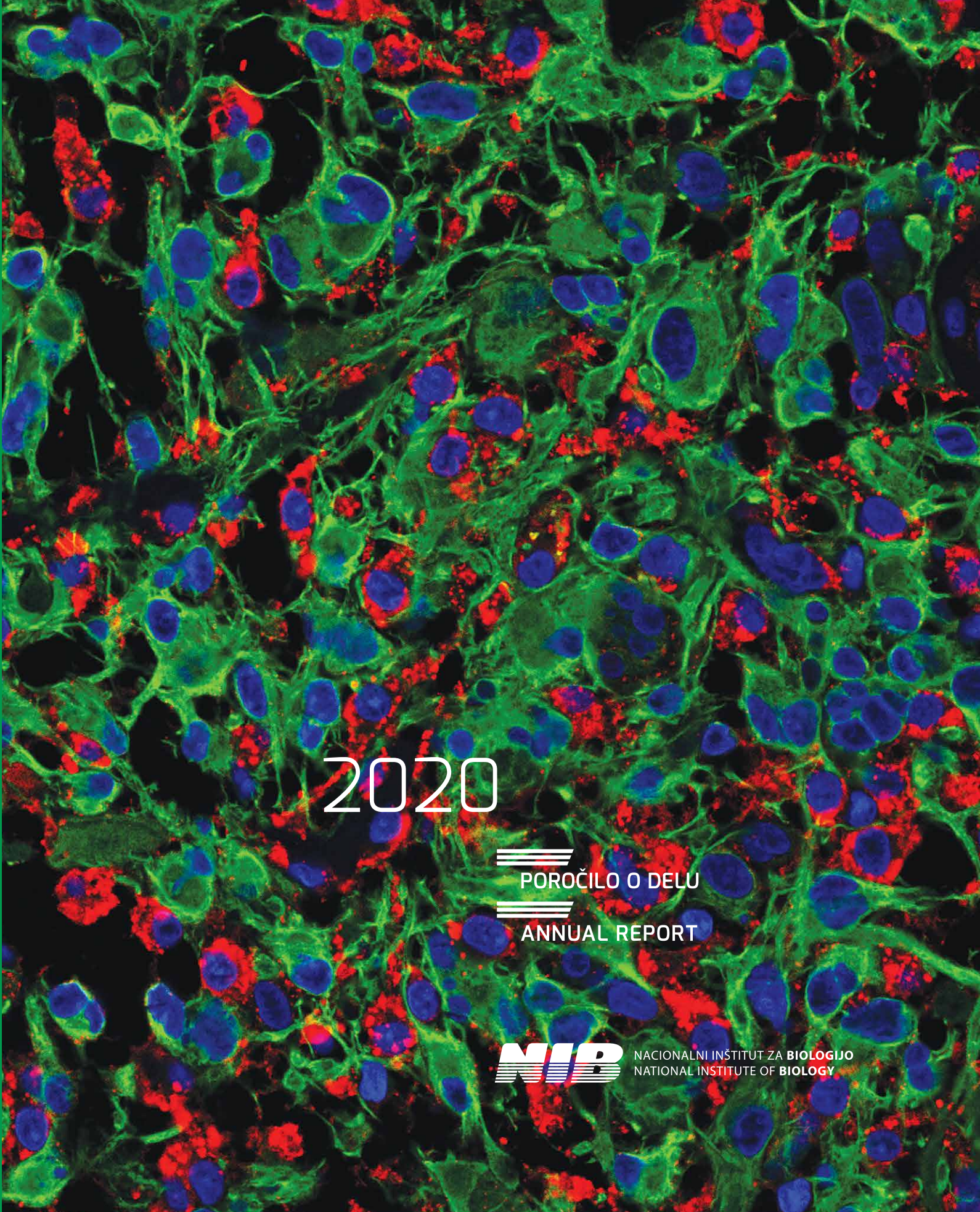

2020

POROČILO O DELU

ANNUAL REPORT

NACIONALNI INŠTITUT ZA **BIOLOGIJO**
NATIONAL INSTITUTE OF **BIOLOGY**

60-letnica Nacionalnega inštituta za biologijo (vir: NIB arhiv). 60th anniversary of the National Institute of Biology (Source: NIB archive).

POSLANSTVO

Poslanstvo NIB je ustvarjanje novega znanja na področju bioloških znanosti za razumevanje življenjskih procesov, ohranjanje biološke raznovrstnosti in zdravega okolja, doseganje večje kvalitete življenja ter podporo trajnostnemu razvoju. Med biološke znanosti štejemo biologijo in njej sorodne naravoslovne vede. Interdisciplinarno se povezujemo na področjih varstva narave in okolja, biotehnologije, farmacije in medicine, kmetijstva, gozdarstva, ribištva in prehrane, turizma in pomorskega prometa ter prostorskega načrtovanja.

To poslanstvo izvajamo s štirimi vrstami dejavnosti:

- ustvarjanje novega znanja s temeljnimi raziskavami na področju bioloških in sorodnih naravoslovnih znanosti in objavljanjem le-tega v znanstvenih publikacijah;
- uvajanje novo ustvarjenega znanja v prakso za potrebe mednarodnih, državnih in lokalnih organov ter za gospodarske subjekte s ciljem izboljševanja kvalitete življenja in trajnostnega razvoja;
- izobraževanje na dodiplomskem, podiplomskem in podoktorskem nivoju:
  - usposabljanje mladih raziskovalcev v podiplomskem študiju do pridobitve doktoratov,
  - spodbujanje kroženja doktorskih in podoktorskih sodelavcev tako iz domačih kot tujih okolij,
  - predavanja in mentorstva na dodiplomskih in podiplomskih programih slovenskih in tujih univerz ter drugih visokih in strokovnih šolah;
- popularizacija znanosti:
  - splošno izobraževalne dejavnosti na različnih seminarjih in delavnicah,
  - angažiranje in informiranje javnosti.

VIZIJA

Kot mednarodno uveljavljena avtonomna inštitucija želimo ustvarjati vrhunsko znanje in razvijati tehnologije na področjih bioloških in sorodnih naravoslovnih znanosti. Z dobro organiziranostjo in vrhunsko opremo bomo skrbeli za zadovoljstvo zaposlenih in vzgojo vrhunskih kadrov. Svoj dolgoročni razvoj bomo zagotavljali v tesni povezavi z družbo in poslovnim sektorjem.

Knjiga Rastvejitev, prvih 1,89341556 × 10^9 sekund, ki skozi oči bivših direktorjev in direktorice ter današnjih raziskovalcev z jasnim pogledom naprej razkriva razburljivih zadnjih 60 let rasti inštituta (vir: NIB arhiv). The book Rastvejitev, the First 1.89341556 × 10^9 Seconds through the eyes of former directors and today's researchers, it provides insight into the exciting 60 years of the Institute's growth, with a clear vision ahead (Source: NIB archive).

MISSION

The mission of NIB is to create new knowledge in the field of biological sciences for understanding life processes, preserving biodiversity and healthy environment in order to achieve better quality of life. Biological sciences include biology and related natural sciences. Our interdisciplinary collaboration includes nature and environment protection, biotechnology, pharmaceutical and medical sciences, agriculture, forestry, fishery and food, tourism and maritime transport, and spatial planning.

We carry out this mission through four types of activities:

- creating new knowledge through basic research in biology and related natural sciences and publishing it in scholarly journals;
- applying this new knowledge in practice for the needs of international, national and local bodies, as well as for economic subjects with the intention of improving the quality of life and sustainable development;
- education at the undergraduate, postgraduate and postdoctoral levels:
  - providing training to young researchers during postgraduate studies, leading to doctorates;
  - encouraging rotation of doctoral and postdoctoral associates from both local and international environments;
  - lectures and mentorships for undergraduate and postgraduate courses of Slovenian and foreign universities and other higher and vocational schools;
- popularizing science:
  - general educational activities at seminars and workshops;
  - community engagement and information.

VISION

Being an internationally renowned autonomous institution, NIB has a vision to create advanced knowledge and develop technologies in the fields of biology and related sciences. Through efficient organization and state-of-the-art facilities, we shall provide for employee satisfaction and development of top-level staff. Working closely with society and the business sector, we will ensure long-term development.

Gladka pokrovača (*Flexopecten glaber*) je pogost prebivalec muljastega dna slovenskega morja, ki očara s setom svojih modrih oči na robovih plašča (foto: B. Mavrič). The scallop *Flexopecten glaber* is a common inhabitant of the muddy bottom of the Slovenian sea, which enchants with a set of its blue eyes on the edges of its mantle (Photo: B. Mavrič).

VSEBINA

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UVODNA BESEDA DIREKTORJA

Prihodnost človeštva je tesno povezana z njegovim razumevanjem ved o življenju. Nikoli doslej se nismo soočali s tako drastičnimi eksistenčnimi problemi – globalne spremembe, porast temperatur, taljenje ledenikov, naraščanje gladine oceanov, uničevanje naravnih habitatov, upadanje biotske pestrosti, prekomeren izlov organizmov, onesnaževanje, prekomerna rast prebivalstva, pomanjkanje pitne vode in zdrave hrane, poseganje v naravne cikle, pandemije. Sestavljanje mozaika, kako preobrniti tovrstne degradacije planeta in kvalitete življenja, je naloga multidisciplinarne znanosti, kjer vede o življenju odigrajo glavno vlogo. Te vede povezuje in neguje Nacionalni inštitut za biologijo (NIB). V nekaterih od teh smo vodilni v svetu. NIB je v zadnjem času naredil ogromne korake naprej za reševanje človeka in njegove vloge v naravi. Naši uspehi se odražajo v mnogih odličnih znanstvenih in poljudnih objavah. Poleg tega smo uspešni v inovativnih biotehnoloških rešitvah ter pedagoškem prenašanju znanja.

Leto 2020, v katerem zaključujem svoj triletni mandat vodenja NIB, je bilo nasploh prelomno. Kljub soočanju z novo realnostjo COVID-19, je kulminiralo v izjemnih uspehih inštituta, kar je nedvomno odraz dobrega dela, kadrovanja in vodenja v prejšnjih letih. V letu 2020 smo namreč dosegli in prestopili nekaj prelomnic. Z Ministrstvom za izobraževanje, znanost in šport smo podpisali 20 milijonov evrov vredno pogodbo za črpanje iz sklada za kohezijsko politiko EU, kar nam omogoča začetek gradnje Biotehnološkega stičišča NIB, pretežko pričakovane nove znanstvene infrastrukture v Ljubljani. V tem letu smo medtem ustvarjali presežke prihodkov nad odhodki, ki nam omogočajo nadaljnjo kadrovsko in organizacijsko rast. Preko nove interne sheme smo ustanovili in pognali v gibanje Raziskovalni sklad NIB, ki po eni strani omogoča financiranje pilotnih projektov mladih nosilcev, po drugi pa povsem nove raziskovalne smeri. Repatriirali smo slovenske raziskovalce, ki bi imeli možnost nadaljevati uspešne kariere v tujini, pa se na

Načrtovana investicija Biotehnološko stičišče NIB (vir: L. Tišler). Planned investment Biotechnological Hub NIB (Source: L. Tišler).

INTRODUCTION BY THE DIRECTOR

The future of humankind is closely related to its understanding the life sciences. Never before have we been faced with such grave existential problems. Global changes, increasing temperatures, glacier melting, rising ocean levels, natural habitats destruction, decreasing biodiversity, overfishing, pollution, overpopulation, shortage of drinking water and healthy food, interfering with natural cycles, pandemics. Putting together the mosaic of how to reverse such degradations of the planet and the qualities of life is the responsibility of interdisciplinary sciences, where life sciences play a major role. These sciences are brought together and nursed by the National Institute of Biology (NIB). In some of them, we are a leading force internationally. In recent times, NIB has made huge steps towards saving people and their role in nature. Our success has been reflected in many excellent scientific and popular publications. On top of that, we are successful in innovative biotechnological solutions and educational transfer of knowledge.

