniji med letoma 1999 in 2010. *Acrocephalus : glasilo Društva za opazovanje in proučevanje ptic Slovenije*. [Tiskana izd.]. 2010, letn. 31, št. 145/146, str. 101-114, ilustr. ISSN 0351-2851. [COBISS.SI-ID [28787161](#)]

BOŽIČ, Luka, DENAC, Damijan. Številčnost in razširjenost izbranih gnezdk struge reke Drave med Mariborom in Središčem ob Dravi (SV Slovenija) v letih 2006 in 2009 ter vzroki za zmanjšanje njihovih populacij = Abundance and distribution of selected breeding river-bed birds on the Drava River between Maribor and Središče ob Dravi (NE Slovenia) in 2006 and 2009, and causes of the reduction of their populations. *Acrocephalus : glasilo Društva za opazovanje in proučevanje ptic Slovenije*. [Tiskana izd.]. 2010, letn. 31, št. 144, str. 27-45, ilustr. ISSN 0351-2851. DOI: [10.2478/v10100-010-0004-7](https://doi.org/10.2478/v10100-010-0004-7). [COBISS.SI-ID [27898073](#)]

KOCE, Urška, DENAC, Damijan. Social foraging and habitat use by a long-distance passerine migrant, Whinchat *Saxicola rubetra*, at a spring stopover site on the SE Adriatic coast. *Journal für Ornithologie* = : *Journal of ornithology* (1853. Print). 2010, vol. 151, issue 3, str. 655-663. ISSN 0021-8375. <http://dx.doi.org/10.1007/s10336-010-0506-z>, DOI: [10.1007/s10336-010-0506-z](https://doi.org/10.1007/s10336-010-0506-z).

DENAC, Damijan. Resource-dependent weather effect in the reproduction of the white stork *Ciconia ciconia*. *Ardea : Tijdschrift der Nederlandse Ornithologische Unie* = [Official journal of the Netherlands Ornithologists' Union]. 2006, letn. 94, št. 2, str. 233-240. ISSN 0373-2266. [COBISS.SI-ID [22038233](#)],

DENAC, Damijan. Chick shelters did not prevent raptor predation on chicks in a mixed common tern *Sterna hirundo* and black-headed gull *Larus ridibundus* colony in Slovenia. *Die Vogelwelt : Zeitschrift für Vogelkunde und Vogelschutz*. 2006, letn. 127, št. 3, str. 187-191. ISSN 0042-7993. [COBISS.SI-ID [22034137](#)]

DENAC, Damijan. Intraspecific exploitation competition as cause for density dependent breeding success in the white stork. *Waterbirds*. 2006, letn. 29, št. 3, str. 391-394. ISSN 1524-4695. [COBISS.SI-ID [22025433](#)],

DENAC, Damijan. Prehranjevalna dinamika in pojav znotrajvrstnega kleptoparazitizma v koloniji navadne čigre *Sterna hirundo* na Ptujskem jezeru (SV Slovenija) = Common tern *Sterna hirundo* feeding dynamics and intraspecific kleptoparasitism in the colony on Ptuj reservoir (Drava river, NE Slovenia). *Acrocephalus : glasilo Društva za opazovanje in proučevanje ptic Slovenije*. [Tiskana izd.]. 2004, letn. 25, št. 123, str. 201-205. ISSN 0351-2851. [COBISS.SI-ID [19507673](#)]