The year 2020, which marks the end of my three-year term as the head of NIB, was memorable. Despite facing a new reality of COVID-19, it culminated in massive successes of the institute, which is undoubtedly the result of good work, staff recruitment and management in the preceding years. In 2020, we reached and passed a few milestones. With the Ministry of Education, Science and Sport we signed a 20 million EUR contract to utilize the EU cohesion funds, which allows us to begin the construction of the Biotechnological Hub of NIB, the long-awaited new science facilities in Ljubljana. This year, our revenues exceeded expenses, which allowed further growth in terms of staff and organization. Through a new internal scheme, we set up and launched the Research Fund of NIB, which enables financing pilot projects of young project leaders, as well as completely new research agendas. We have repatriated Slovenian researchers who could have pursued their successful careers abroad, but decided to return to their homeland,

njihovo odločitev vračajo v domovino, kjer nam bodo pomagali z novimi preboji. Podpisali smo sporazum z Univerzo v Ljubljani, s katerim je NIB postal njen pridruženi član, kar ustvarja povsem nove sinergije v slovenskem znanstveno izobraževalnem ekosistemu. S temi mejniki smo začrtali korake proti formiranju kampusa ved o življenju v Ljubljani, ki bo poleg Morske biološke postaje v Piranu nudil potrebno infrastrukturo za naš nadaljnji preboj in prenašanje znanja na prihodnje generacije. Naš kampus znanja bo preraščal institucionalne in narodne bariere. Z novimi facilitetami stremimo k temu, da bo NIB postal vodilni regionalni center bioznanosti.

Namesto svečane prireditve ob 60. obletnici NIB smo v obdobju zaostrenih epidemioloških razmer objavili knjigo Rastvejitev ter posneli film z njenimi ustvarjalci. V filmu, ki je na voljo na naši spletni strani, imamo možnost poslušati tudi naše letošnje nagrajence. Letošnji dobitniki nagrad Miroslava Zeia so: prof. dr. Marina Dermastia za življenjsko delo, dr. Ion Gutierrez Aguirre in prof. dr. Lovrenc Lipej za izjemne dosežke, častni član NIB pa je postal akademik prof. dr. Matija Gogala. Iskrene čestitke vsem nagrajencem.

Trdim, da je 21. stoletje obdobje ved o življenju. Aristotel je kot »življenje« videl stvari, ki se razvijajo, rastejo in odmirajo. Po analogiji se razvija, raste in odmira tudi vsaka družba in pozicioniranje znanja v njej. Pred 60 leti so bile biološke znanosti na Slovenskem v zgodnji fazi razvoja. Danes so v fazi pospešene rasti in naj tako ostane čimdalje. Za znanje pa naj velja, naj nikoli ne zaide v fazo odmiranja.

Po 60 letih obstoja NIB vstopa v svoje zrelo obdobje. Vsem kolegicam in kolegom, trenutno aktivnim in že upokojenim, čestitam za to lepo okroglo obletnico: Hvala za vaš doprinos k našim skupnim uspehom. Te okrogle obletnice tudi ne bi mogli praznovati brez podpornikov slovenske znanosti, med katere štejemo tudi vas, spoštovane bralke, spoštovani bralci. Hvala za vašo preteklo in kontinuirano podporo. Nacionalnemu inštitutu za biologijo in njegovemu novemu vodstvu pa želim vse dobro v letih, ki prihajajo.

Izr. prof. Matjaž Kuntner, direktor 2018–2020

where they will assist us in new breakthroughs. We have signed an agreement with the University of Ljubljana, which makes NIB its associate member. This creates completely new synergy in the Slovenian scientific and educational environment. These milestones have paved the way towards forming a life sciences campus in Ljubljana. Together with the Marine Biological Station in Piran, it will offer the necessary facilities for our continuing breakthroughs and transfer of knowledge to the future generations. Our knowledge campus shall not be limited by institutional and national barriers. With new facilities, we strive to make NIB the leading regional center of bioscience.

In the period of tense epidemiological situation, we replaced the gala event on the occasion of the 60th anniversary of NIB with publishing the book entitled Rastvejitev, and making a film with its creators. In the film, available on our website, you can hear our laureates from this year. This year's Miroslav Zei Awards go to Prof. Dr. Marina Dermastia for life achievement, to Dr. Ion Gutierrez Aguirre and Prof. Dr. Lovrenc Lipej for exceptional achievements, while academician Prof. Dr. Matija Gogala became a honorary member of NIB. Congratulations!

In my belief, the 21st century is the era of life sciences. According to Aristotle, "life" refers to living things that develop, grow and decay. By analogy, any society and the position of knowledge in it are also subject to development, growth and decay. Sixty years ago, biological sciences in Slovenia were in the early development stage. Nowadays, they are going through a phase of accelerated growth and it should remain that way as long as possible. Regarding knowledge, it should never enter the decay phase.

After 60 years of existence, NIB is entering its mature period. I would like to congratulate all my colleagues, the active and the retired ones, on this round anniversary: Thank you for your contribution towards our joint success. Celebrating this decennial anniversary would not be possible without the supporters of Slovenian science, and you, dear reader, are considered as one of them. Thank you for your past and continuous support! And I wish all the best to the National Institute of Biology and its new management in the years to come.

Assoc. Prof. Dr. Matjaž Kuntner, director 2018-2020

VODSTVO INŠTITUTA
INSTITUTE'S MANAGEMENT

DIREKTOR
DIRECTOR

izr. prof. dr. Matjaž Kuntner (od from 2018)
Mandat Mandate: 1. 3. 2018 – 31. 12. 2020

POMOČNIK DIREKTORJA ZA FINANČNO IN SPLOŠNO PODROČJE
DEPUTY DIRECTOR FOR FINANCE AND GENERAL MATTERS

mag. Franc Potočnik (od from 1999)
Mandat Mandate: 1. 3. 2018 – 28. 2. 2023

POMOČNIK DIREKTORJA ZA PROJEKTNO PODPORO IN PRENOS TEHNOLOGIJ
DEPUTY DIRECTOR FOR TECHNOLOGY TRANSFER

mag. Jure Vindišar (od from 2017)
Mandat Mandate: 1. 3. 2018 – 28. 2. 2023

Vodstvo NIB, ki je petletni mandat nastopilo s 1. marcem 2018, so v letu 2020 sestavljali direktor izr. prof. dr. Matjaž Kuntner ter pomočnika direktorja mag. Jure Vindišar in mag. Franc Potočnik.

The NIB management, who began their term on 1st March, 2018, consisted of director Assoc. Prof. Dr. Matjaž Kuntner, and deputy directors Jure Vindišar, MSc, and Franc Potočnik, MSc.

Direktor, izr. prof. dr. Matjaž Kuntner, je dne 24. 4. 2020 podal odstopno izjavo z mesta direktorja. Zaradi navedenega je bil izveden javni razpis za imenovanje novega direktorja in Upravni odbor je dne 3. 11. 2020 za direktorico NIB imenoval prof. dr. Majo Ravnikar. Vlada RS je k njenemu imenovanju podala soglasje dne 9. 12. 2020, funkcijo direktorice NIB pa je nastopila s 1. 1. 2021.

Director, Assoc. Prof. Dr. Matjaž Kuntner, tendered his resignation as director on 24th April, 2020. As a result, invitation for the post of a new director was published, and the Board of Governors appointed Prof. Dr. Maja Ravnikar as the new director of NIB on 3rd November, 2020. The Government of the Republic of Slovenia gave its consent on 9th December, 2020, and she began her term as director of NIB on 1st January, 2021.

UPRAVNI ODBOR
BOARD OF GOVERNORS

prof. dr. Franci Demšar, Nacionalna agencija Republike Slovenije za kakovost v visokem šolstvu – predsednik president
prof. dr. Maja Ravnikar, Nacionalni inštitut za biologijo – podpredsednica vice-president
dr. Tomaž Boh, Ministrstvo za izobraževanje, znanost in šport (od from 20. 1. 2020)
dr. Ruth Rupreht, Ministrstvo za okolje in prostor
prof. dr. Uroš Urleb, Biofarmacevtika Mengeš, Novartis
Mandat Mandate: 22. 6. 2018 – 21. 6. 2022

ZNANSTVENI SVET
SCIENTIFIC COUNCIL

Znanstveni svet NIB, katerega člani so bili izvoljeni za mandatno obdobje od 15. 6. 2016 do 14. 6. 2020, je deloval v sestavi:

The Scientific Council of NIB, elected for the period from 15 June 2016 to 14 June 2020, consisted of the following members:

izr. prof. dr. Valentina Turk, predsednica president
izr. prof. dr. Meta Virant-Doberlet, podpredsednica vice-president
prof. dr. Anton Brancelj
prof. dr. Marina Dermastia
prof. dr. Metka Filipič
prof. dr. Kristina Gruden
izr. prof. dr. Matjaž Kuntner (direktor director)
izr. prof. dr. Patricija Mozetič
doc. dr. Andreja Ramšak
izr. prof. dr. Jana Žel
Mandat Mandate: 26. 4. 2016 – 25. 4. 2020

Znanstveni svet NIB, katerega člani so izvoljeni za mandatno obdobje od 17. 6. 2020 do 16. 6. 2024, deluje v sestavi:

The Scientific Council of NIB, elected for the period from 17 June 2020 to 16 June 2024, consisted of the following members:

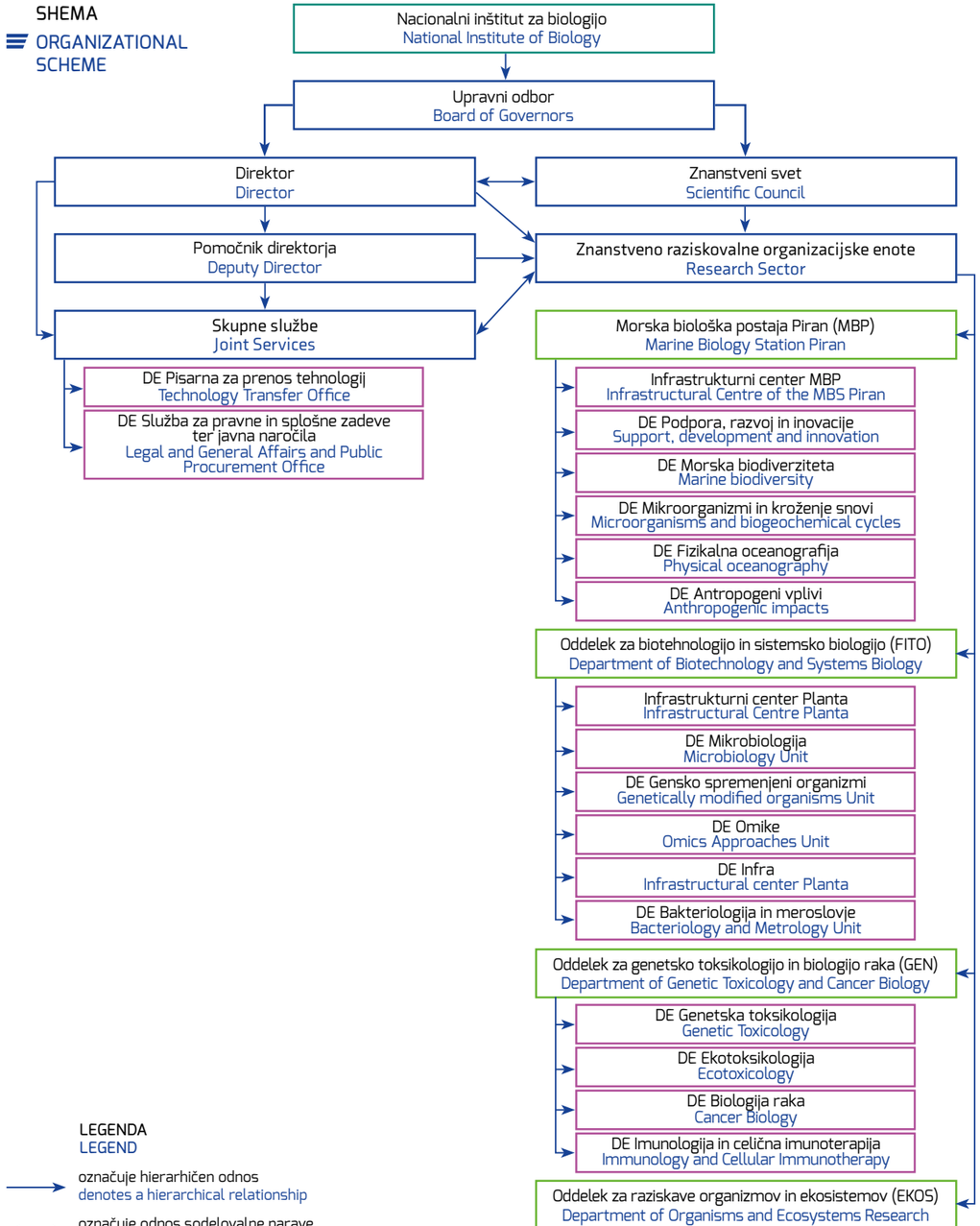
prof. dr. Marina Dermastia (predsednica president)
doc. dr. Bojana Žegura (podpredsednica vice-president)
prof. dr. Kristina Gruden
prof. dr. Lovrenc Lipej
dr. Nataša Mori
izr. prof. dr. Patricija Mozetič
dr. Martina Orlando Bonaca
prof. dr. Maja Ravnikar (direktorica director)
doc. dr. Al Vrezec
doc. dr. Anže Županič

ČASTNI ČLANI
HONORARY MEMBERS

prof. dr. Kazimir Tarman, od from 25. 10. 2010
dr. Guy Van Den Eede, od from 25. 10. 2010
prof. dr. Cornelis Johannes Forrendinis van Noorden, od from 14. 11. 2014
prof. dr. Tom Turk, od from 8. 11. 2017
Akad. prof. dr. Matija Gogala, od from 21. 12. 2020

Preplet cevkastih mnogoščetincev, ki so pogost del filtratorske obrasti slovenskega morja (foto: B. Mavrič).
Interweaving of tubular polychaetes, which are a frequent constituent of the filtering fouling community in the Slovenian sea (Photo: B. Mavrič).

ORGANIZACIJSKA SHEMA
ORGANIZATIONAL SCHEME



LEGENDA
LEGEND

označuje hierarhičen odnos
denotes a hierarchical relationship

označuje odnos sodelovalne narave
denotes a cooperative relationship

PREGLED POSLOVANJA NIB V LETU 2020

Že za poslovno leto 2019 je bilo zapisano, da je bilo za NIB eno najbolj uspešnih v njegovem dosedanjem poslovanju, leto 2020 pa je bilo še za odtenek uspešnejše.

Najpomembnejši uspeh v letu 2020 je za dolgoročni razvoj NIB predstavljal podpis pogodbe z Ministrstvom za izobraževanje, znanost in šport za sofinanciranje investicijskega projekta Biotehnološko stičišče Nacionalnega inštituta za biologijo (BTS-NIB). Pogodba, ki je bila podpisana 9. 3. 2020, iz sredstev evropske kohezijske politike zagotavlja 20 milijonov EUR za izgradnjo vrhunske raziskovalne infrastrukture. Odobritev financiranja investicije za NIB pomeni priznanje, da je res vrhunska raziskovalna organizacija, ki dosega odlične rezultate v vseh najpomembnejših razsežnostih znanstveno raziskovalnega delovanja na področju biologije in sorodnih ved: pri ustvarjanju novega znanja in njegovega objavljanja v uglednih znanstvenih publikacijah, pri prenašanju tega znanja v gospodarstvo, pri uporabi tega znanja za podporo državnim organom in drugim institucijam pri izvajanju njihovih politik ter pri prenosu ustvarjenega znanja mladim generacijam v pedagoškem procesu. To priznanje hkrati pomeni zavezo NIB k še večji znanstveni prodornosti in še intenzivnejši vpetosti v procese prenašanja novega znanja uporabnikom.

Ta uspeh in to priznanje ne bi mogla biti dosežena v bolj primernem letu, saj je NIB v letu 2020 praznoval 60-letnico svojega delovanja. V tem obdobju je NIB naredil velike razvojne korake in si z njimi ustvaril ugled, ki ga uživa danes, realizacija investicije pa mu bo omogočila nadaljevanje takšne razvojne dinamike.

Finančno je NIB v letu 2020 posloval zelo uspešno, kljub temu da se je soočal z mnogimi težavami, povezanimi s pandemijo COVID-19. Prvič v svojem delovanju je uspel preseči 10 milijonov EUR prihodkov – ti so znašali 10.590.903 EUR. Ustvarjeni prihodki so bili višji od načrtovanih za 480.068 EUR (4,75 %). Ustvarjeni presežek prihodkov nad odhodki (pred obračunom davka od dohodkov pravnih oseb) v višini 231.527 EUR je sicer nekoliko zaostajal za načrtovanim (za 20.369 EUR oz. 8,07 %), kar pa je povsem razumljivo, saj so pri poslovanju nastali visoki nepredvideni stroški, povezani z obvladovanjem navedene pandemije.

V primerjavi z letom 2019 so bili realizirani prihodki NIB v letu 2020 višji za 1.098.494 EUR (11,57 %), realizirani odhodki pa za 1.389.005 EUR (15,29 %). Posledično je bil v letu 2020 ustvarjen slabši poslovni izid kot v letu 2019 (za 176.503 EUR oz. 43,26 %), kar je, kot že navedeno, posledica povečanih stroškov za obvladovanje pandemije v letu 2020.

Nominalno največja rast prihodkov v letu 2020 v primerjavi z letom 2019 je bila dosežena pri prihodkih od ARRS. Ti so v letu 2020 znašali 5.986.628 EUR in so bili od primerljivih prihodkov v letu 2019 višji za 601.579 EUR (za 11,35 %). Naslednji po nominalni vrednosti povečanja so bili prihodki od projektov iz različnih evropskih programov (OBZORJE 2020, INTERREG, LIFE …), ki so v letu 2020 znašali 1.721.283 EUR in so bili višji od primerljivih v letu 2019 za 297.997 EUR (20,94 %). Prihodki na trgu v letu 2020 v višini 1.322.637 EUR pa so bili nižji kot v letu 2019 za 137.605 EUR (10,77 %), od teh v pretežni meri prihodki na trgu iz javnih sredstev. Tudi na področju izvajanja temeljnega raziskovanja je bil NIB v letu 2020 uspešen. V tem letu so raziskovalci NIB objavili 128 znanstvenih člankov v revijah s faktorjem vpliva, od teh 81 v revijah v prvem kvartilu, dve znanstveni knjigi ter sodelovali pri objavi enajstih znanstvenih knjig, v katerih so bila njihova poglavja.

OVERVIEW OF THE NIB OPERATIONS IN 2020

As we said last year, already the fiscal year 2019 was one of the most successful in the history of NIB, and 2020 was even more successful.

For its long-term development, NIB's greatest achievement in 2020 is signing a contract with the Ministry of Education, Science and Sport for co-financing the investment project of the NIB Biotechnological Hub (BTS-NIB). The contract, signed on 9th March, 2020, shall provide 20 million EUR from the European cohesion policy funds to build state-of-the-art research infrastructure. The approval of funding the investment is a way of recognizing NIB as a top research organization, achieving great results in all of the most important spheres of scientific and research activities in the area of biology and related sciences: in generating new knowledge and its publication in respected scientific journals, in transferring this knowledge to economy, in using the knowledge for the support of public authorities and other institutions in the implementation of their policies and transferring the generated knowledge to young generations within the educational process. At the same time, this recognition makes NIB responsible for even greater scientific agility and increased integration in the processes of transferring new knowledge to its users.

With NIB celebrating its 60th anniversary in 2020, the timing of this success and recognition was perfect. During this time, NIB has made huge development steps and built a well-earned reputation, while the investment, when realized, will allow this development dynamics to continue.

Despite facing many COVID-19 pandemic-related challenges, NIB's financial operations were very successful in 2020. For the first time in its history it reached 10 million EUR in revenues, amounting to 10,590,903 EUR. We posted revenues of 10,590,903 EUR, which is 480,068 EUR (4.75%) more than planned, while the generated profit of 231,527 EUR (before corporate income tax) was behind the plan (by 20,369 EUR, i.e. 8.07%), which can be explained by unexpectedly high operating costs, related to beating the pandemic.

Compared to 2019, NIB's revenues in 2020 were higher by 1,098,494 EUR (11.57 %), and expenses by 1,389,005 EUR (15.29 %). As a result, NIB had a lower P&L in 2020, compared to 2019 (by 176,503 EUR or 43.26%). As said before, this is due to increased costs of beating the pandemic in 2020.

Nominally, the greatest revenue increase in 2020 compared to 2019 was achieved in relation to revenues from the Slovenian Research Agency (ARRS). These equaled 5,986,628 EUR and were by 601,579 EUR (11.35%) higher than comparable revenues in 2019. The next in terms of the nominal amount of increase were revenues generated in projects from various European programs (HORIZON 2020, INTERREG, LIFE, etc.), which equaled 1,721,283 EUR in 2020 and were by 297,997 EUR (20.94%) higher than comparable revenues in 2019. Revenues on the market in the amount of 1,322,637 EUR were by 137,605 EUR (10.77%) lower in 2020 than in 2019. This mostly refers to the revenues on the market, financed from public funds. In 2020, NIB was successful also in the area of basic research. Its researchers published 128 scientific articles in journals with the impact factor, including 81 in journals in the first quarter; they published two scientific books and participated in the publication of eleven scientific books that include their chapters.

PRIHODKI V EUR REVENUES IN EUR	2020	STRUKTURA 2020 (%) STRUCTURE 2020 (%)	2019	INDEKS 2020/19 INDEX 2020/19
Prihodki od ARRS Slovenian Research Agency	5.986.627,82	56,53	5.299.559,61	112,96
Druge javne službe Other public institutions	1.558.147,11	14,71	1.495.311,35	104,20
Evropski skladi EU funds	1.721.282,68	16,25	1.423.305,62	120,94
Domači trg Domestic market	682.351,81	6,44	652.037,18	104,65
Tuji trg Foreign market	640.284,84	6,05	617.246,10	103,73
Drugi prihodki Other revenues	2.208,92	0,02	4.949,21	44,63
Skupaj prihodki Total revenues	10.590.903,18	100,00	9.492.409,07	111,57

ODHODKI V EUR EXPENSES IN EUR	2020	STRUKTURA 2020 (%) STRUCTURE 2020 (%)	2019	INDEKS 2020/19 INDEX 2020/19
Stroški dela Labour	6.095.545,46	58,84	5.458.698,27	111,67
Stroški amortizacije Amortization	552.228,62	5,33	509.506,69	108,38
Stroški materiala Material	1.676.753,41	16,19	1.196.167,42	140,18
Stroški storitev Services	1.961.987,02	18,94	1.854.193,79	105,81
Drugi stroški in odhodki Other	72.861,90	0,70	65.813,14	110,71
Skupaj odhodki Total expenditure	10.359.376,41	100,00	9.084.379,31	114,04

REZULTAT POSLOVANJA BUSINESS RESULT	231.526,77		408.029,76	205,99

Tudi z vidika začetka izvajanja novih projektov je bilo leto 2020 za NIB uspešno. Izvajati je začel petnajst projektov ARRS (deset kot nosilna organizacija, pet kot sodelujoča). Raziskovalno sodelovalni projekt Obzorja 2020 (ADAPT) pa se je začel izvajati sredi leta. Projekt je namenjen iskanju biomarkerjev za dizajniranje krompirja odpornega na kombinacijo različnih stresnih dejavnikov in pripravo odločitvenih dreves za izboljšavo kmetijskih praks prilagojenim letnim vremenskim razmeram. Drugi projekt Obzorja 2020, ki se je prav tako začel sredi leta, je projekt promocije raziskovalcev in njihovega dela, ki se širši javnosti predstavlja pod imenom Noč raziskovalcev (NOČMOČ). V 2020 je NIB izvajal 13 projektov iz programa Obzorje 2020, eden od teh je koordinatorski projekt. NIB je v letu 2020 pridobil projekt sheme MSCA RISE, kjer sodeluje kot partner, vendar se je začetek le-tega, predvsem zaradi epidemioloških razmer, ki bi otežile njegovo izvajanje, premaknilo v leto 2021.

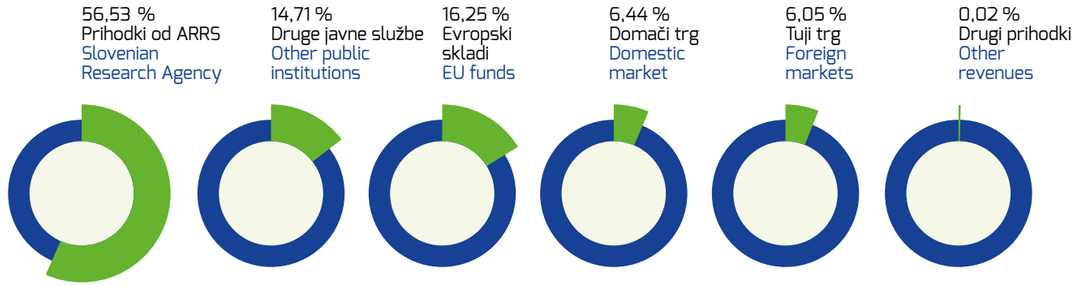
NIB je v letu 2020 začel izvajati še strateški projekt INTERREG MED na področju inovacij v modri bioekonomiji, t. i. projekt B-Blue –vzpostavitev modre biotehnološke skupnosti v Sredozemlju, in dva projekta (TRETAMARA, GreenHull) iz programa INTERREG Slovenija-Italija.

Nadalje je NIB kot konzorcijski partner v letu 2020 sodeloval pri izvedbi operacij razvoja raziskovalne infrastrukture za mednarodno konkurenčnost slovenskega RRI prostora – RI-SI-2 Lifewatch: Evropska infrastruktura za e-znanost in tehnologijo za raziskave biotske raznovrstnosti in ekosistemov.

Tudi v letu 2020 je NIB intenzivno sodeloval pri prijavah projektov na različne razpise. Med drugim je sodeloval pri 30 prijavah predlogov projektov na razpisih v okviru programa Obzorje 2020 in pri 21 prijavah predlogov projektov drugih različnih mednarodnih razpisov.

STRUKTURA PRIHODKOV NIB V LETU 2020

REVENUE STRUCTURE IN 2020



NIB also had a successful 2020 in terms of the launch of new projects. NIB launched fifteen projects of the Slovenian Research Agency (ten as the leading and five as a participating organization). One research – the participating project from the Horizon 2020 program (ADAPT) – began in the middle of the year. The project is aimed at identifying biomarkers in order to develop multiple-stress tolerant potato, and setting up decision trees for the improvement of agriculture practices, adapted to seasonal weather conditions. The other project, Horizon 2020, which also began mid-year, is a project to promote researchers and their work, publicly known as the Researchers' Night. In 2020, NIB was working on thirteen projects from the Horizon 2020 program, which included one coordination project. In 2020, NIB acquired a MSCA RISE scheme project, where it collaborates as a partner; however, mostly due to the epidemic situation that would have made doing such project difficult, its beginning was moved to 2021.

In 2020, NIB began a strategic INTERREG MED project in the field of innovations in blue bioeconomy – B-Blue project: Building blue biotechnology community in the Mediterranean, and two projects (TRETMARA, GreenHull) from the INTERREG Slovenia – Italy program.

As a consortium partner, NIB took part in the running of operations for the development of research infrastructure for international competitiveness of Slovenian RDI space – RI-SI-2 Lifewatch" – European Infrastructure for e-Science and Technology for Biodiversity and Ecosystem Research.

The year 2020 was also marked by NIB's intensive participation in project applications for various calls for proposals. NIB participated in 30 project proposal applications for calls for proposals within the Horizon 2020 program and 21 project proposal applications in various other international calls for proposals.

IZVAJANJE RAZISKOVALNIH PROGRAMOV IN PROJEKTOV

NIB je v letu 2020 kot nosilec izvajal naslednje raziskovalne programe:

- P1-0237: Raziskave obalnega morja, ki se izvaja v organizacijski enoti MBP (7,78 FTE, 19 raziskovalcev, en upokojeni raziskovalec, dva raziskovalca na začetku kariere, en tehnični sodelavec, sedem MR-jev, vodja dr. Patricija Mozetič), obdobje financiranja 2020–2025;
- P4-0165: Biotehnologija in sistemska biologija rastlin, ki se izvaja v organizacijski enoti FITO (5,40 FTE, 18 raziskovalcev, en raziskovalec na začetku kariere, šest tehničnih sodelavcev, šest MR, vodja dr. Maja Ravnikar), obdobje financiranja 2015–2021;
- P1-0255: Združbe, interakcije in komunikacije v ekosistemih, ki se izvaja v organizacijski enoti EKOS (6,40 FTE, 16 raziskovalcev, en upokojeni raziskovalec, trije tehnični sodelavci, pet MR, vodja dr. Meta Virant Doberlet) ter v soizvajalski organizaciji Prirodoslovni muzej Slovenije (0,19 FTE, 2 raziskovalca), obdobje financiranja 2017–2022;
- P1-0245: Ekotoksikologija, toksikološka genomika in karcinogeneza, ki se izvaja v organizacijski enoti GEN (3,83 FTE, 12 raziskovalcev, dva tehnična sodelavca, pet MR-ji, vodja dr. Tamara Lah Turnšek), obdobje financiranja 2019–2024;
- P4-0407: Okoljska in aplikativna virologija: virusi, prijatelji in sovražniki, ki se izvaja v organizacijski enoti FITO (2,46 FTE, šest raziskovalcev, trije tehnični sodelavci, trije MR-ji, vodja dr. Jana Žel), obdobje financiranja 2019–2024.

Poleg zgoraj navedenih petih raziskovalnih programov je organizacijska enota MBP sodelovala še pri izvajanju programa P1-0143: Kroženje snovi v okolju, snovna bilanca in modeliranje okoljskih procesov ter ocena tveganja, katerega nosilec je Inštitut Jožef Stefan, vodja dr. Milena Horvat, obseg FTE za NIB 0,33.

NIB je v letu 2020 izvajal tudi infrastrukturni program v obsegu 6 FTE.

Poleg zgoraj naštetih programov je NIB v letu 2020 izvajal tudi 42 projektov ARRS v skupnem obsegu 19,19 FTE, od tega 31 temeljnih, 4 aplikativne in 6 podoktorskih projektov ter enega v okviru komplementarne sheme (25 kot nosilec in 17 kot sodelujoča organizacija) ter dva projekta v okviru CRP programov (enega v programu Zagotovimo.si hrano za jutri in enega v programu CRP 2019, oba kot nosilec), v skupnem letnem obsegu 0,55 FTE.

Obseg financiranja projektov s strani ARRS je bil v letu 2020 za 4,56 FTE oz. 31,17 % večji kot v preteklem letu.

V 2020 je NIB izvajal 13 projektov iz programa Obzorje 2020. En raziskovalni, sodelovalni projekt Obzorja 2020 (ADAPT), se je začel izvajati sredi leta. Drugi projekt Obzorja 2020, ki se je začel izvajati sredi leta, je projekt promocije raziskovalcev in njihovega dela, ki se širši javnosti predstavlja pod imenom Noč raziskovalcev (NOČMOČ). Višina ustvarjenih prihodkov je v letu 2020 na teh projektih znašala 793.213,21 EUR in je predstavljala 7,49 % vseh prihodkov NIB-a.

Poleg projektov 8. Okvirnega programa je NIB v letu 2020 izvajal še en projekt iz programa ARIMNET (EnViRos), ki sodi v 7. Okvirni program EU, en projekt iz programa EMPIR (SEPTIMET) in dva projekta iz programa ERA CoBio Tech, ki sta sestavni del programa Obzorje 2020. Vloga NIB v teh projektih je partnerska. Višina prihodkov iz teh štirih projektov je v letu 2020 znašala 189.580,66 EUR in je predstavljala 1,79 % vseh prihodkov.

V 2020 je NIB izvajal trinajst projektov iz drugih mednarodnih programov financiranja (LIFE, INTERREG Alpine Space, INTERREG Europe, INTERREG Mediterranean, INTERREG Slovenija – Hrvaška, INTERREG Italija – Slovenija). Poleg obstoječih dveh strateških projektov iz progama INTERREG MED (SHAREMED, OSMOSIS) je NIB v letu 2020 začel izvajati še en INTERREG MED strateški projekt na področju inovacij v modri bioekonomiji – projekt B-Blue: Vzpostavitev modre biotehnološke skupnosti v Sredozemlju.

IMPLEMENTATION OF RESEARCH PROGRAMS AND PROJECTS

NIB carried out the following research programs as the leader in 2020:

- P1-0237 – Coastal Sea Research, running at the MBS organizational unit (7.78 FTE, 19 researchers, one retired researcher, two researchers at the beginning of their careers, one technical assistant, six YRs, and the head Dr. Patricija Mozetič), funding period 2020–2025;
- P4-0165 – Biotechnology and Plant Systems Biology, running at the FITO organizational unit (5.4 FTE, 18 researchers, one researcher at the beginning of the career, six technical assistants, six YRs, and the head Dr. Maja Ravnikar), funding period 2015–2021;
- P1-0255 – Communities, Interactions and Communications in Ecosystems, running at the EKOS organizational unit (6.4 FTE, 16 researchers, one retired researcher, three technical assistants, five YRs, and the head Dr. Meta Virant-Doberlet) and co-implemented by the Slovenian Museum of Natural History (0.19 FTE, 2 researchers), funding period 2017–2022;
- P1-0245 – Ecotoxicology, Toxicogenomics, and Carcinogenesis, running at the GEN organizational unit (3.83 FTE, 12 researchers, two technical assistants, three YRs, and the head Dr. Tamara Lah Turnšek), funding period 2019–2024;
- P4-0407: Environmental and Applicative Virology: Viruses – Friends and Foes, running at the FITO organizational unit (2.46 FTE, six researchers, three technical assistants, three YRs, and the head Dr. Jana Žel), funding period 2019–2024.

In addition to these five research programs, the MBS organizational unit also collaborated in the implementation of program P1-0143 – Cycling of substances in the environment, mass balances, modeling of environmental processes and risk assessment – with the Jožef Stefan Institute as the project leader, the head Dr. Milena Horvat, in the amount of 0.33 FTE for NIB.

In 2020, NIB implemented an infrastructural program equaling 6 FTE.

In addition to the programs, NIB also carried out 42 ARRS projects in 2020 in the total amount of 19.19 FTE. They include 31 basic, 4 applicative and 6 postdoctoral projects, and one within the framework of the complementary scheme (25 as the leader and 17 as a participating organization), as well as two projects within the CRP programs (one in the program "Let us assure food for tomorrow" and one in the "CRP 2019" program, both as the leader) in a total annual scope of 0.55 FTE

The amount of project funding provided by the Slovenian Research Agency in 2020 was 4.56 FTE or 31.17% higher than the year before.

In 2020, NIB worked on thirteen Horizon 2020 projects. One research – the participating project from the Horizon 2020 program (ADAPT) – began in the middle of the year. The other project, Horizon 2020, which began midyear, is a project to promote researchers and their work, publicly known as the Researchers' Night. These projects generated 793,213.21 EUR of revenues or 7.49% of NIB's total revenues.

In addition to the projects of the Eighth Framework Program, NIB carried out in 2020 one project from the ARIMNET program (EnViRos), which is part of the EU's Seventh Framework Program, one project from the EMPIR (SEPTIMET) program, and two projects from the ERA CoBio Tech program, which are integral parts of the Horizon 2020 program. In these projects, NIB has a partnership role. These four projects generated 189,580.66 EUR of revenues in 2020, or 1.79% of total revenues.

In 2020, NIB ran 13 projects from other international funding programs (LIFE, INTERREG Alpine Space, INTERREG Europe, INTERREG Mediterranean, INTERREG Slovenia – Croatia, INTERREG Italy – Slovenia). Together with the existing two strategic projects from the INTERREG MED (SHAREMED, OSMOSIS) program, NIB started in 2020 another INTERREG MED strategic project in the field of innovations in blue bioeconomy – B-Blue project: Building blue biotechnology community in the Mediterranean.

Nadalje je NIB izvajal še skupno šest projektov iz sheme European Food Safety Auhority (EFSA) in European Maritime and Fisheries Fund (EMFF). Partnersko sodelovanje je potekalo v dveh referenčnih laboratorijih: EU referenčna laboratorija za povzročitelje bolezni na rastlinah (viruse, vioride in fitoplazme ter za bakterije). 2020 smo dobili odobren en projekt preko sheme Partnership for Research and Innovation in the Mediterranean Area (PRIMA), katerega financiranje poteka preko Javne agencije za raziskovalno dejavnost Republike Slovenije in se bo začel izvajati v letu 2021.

V letu 2020 je NIB sodeloval v 19 projektih sofinanciranih s strani evropskih kohezijskih in investicijskih skladov, katerih sofinanciranje poteka preko slovenskih ministrstev: 12 Euphresco projektov, dva projekta iz razpisa MIZŠ »RRI v verigah in mrežah vrednosti«, trije projekti iz razpisa MIZŠ za spodbujanje raziskovalcev na začetku kariere in projekt iz razpisa »Spodbujanje dejavnosti prenosa znanja preko delovanja pisarn za prenos tehnologij«. Razpisi MIZŠ za spodbujanje raziskovalcev na začetku kariere so se v letu 2020 zaključili.

NIB je kot konzorcijski partner v letu 2020 sodeloval pri izvedbi operacij razvoja raziskovalne infrastrukture za mednarodno konkurenčnost slovenskega RRI prostora RI-SI-2, in sicer – RI-SI Lifewatch: Evropska infrastruktura za e-znanost in tehnologijo za raziskave biotske raznovrstnosti in ekosistemov ter ELIXIR-SI kot osrednja nacionalna infrastruktura za pridobivanje visokogostotnih podatkov, vzpostavitev osrednjega nacionalnega podatkovnega vozlišča v koordinaciji z ostalimi komplementarnimi infrastrukturami znotraj NRRI ter vzpostavitev središča za izobraževanje in usposabljanje na področju ved o življenju za uporabo bioinformatskih orodij in storitev.

Višina ustvarjenih prihodkov na teh projektih je znašala 1.760.317,38 EUR in je predstavljala 16,62 % vseh prihodkov v letu 2020.

Delovanje raziskovalnega sklada NIB za podporo raziskovalcem pri njihovem raziskovalnem in razvojem delu je bilo v letu 2020 vzpostavljeno po odobritvi vlade, ki je dovolila uporabo dela presežkov prihodkov za namene sklada. S pomočjo strokovne komisije direktorja Nacionalnega inštituta za biologijo sta bila v tem letu izpeljana dva interna postopka in izbrani ter financirani najkvalitetnejši predlogi.

INVESTICIJE

NIB je v letu 2020 realiziral investicijska vlaganja v višini 1.893.913 EUR, od tega aktivirano v višini 1.706.456 EUR in v pridobivanju v višini 187.458 EUR. Viri nabav so sredstva obračunane amortizacije tekočega leta v višini 552.228 EUR ter neporabljene amortizacije preteklih let v višini 246.391 EUR, sredstva razporejenih presežkov prihodkov preteklih let za investicije v višini 343.676,14 EUR, sredstva investicijskega transferja strani MO v višini 26.250 EUR, sredstva od ARRS, Paket 18, v višini 147.828,61 EUR, sredstva iz projektnega financiranja (LIFE IP, NAT2CARE, RI-SI-2 LifeWatch, GREENHULL, ELIXIR) v višini 386.217,39 EUR in sredstva s strani MIZŠ (evropska kohezijska sredstva) za BTS-NIB v višini 191.322,65 EUR.

NIB ran a total of six projects from the European Food Safety Authority (EFSA) and European Maritime and Fisheries Fund (EMFF) scheme. The partnership collaboration took place at two reference laboratories: EU Reference Laboratory for pests of plants on viruses, viroids and phytoplasmas, and bacteria). In 2020 another project was approved through the Partnership for Research and Innovation in the Mediterranean Area (PRIM) scheme. It is financed through the Slovenian Research Agency and will begin in 2021.

In 2020, NIB participated in 19 projects, co-funded by European cohesion and investment funds via the Slovenian ministries: 12 Euphresco projects, two projects from the Ministry of Education, Science and Sport's call for proposals "RDI in value chains and networks", three projects from the Ministry of Education, Science and Sport's call for proposals for support to researchers at the beginning of their careers and one project from the call for proposals "Promoting knowledge transfer through the operation of technology transfer offices". The Ministry of Education, Science and Sport's calls for proposals for support to researchers at the beginning of their careers ended in 2020.

As a consortium partner, NIB took part in the running of operations for the development of research infrastructure for international competitiveness of Slovenian RDI space – RI-SI Lifewatch" – European Infrastructure for e-Science and Technology for Biodiversity and Ecosystem Research, and ELIXIR-SI as the central national infrastructure for acquiring high-density data, for establishing a central national data hub in coordination with other complementary infrastructures as part of the Research Infrastructure Development Plan, and for establishing a life sciences education and training center for the use of bioinformatics tools and services.

These projects generated 1,760,317.38 EUR of revenues or 16.62% of NIB's total revenues in 2020.

The NIB research fund, supporting researchers with their research and development work, was established in 2020, following the approval of the government, which allowed the use of part of the surplus for the purpose of the fund. With the assistance of NIB director's expert commission, two internal procedures were carried out and the best proposals were selected and funded.

INVESTMENTS

In 2020, NIB realized investments in the amount of 1,893,913 EUR of which 1,706,456 EUR were activated and 187,458 EUR in acquisitions. The sources of supply include a depreciation expense for the current year of 552,228 EUR, unused depreciation from past years in the amount of 246,391 EUR, funds from the allocated surplus revenues from previous years for investments in the amount of 343,676.14 EUR, investment transfer received from the Ministry of Defense in the amount of 26,250 EUR, funds received from the 18 ARRS Package in the amount of 147,828.61 EUR, funds received from project financing (LIFE IP, NAT2CARE, RI-SI-2 LifeWatch, GREENHULL, ELIXIR) in the amount of 386,217.39 EUR, and funds received from the Ministry of Education, Science and Sport (European cohesion funds) for BTS-NIB in the amount of 191,322.65 EUR.

ZAPOSLENI V LETU 2020

Inštitut je bil v letu 2020 sestavljen iz štirih raziskovalnih enot in skupnih služb. Zaposleni v največjih dveh enotah predstavljajo 63 % vseh zaposlenih na NIB. Oddelek za biotehnologijo in sistemsko biologijo je 31. 12. 2020 zaposloval 63 sodelavcev, enota Morska biološka postaja Piran 41 sodelavcev, Oddelek za genetsko toksikologijo in biologijo raka 18 sodelavcev, Oddelek za raziskave organizmov in ekosistemov 27 sodelavcev, Skupne službe pa 17 sodelavcev.

Na NIB je bilo 31. 12. 2020 154 zaposlenih, od tega 83 raziskovalcev, 22 mladih raziskovalcev ter 49 strokovno-tehničnih in administrativnih sodelavcev.

V letu 2020 se je na novo zaposlilo 22 sodelavcev, 10 sodelavcev je delovno razmerje na NIB prenehalo.

Raziskovalnim programom je bilo s strani ARRS dodeljenih 6 mentorskih mest za mlade raziskovalce. V letu 2020 sta doktorirala dva mlada raziskovalca.

31. 12. 2020 je bilo na inštitutu zaposlenih 49 % delavcev z doktoratom znanosti, 5 % z magisterijem znanosti, 40 % s VII. stopnjo izobrazbe, 6 % zaposlenih je imelo nižjo izobrazbo od VII. stopnje.

STANJE PO ORGANIZACIJSKIH ENOTAH NA DAN 31. 12. 2020

NUMBER OF STAFF BY UNITS ON 31 DECEMBER, 2020

EMPLOYEES IN 2020

In 2020, the Institute was comprised of four research units and Joint Services. The employees in the biggest two units represent 63% of all NIB employees. On 31 December 2019, the Department of Biotechnology and Systems Biology had 63 employees, the Marine Biology Station Piran unit had 41, the Department of Genetic Toxicology and Cancer Biology had 18, the Department of Organisms and Ecosystems Research had 27, and Joint Services had 17.

On 31 December 2020, NIB had 154 employees of which 83 were researchers, 22 were young researchers, and 49 were the professional-technical and administrative staff.

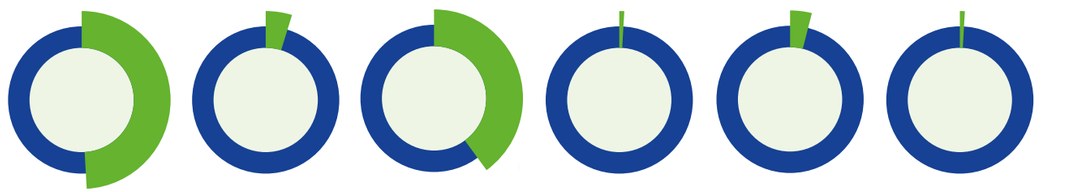
In 2020, 22 new employees were hired and ten employment relationships at NIB were terminated.

The ARRS allocated six mentoring positions to research programs for young researchers. In 2020, two young researchers received their doctorates.

On 31 December 2020, 49% of the Institute's employees had doctoral degrees, 5% had master's degrees, 40% had a level of education of VII, and 6% had a level of education lower than VII.

IZOBRAZBENA STRUKTURA NA DAN 31. 12. 2020

EDUCATIONAL STRUCTURE ON 31 DECEMBER, 2020



DOKTORATI, MAGISTERIJI IN DIPLOME V LETU 2020

Svojo doktorsko disertacijo so pripravili pod (so)mentorstvom raziskovalcev z NIB in jo zagovarjali v letu 2020:

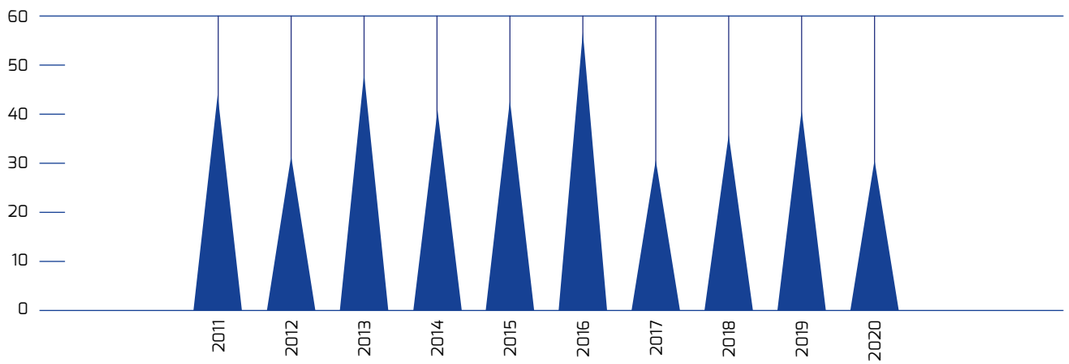
DOCTORAL DISSERTATIONS, MASTER'S THESES AND UNDERGRADUATE THESES IN 2020

Doctoral dissertations under the (co)supervision of NIB researchers in 2020:

ŠTUDENT/ STUDENT	(SO) MENTOR/ (CO)SUPERVISOR
dr. Hercog, Klara (GEN)	Mentorica prof. dr. Metka Filipič (GEN), somentorica doc. dr. Bojana Žegura (GEN)
dr. Quiñones Lebrón, Shakira G.	Mentor izr. prof. dr. Matjaž Kuntner (EKOS), somentorica doc. dr. Simona Kralj-Fišer
dr. Rezaei, Mona	Mentor prof. dr. Lovrenc Lipej (MBP), somentor doc. dr. Al Vrezec (EKOS)
dr. Trkov, Domen (MBP)	Mentor prof. dr. Lovrenc Lipej (MBP)

ŠTEVILO DIPLOMSKIH, MAGISTRSKIH IN DOKTORSKIH NALOG POD (SO)MENTORSTVOM RAZISKOVALCEV Z NACIONALNEGA INŠTITUTA ZA BIOLOGIJO V OBDOBJU 2011-2020

NUMBER OF UNDERGRADUATE THESES, MASTER'S THESES AND DOCTORAL DISSERTATIONS UNDER (CO)SUPERVISION OF NIB RESEARCHERS IN YEARS 2011-2020



ŠTEVILO ZAGOVARJANIH MAGISTRSKIH IN DOKTORSKIH NALOG TER MENTORSTEV IN SOMENTORSTEV S STRANI ZAPOSLENIH NA NIB V LETU 2020

NUMBER OF MASTER'S THESES, DOCTORAL DISSERTATIONS, SUPERVISIONS AND CO-SUPERVISIONS BY NIB EMPLOYEES IN YEAR 2020

magistska naloga Master's Thesis	3
doktorska disertacija Doctoral Dissertation	2
mentor pri doktorskih disertacijah Supervisor for Doctoral Dissertations	4
mentor pri magistrskih delih Supervisor for Master's Theses	13
mentor pri diplomskih delih Supervisor for Undergraduate Theses	5
somentor pri doktorskih disertacijah Co-Supervisor for Doctoral Dissertations	2
somentor pri magistrskih delih Co-Supervisor for Master's Theses	9
somentor pri diplomskih delih Co-Supervisor for Undergraduate Theses	3

OBJAVE IN CITIRANOST V LETU 2020

PUBLICATIONS AND CITATIONS IN 2020

Objavljeni članki (izvirni in pregledni znanstveni članki, kratki znanstveni prispevki) po letu objave, povprečnem faktorju vpilva po JCR (Journal Citation Reports), povprečni umeščenosti revije, v kateri so bili objavljeni, v področne četrtine ("kvartile") po JCR ter število čistih citatov po Web of Science/ Scopus:

Published articles (Original Scientific Articles, Review Articlees and Short Scientific Articles) by year, average Impact Factor (JCR), average journal quarter position (JCR) and number of pure citations in Web of Science/ Scopus:

LETO YEAR	ŠTEVILO OBJAVLJENIH ZNANSTVENIH ČLANKOV NUMBER OF PUBLISHED SCIENTIFIC ARTICLES	POVPREČNI IF (JCR) AVERAGE IF (JCR)	POVPREČNA UMEŠČENOST REVIJE V ČETRINE PO JCR AVERAGE JOURNAL QUARTER POSITION (JCR)	ŠTEVILO ČISTIH CITATOV NUMBER OF PURE CITATIONS
2016	98	2,908	2	2468
2017	113	2,899	2	2421
2018	109	3,148	2	3505
2019	119	3,887	2	4186
2020	125	4,315	2	5967

NAJVPLIVNEJŠI ČLANKI V LETU 2020

THE MOST INFLUENTIAL ARTICLES IN 2020

NIB VODILNI PARTNER V RAZISKAVI

NIB AS COORDINATOR IN RESEARCH

GRUDEN, Kristina, PETEK, Marko, PODPEČAN, Vid, et al. Ménage à trois: unraveling the mechanisms regulating plant-microbe-arthropod interactions. *Trends in Plant Science*, ISSN 1360-1385. [Print ed.], 2020, vol. 25, no. 12, str. 1215-1226, doi: 10.1016/j.tplants.2020.07.008. [COBISS.SI-ID 47574275]
IF (JCR): 14.416

FILIPIĆ, Arijana, GUTIÉRREZ-AGUIRRE, Ion, PRIMC, Gregor, MOZETIČ, Miran, DOBNIK, David. Cold plasma, a new hope in the field of virus inactivation. *Trends in biotechnology*, ISSN 0167-7799. [Print ed.], 2020, vol. 38, iss. 11, str. 1278-1291, doi: 10.1016/j.tibtech.2020.04.003. [COBISS.SI-ID 33308199]
IF (JCR)= 14.343

KUNTNER, Matjaž, CODDINGTON, Jonathan A. Sexual size dimorphism: evolution and perils of extreme phenotypes in spiders. *Annual review of entomology*, ISSN 0066-4170. [Print ed.], 2020, vol. 65, str. 57-80, doi: 10.1146/annurev-ento-011019- 025032. [COBISS.SI-ID 5289551]
IF (JCR)= 13.796

BAČNIK, Katarina, KUTNJAK, Denis, PECMAN, Anja, MEHLE, Nataša, TUŠEK-ŽNIDARIČ, Magda, GUTIÉRREZ-AGUIRRE, Ion, RAVNIKAR, Maja. Viromics and infectivity analysis reveal the release of infective plant viruses from wastewater into the environment. *Water research*, ISSN 0043-1354, 2020, vol. 177, str. 1-11, doi: 10.1016/j.watres.2020.115628. [COBISS.SI-ID 5318735]
IF (JCR)= 9.130

BONANNO, Giuseppe, VENEZIANO, Vincenzo, ORLANDO-BONACA, Martina. Comparative assessment of trace element accumulation and biomonitoring in seaweed Ulva lactuca and seagrass Posidonia oceanica. *Science of the total environment*, ISSN 0048-9697, 2020, vol. 718, str. 1-10, doi: 10.1016/j.scitotenv.2020.137413. [COBISS.SI-ID 5317455]
IF (JCR)= 6.551

UJVÁROS, Andrea Zsuzsanna, HERCOG, Klara, RIBA, Milán, GONDA, Sándor, FILIPIČ, Metka, VASAS, Gábor, ŽEGURA, Bojana. The cyanobacterial oligopeptides microginins induce DNA damage in the human hepatocellular carcinoma (HepG2) cell line. *Chemosphere*, ISSN 0045-6535. [Print ed.], 2020, vol. 240, str. 1-11, doi: 10.1016/j.chemosphere.2019.124880. [COBISS.SI-ID 5164111]
IF (JCR)= 5.778

TURK DERMASTIA, Timotej, CERINO, Federica, STANKOVIĆ, David, FRANCÉ, Janja, RAMŠAK, Andreja, TUŠEK-ŽNIDARIČ, Magda, BERAN, Alfred, NATALI, Vanessa, CABRINI, Marina, MOZETIČ, Patricija. Ecological time series and integrative taxonomy unveil seasonality and diversity of the toxic diatom Pseudo-nitzschia H. Peragallo in the northern Adriatic Sea. *Harmful algae*, ISSN 1568-9883, Mar. 2020, vol. 93, 101773, str. 1-20, ilustr., doi: 10.1016/j.hal.2020.101773. [COBISS.SI-ID 40469253]
IF (JCR)= 3.707

NIB SODELUJOČI PARTNER V RAZISKAVI

NIB AS PARTNER IN RESEARCH

CORRÊA, Régis L., SANZ-CARBONELL, Alejandro, KOGEJ, Zala, MÜLLER, Sebastian Y., AMBRÓS, Silvia, LÓPEZ-GOMÓLLON, Sara, GÓMEZ, Gustavo, BAULCOMBE, David C., ELENA, Santiago F. Viral fitness determines the magnitude of transcriptomic and epigenomic reprograming of defense responses in plants. *Molecular biology and evolution*, ISSN 0737-4038, 2020, vol., iss., str. 1-16, ilustr., doi: 10.1093/molbev/msaa091. [COBISS.SI-ID 17727747]
IF (JCR)= 11.062

MØLLER, Peter, AZQUETA, Amaya, BOUTET-ROBINET, Elisa, KOPPEN, Gudrun, BONASSI, Stefano, MILIĆ, Mirta, GAJSKI, Goran, COSTA, Solange, ŽEGURA, Bojana, NOVAK, Matjaž, et al. Minimum Information for Reporting on the Comet Assay (MIRCA): recommendations for describing comet assay procedures and results. *Nature protocols*, ISSN 1750-2799. [Online ed.], 2020, vol. 15, str. 3817–3826, preglednica, doi: 10.1038/s41596-020-0398-1. [COBISS.SI-ID 34443523]
IF (JCR)=10.419

BRAMBILLA, Mattia, SCRIDEL, Davide, BAZZI, Gaia, ILAHIANE, Luca, IEMMA, Aaron, PEDRINI, Paolo, BASSI, Enrico, BIONDA, Radames, MARCHESI, Luigi, GENERO, Fulvio, TEUFELBAUER, Norbert, PROBST, Remo, VREZEC, Al, KMECL, Primož, MIHELIČ, Tomaž, BOGLIANI, Giuseppe, SCHMID, Hans, ASSANDRI, Giacomo, PONTARINI, Renato, BRAUNISCH, Veronika, ARLETTAZ, Raphaël, CHAMBERLAIN, Dan. Species interactions and climate change: how the disruption of species co-occurrence will impact on an avian forest guild. *Global change biology*, ISSN 1354-1013. Print ed., 2020, vol. 26, iss. 3, str. 1212-1224, doi: 10.1111/gcb.14953. [COBISS.SI-ID 5282383]
IF (JCR)= 8.555

BANCHI, Elisa, AMETRANO, Claudio Gennaro, TORDONI, Enrico, STANKOVIĆ, David, ONGARO, Silvia, TRETIACH, Mauro, PALLAVICINI, Alberto, MUGGIA, Lucia, VERARDO, Pierluigi (sodelavec pri raziskavi), TASSAN, Francesca (sodelavec pri raziskavi), TROBIANI, Nadia (sodelavec pri raziskavi), MORETTI, Olga (sodelavec pri raziskavi), BORNEY, Maria Francesca (sodelavec pri raziskavi), LAZZARIN, Stefania (sodelavec pri raziskavi). Environmental DNA assessment of airborne plant and fungal seasonal diversity. *Science of the total environment*, ISSN 0048-9697, 10 Oct. 2020, vol. 738, 140249, str. 1-14, ilustr., doi: 10.1016/j.scitotenv.2020.140249. [COBISS.SI-ID 23552771]
IF (JCR)= 6.551

BIBLIOGRAFIJA INŠTITUTA V LETIH 2011 – 2020 (ANALITIČNI PODATKI)

INSTITUTE'S BIBLIOGRAPHY IN 2011 – 2020 (ANALYTICAL DATA)

ZVRST DOKUMENTA TYPE OF DOCUMENT	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	SKUPAJ TOTAL
znanstveni članki z IF scientific papers with IF	72	86	83	79	80	82	97	91	99	109	**878**
znanstveni članki brez IF other scientific papers	9	16	7	13	18	16	16	18	20	16	**149**
strokovni in poljudni članki professional and popular articles	69	66	62	45	43	62	58	49	44	60	**558**
objavljeni prispevki s kongresov published conference papers	39	18	24	16	17	16	24	17	11	9	**191**
povzetki s kongresov published conference paper abstracts	159	101	166	166	156	149	159	178	178	72	**1484**
poglavja v knjigah book chapters	10	14	28	11	9	7	18	8	30	63	**198**
knjige books	4	4	3	6	1	6	5	1	2	3	**35**
poročila reports	27	28	34	23	35	38	51	51	40	33	**360**
doktorska dela doctoral dissertations	8	7	9	8	4	4	2	6	2	2	**52**
magistrska dela master's theses	1	1	0	2	1	2	1	5	0	3	**16**
patenti patents	4	3	2	2	2	0	1	1	2	2	**19**
razno other	128	121	207	138	161	151	217	250	198	207	**1778**
SKUPAJ TOTAL	**530**	**465**	**625**	**509**	**527**	**533**	**649**	**675**	**626**	**579**	**5718**

PRISPEVKI SOAVTORJEV IZ RAZLIČNIH ODDELKOV NIB SO ŠTETI ENKRAT.
PAPERS OF CO-AUTHORS FROM DIFFERENT NIB DEPARTMENTS ARE COUNTED ONCE.

Akademik prof. dr. Matija Gogala je prejel priznanje častni član NIB (vir: MATADOR produkcija).
The Honorary Member of NIB recognition went to academician Prof. Dr. Matija Gogala (Source: MATADOR produkcija).

USPEHI, NAGRADE IN PRIZNANJA V LETU 2020

NAGRADE MIROSLAVA ZEIA IN PRIZNANJA NACIONALNEGA INŠTITUTA ZA BIOLOGIJO

Ljubljana, 21. 12. 2020

NIB je ob 60-letnici obstoja že enajstič podelil nagrade in priznanja Nacionalnega inštituta za biologijo, poimenovana po prof. dr. Miroslavu Zeiu, enem izmed njegovih ustanoviteljev. Nagrade Miroslava Zeia so bile podeljene posameznikom za njihove izjemne dosežke na področju osnovnih in uporabnih raziskav ved o življenju ter uresničevanje vizij in poslanstva NIB. Slavnostna počastitev 60. obletnice NIB in podelitev nagrad Miroslava Zeia ter priznanj NIB je potekala v obliki video obeležja v ponedeljek, 21. 12. 2020, v Ljubljani. Častni pokrovitelj dogodka je bil predsednik Republike Slovenije, gospod Borut Pahor, častni govorec pa bivši predsednik RS ter predsednik globalnega Panela za vprašanje vode in miru, prof. dr. Danilo Türk.

Priznanje častni član NIB je prejel akademik prof. dr. Matija Gogala, ki je z dolgoletnim delom bistveno prispeval k ugledu in znanstveni odličnosti NIB.

Veliko nagrado Miroslava Zeia za življenjsko delo na področju dejavnosti NIB za leto 2020 je prejela prof. dr. Marina Dermastia, vrhunska in mednarodno uveljavljena znanstvenica.

Nagrado Miroslava Zeia za izjemne dosežke na področju dejavnosti NIB za leto 2020 sta prejela prof. dr. Lovrenc Lipej in dr. Jon Gutierrez Aguirre.

Prof. dr. Tamara Lah Turnšek, Zoisova nagrajenka za življenjsko delo 2020 (foto: STA).
Prof. dr. Tamara Lah Turnšek, recipient of the 2020 Zois award for lifetime achievements (Photo: STA).

SUCCESSES, AWARDS AND RECOGNITIONS IN 2020

MIROSLAV ZEI AWARDS AND RECOGNITIONS BY THE NATIONAL INSTITUTE OF BIOLOGY

Ljubljana, 21 December, 2020

On the occasion of its 60th anniversary, the National Institute of Biology held its eleventh presentation of awards and recognitions, named after Prof. Dr. Miroslav Zei, one of the institute's founders. The Miroslav Zei Awards were presented to individuals for their outstanding achievements in the area of basic and applicable researches of life sciences, and fulfilling NIB visions and missions. A gala event, celebrating the 60th anniversary of the National Institute of Biology, Miroslav Zei Awards presentation and the National Institute of Biology recognitions presentation took place over a video conference on Monday, 21 December, 2020. The honorary patron of the event was the president of the Republic of Slovenia, Mr. Borut Pahor, and the keynote speaker was former president of the Republic of Slovenia and the president of the Global Panel on Water and Peace, Prof. Dr. Danilo Türk.

The Honorary Member of NIB recognition went to academician Prof. Dr. Matija Gogala. Through the many years of his work, he significantly contributed to the reputation and scientific excellence of NIB.

The great 2020 Miroslav Zei Award for lifetime achievements, related to NIB's activities, went to Prof. Dr. Marina Dermastia, a top and internationally renowned scientist.

The 2020 Miroslav Zei Award for exceptional achievements, related to NIB's activities, went to Prof. Dr. Lovrenc Lipej and Dr. Jon Gutierrez Aguirre.

NACIONALNI INŠTITUT ZA BIOLOGIJO JE PRAZNOVAL 60-LETNICO OBSTOJA

NIB je za obeležitev 60-letnice obstoja v letu 2020 pripravil vrsto dogodkov. S svojo zanimivostjo in tudi aktualnostjo je povabil k razpravi in delitvi znanja vse, ki jih narava in okolje zanimata – tako strokovnjake kot tudi laično javnost. V januarju se je tradicionalni raziskovalni odpravi študentov biologije v Kostariko pridružila ekipa izobraževalnega programa RTV Slovenije, ki je pod strokovnim vodstvom NIB posnela dokumentarni film o biodiverziteti Kostarike v dveh delih – Biodiverziteta v tropskem gozdu in Vrnitev v pragozd. Na dan, ko praznujemo svetovni dan Zemlje, 22. aprila, je izšla knjiga 60 obrazov biodiverzitete. Tradicionalni Dan odprtih vrat Morske biološke postaje Piran je letos potekal 25. septembra v virtualnem svetu. Prav tako je bil virtualni dogodek Nacionalni inštitut za biologijo v dialogu z gospodarstvom, ki je bil 30. septembra pripravljen v sodelovanju z Gospodarsko zbornico Slovenije. Ob svetovnem dnevu hrane, 16. oktobra, in podelitvi letošnje Nobelove nagrade za mir Svetovnemu programu za hrano (WFP) smo na NIB pripravili fizično in virtualno razstavo udomačitve žitaric iz trav. Vrh vseh dogodkov pa je bil izid knjige Rastvejitev, prvih $1{,}89341556 \times 10^9$ sekund, ki skozi oči bivših direktorjev in direktorice ter današnjih raziskovalcev z jasnim pogledom naprej razkriva razburljivih zadnjih 60 let rasti inštituta.

SLAVNOSTNI DOGODEK OB PODPISU POGODBE O SOFINANCIRANJU IZVEDBE OPERACIJE BIOTEHNOLOŠKO STIČIŠČE NACIONALNEGA INŠTITUTA ZA BIOLOGIJO (BTS-NIB)

6. marca 2020 je na Nacionalnem inštitutu za biologijo potekal slavnostni dogodek ob podpisu Pogodbe o sofinanciranju izvedbe operacije BIOTEHNOLOŠKO STIČIŠČE NACIONALNEGA INŠTITUTA ZA BIOLOGIJO (BTS-NIB). S slavnostnim nagovorom je NIB počastil prof. dr. Jernej Pikalo, minister za izobraževanje, znanost in šport Republike Slovenije.

NACIONALNI INŠTITUT ZA BIOLOGIJO POSTAL PRIDRUŽENI ČLAN UNIVERZE V LJUBLJANI

Rektor Univerze v Ljubljani (UL) prof. dr. Igor Papič in direktor Nacionalnega inštituta za biologijo izr. prof. dr. Matjaž Kuntner sta 27. 8. 2020 podpisala pogodbo, s katero je NIB postal pridruženi član največje in najstarejše univerze v Sloveniji. Instituciji bosta okrepljeno sodelovali na področju znanstvene, raziskovalne, razvojne in pedagoške dejavnosti.

PROF. DR. TAMARA LAH TURNŠEK ZOISOVA NAGRAJENKA ZA ŽIVLJENJSKO DELO 2020

Prof. dr. Tamara Lah Turnšek, dolgoletna direktorica NIB, ki je raziskovalno delo posvetila proučevanju molekularnih mehanizmov, povezanih z nastankom in napredovanjem rakavih bolezni, je postala Zoisova nagrajenka za življenjsko delo 2020.

PRIZNANJE PROMETEJ ZNANOSTI

Biodiverziteta je skupni imenovalec raziskav, ki jih opravljajo na Oddelku za raziskave organizmov in ekosistemov. V kratkih prispevkih, ki so jih prispevali vsi sodelavci oddelka, so na poljuden način predstavili znanje, ki so ga pridobili pri svojem raziskovalnem delu. Izr. prof. dr. Davorin Tome, dr. Nataša Mori in doc. dr. Al Vrezec so v kategoriji Skupine komunikatorjev znanosti prejeli nagrado za uredniško delo pri poljudnoznanstveni knjigi 60 obrazov biodiverzitete, izdani v letu 2020 ob 60-letnici NIB.

Prof. dr. Marina Dermastia je postala nosilka naziva Finalistka izbora Komunikatorice znanosti leta 2020. Prof. dr. Dermastia je raziskovalno delo na področju rastlinstva dograjala z ustvarjalnim in izjemno tenkočutnim komuniciranjem v letu 2020, ki je bilo razglašeno za Mednarodno leto zdravja rastlin. Poleg tega je aktivno sodelovala na Dnevu očarljivih rastlin, na Evropski noči raziskovalcev ter pri dogodkih izvedenih ob 60-letnici NIB. Med drugim je ob tej priložnosti souredila knjigo Rastvejitev.

THE NATIONAL INSTITUTE OF BIOLOGY CELEBRATED ITS 60TH ANNIVERSARY

To commemorate 60 years of its existence, NIB held a number of events in 2020. Making them interesting and topical, the Institute asked anybody – professionals and amateurs alike – with interest for nature and environment to join the debate and share their knowledge. In January, the traditional research expedition of biology students to Costa Rica was joined by a team of the Slovenian National Television's educational division. Under the expert guidance of NIB, they made a film in two parts about Costa Rica's biodiversity – Biodiversity in Tropical Forest and Back to the Rainforest. On the international Earth Day, 22 April, came out the book 60 Views of Biodiversity. The traditional Piran Marine Biology Station Open Day took place on 25 September in a virtual environment. The event, called the National Institute in Dialogue with the Economy, was also a virtual one. It was held on 30 September in collaboration with the Chamber of Commerce of Slovenia. On the World Food Day, on 16 October, and on the occasion of awarding the Nobel Peace Prize to the World Food Program (WFP), NIB arranged a physical and virtual exhibition of the domestication of cereal grains from grasses. The pinnacle of all events was the publication of the book Rastvejitev, the First 1.89341556×10^9 Seconds. Through the eyes of former directors and today's researchers, it provides insight into the exciting 60 years of the Institute's growth, with a clear vision ahead.

SIGNING CEREMONY FOR THE CONTRACT FOR CO-FINANCING THE RUNNING OF THE OPERATION "BIOTECHNOLOGICAL HUB OF THE NATIONAL INSTITUTE OF BIOLOGY (BTS-NIB)"

On 6 March, 2020, the National Institute of Biology hosted a signing ceremony for the Contract for co-financing the running of the operation "BIOTECHNOLOGICAL HUB OF THE NATIONAL INSTITUTE OF BIOLOGY (BTS-NIB)". Prof. Dr. Jernej Pikalo, the minister of education, science and sport of the Republic of Slovenia, addressed NIB.

THE NATIONAL INSTITUTE OF BIOLOGY BECOMES AN ASSOCIATED MEMBER OF THE UNIVERSITY OF LJUBLJANA

The rector of the University of Ljubljana (UL) Prof. Dr. Igor Papič and the director of the National Institute of Biology (NIB), Assoc. Prof. Dr. Matjaž Kuntner, signed a contract on 27 August, 2020, which establishes NIB as an associate member of the largest and oldest university in Slovenia. Both institutions will strengthen their collaboration in the field of scientific, research, development and educational activities.

PROF. DR. TAMARA LAH TURNŠEK, RECIPIENT OF THE 2020 ZOIS AWARD FOR LIFETIME ACHIEVEMENTS

Prof. Dr. Tamara Lah Turnšek, dolgoletna direktorica NIB, ki je raziskovalno delo posvetila proučevanju molekularnih mehanizmov, povezanih z nastankom in napredovanjem rakavih bolezni, je postala Zoisova nagrajenka za življenjsko delo 2020.

Prof. Dr. Tamara Lah Turnšek, a long-time director of NIB, who dedicated her research work to studying molecular mechanisms, related to the development and progress of cancers, became the 2020 Zois laureate for lifetime achievements.

THE PROMETHEUS OF SCIENCE AWARD

Biodiversity is a common denominator of research activities, carried out at the Department of Organisms and Ecosystems Research. In short articles, contributed by all department staff, they presented in a popular way the knowledge acquired through their research work. In the Science Communicator Teams category, Assoc. Prof. Dr. Davorin Tome, Dr. Nataša Mori and Assist. Prof. Dr. Al Vrezec received an award for their editorial work with the popular science book, entitled 60 Views of Biodiversity, published on the occasion of the 60th anniversary of the National Institute of Biology.

Prof. Dr. Marina Dermastia became a holder of the title Finalist of the Science Communicator Competition. Professor Dermastia supplemented her research work in the field of plants with creative and extremely sensitive communication in 2020, declared as the International Year of Plant Health. She also took an active part in the Charming Plants Day, the European Researchers Night, and the events around the 60th anniversary of NIB, including co-editing the book Rastvejitev, published on this occasion.

Rektor Univerze v Ljubljani (UL) prof. dr. Igor Papič in direktor Nacionalnega inštituta za biologijo izr. prof. dr. Matjaž Kuntner sta podpisala pogodbo, s katero je NIB postal pridruženi član največje in najstarejše univerze v Sloveniji (foto: arhiv UL). The rector of the University of Ljubljana (UL) Prof. Dr. Igor Papič and the director of the National Institute of Biology (NIB), Assoc. Prof. Dr. Matjaž Kuntner, signed a contract, which establishes NIB as an associate member of the largest and oldest university in Slovenia (Photo: UL archive).

Priznanje Prometej znanosti za odličnost v komuniciranju je prejel tudi Bernard Perme za vlogo snemalca in direktorja fotografije pri dveh odmevnih dokumentarnih filmih – Kostarika: Biodiverziteta v tropskem gozdu in Kostarika: Vrnitev v pragozd.

PILOTNI MONITORING SARS-COV-2 V ODPADNIH VODAH

Oddelek za biotehnologijo in sistemsko biologijo se je s svojimi izkušnjami s področja virologije in epidemiologije virusov intenzivno vključil v sledenje virusa SARS-CoV-2 v Sloveniji, in sicer njegovo prisotnost v odpadnih vodah, in pridobil razširitev ARRS programa P4-0407 v višini 80.000 EUR letno za 2 leti (Vodja: Jana Žel). V nekaj mesecih so bile razvite, optimizirane in validirane metrološko ustrezne metode koncentracije in sledenja virusa v odpadnih vodah. Vzpostavljena je tudi mreža z osmimi slovenskimi čistilnimi napravami, ki zagotavljajo vzorce odpadne vode za analizo. Rezultati pridobljeni z uporabo učinkovitih metod za koncentriranje in analizo SARS--CoV-2 so že vključeni v matematične modele napovedovanja poteka epidemije pri COVID-19 Sledilniku, pri čemer je posebej obetavno, da je spremembo trenda okuženosti zaznati prej, kot se jo zazna s testiranjem posameznikov. Predlagana je bila tudi vključitev v uradni monitoring sledenja SARS-CoV-2 v odpadnih vodah. Poleg sodelovanja z več slovenskimi raziskovalnimi inštitucijami poteka tudi aktivno mednarodno sodelovanje v EU na področju odpadnih vod COVID-19 (COST ES 1307- Sewage Analysis CORe group Europe in na srečanjih, ki jih organizira EU Joint Research Center), kar zagotavlja izmenjavo znanja in materialov na nacionalni in mednarodni ravni. Prof. dr. Maja Ravnikar je s sodelavci stalno vključena tudi v informiranje javnosti o SARS-CoV-2.

Raziskovalci NIB so prejeli več nagrad slovenskih strokovnih združenj in drugih nagrad.

Podpis pogodbe o sofinanciranju izvedbe operacije Biotehnološko stičišče Nacionalnega inštituta za biologijo (foto: NIB arhiv).
The Contract signing for co-financing the running of the operation Biotechnological hub of the National Institute of Biology (Photo: NIB archive).

Bernard Perme also received the Prometheus of Science Award for excellence in communication for his role as the cameraman and director of photography in two successful documentary films, Costa Rica: Biodiversity in Tropical Forest and Back to the Rainforest.

PILOT MONITORING OF SARS-COV-2 IN WASTE WATERS

With its experience in virology and viral epidemiology, the Department of Biotechnology and Systems Biology eagerly joined monitoring the SARS-CoV-2 virus presence in waste waters in Slovenia. It acquired broadening the ARRS P4-0407 program in the amount of 80,000 EUR for two years (leader: Jana Žel). Within a few months, the department developed, optimized and validated metrologically adequate methods of concentration levels and virus monitoring in waste waters. Established was a network with eight Slovenian wastewater treatment plants that provide waste water samples for analysis. The results, obtained with the use of efficient methods of concentration and SARD-CoV-2 analyses, have been included in mathematical models of predicting the course of the epidemic on COVID Meter. What makes it particularly promising is that changes in infection trends are detected earlier, compared to testing individual people. It has been suggested to include the method in the official SARS-CoV-2 monitoring in waste waters. In addition to collaboration with several Slovenian research institutions, active international cooperation in the EU in the field of COVID-19 waste waters is also taking place (COST ES 1307 – Sewage Analysis CORe group Europe, and at meetings, organized by the EU Joint Research Center), which provides exchange of knowledge and materials at a national and international levels. Prof. Dr. Maja Ravnikar and her colleagues are included in informing the public about SARS-CoV-2 on a permanent basis.

NIB's researchers received several awards from Slovenian professional associations and other awards.

IZUMI IN INOVACIJE

Izumi in inovacije za NIB pomenijo odsev rezultatov raziskovalnega dela in potencial za sodelovanje z industrijskimi partnerji. Na NIB je področje izumov in inovacij v domeni Komisije za izume, sestavljene iz raziskovalcev, ki jih predlagajo oddelki NIB ter predstavnikov Pisarne za prenos tehnologij.

V letu 2020 so raziskovalci oddelka FITO v sodelovanju s kolegi iz Univerze v Ljubljani in Instituta Jožef Stefan ustvarili izum z naslovom Method for water disinfection.

Patentna prijava Method and device for disinfection of liquid je bila oktobra 2020 vložena na Evropski patentni urad.

V okviru 13. Mednarodne konference o prenosu tehnologij, ki predstavlja tudi letni nacionalni dogodek Konzorcija za prenos tehnologij iz javno-raziskovalnih organizacij v gospodarstvo, so prvo nagrado za najboljšo inovacijo iz javno-raziskovalnih organizacij prejeli raziskovalci NIB v združeni ekipi z raziskovalci Instituta Jožef Stefan in Univerze v Ljubljani. Prvo mesto so osvojili s predstavitvijo inovacije VirOut, ki lahko v velikem obsegu na okolju prijazen način učinkovito uničuje v vodi prisotne škodljive mikroorganizme.

Raziskovalci NIB so postali finalisti natečaja Agrobiznis Hi-tech 2020 na področju novih tehnologij v kmetijstvu in živilskopredelovalni industriji, organiziranega s strani poslovnega dnevnika Finance, in sicer z inovacijo razvoja super krompirja odpornega proti suši in poplavam.

Sodelavci v Pisarni za prenos tehnologij so se v letu 2020 z namenom krepitve znanj in kompetenc s področja obvladovanja intelektualne lastnine in prenosa tehnologij kot udeleženci ali soorganizatorji udeleževali posvetov in izobraževanj s področja upravljanja intelektualne lastnine (tako tistih, ki jih organizirajo partnerji v okviru konzorcija KTT, kot dogodkov Evropske komisije).

PRENOS ZNANJA V GOSPODARSTVO

Upravljanje trženja izdelkov in storitev na NIB je sistemsko v domeni Pisarne za prenos tehnologij.

V okviru leta 2017 ustanovljenega Konzorcija za prenos tehnologij iz JRO v gospodarstvo tudi pisarna na NIB izvaja različne dejavnosti za podporo raziskovalcem z namenom pospešitve prenosa znanj v gospodarstvo oziroma povečanja deleža tržnih prihodkov v celotnih prihodkih NIB.

Tu gre za izvedbo izobraževanj, usposabljanj in svetovanj na področju izdelave poslovnih načrtov, trženja izdelkov in storitev ter upravljanja intelektualne lastnine.

Te aktivnosti se izvajajo v okviru petletnega projekta KTT (2017–2022) – Konzorcija za prenos tehnologij iz JRO v gospodarstvo, financiranega s strani MIZŠ, katerega namen je spodbuditi krepitev povezav in sodelovanja med javnimi raziskovalnimi organizacijami in gospodarstvom ter krepitev kompetenc pisarn za prenos tehnologij, raziskovalcev in podjetij.

V okviru in tudi s podporo razpoložljivih sredstev projekta je bil med drugim v letu 2020 za raziskovalce NIB na začetku kariere v sodelovanju s Projektno pisarno izveden Informativni dan za raziskovalce na začetku kariere s tematiko Podpora raziskovalcem pri prenosu tehnologij (Pospešujemo inovacije!).

INVENTIONS AND INNOVATIONS

For NIB, inventions and innovations also represent a reflection of the results of its research work and the potential to establish quality cooperation with the industrial partners. The field of inventions and innovations at NIB is managed by the Inventions Commission, comprised of researchers, put forward by the various NIB departments and representatives of the Technology Transfer Office

In 2020, the researchers of the FITO department, together with their colleagues from the University of Ljubljana and the Jožef Stefan Institute, came up with the invention, referred to as the "Method for Water Disinfection".

In October 2020, NIB filed the patent application "Method and Device for Disinfection of Liquid" with the European Patent Office.

At the 13th International Technology Transfer Conference, which is also the annual national event of the Consortium for Technology Transfer from Public Research Organizations to the Economy, the first prize for the best innovation from public research organizations was awarded to NIB researchers in the united team with researchers from the Jožef Stefan Institute and the University of Ljubljana researchers. They won the first prize for the innovation "VirOut" which can largely, in an environmentally friendly way, destroy harmful microorganism present in water.

NIB's researchers reached the finals of the Agrobiznis Hi-tech 2020 competition in the category New Technologies in Agriculture and Food Processing Industry, organized by the business daily newspaper Finance, with their innovation of developing a super potato, resistant to droughts and floods.

To strengthen knowledge and competencies in the field of intellectual property management and technology transfer, the colleagues in the Technology Transfer Office participated in consultations and trainings in the field of intellectual property management, either as participants or co-organizers (both within the CTT consortium and the European Commission events).

TRANSFER OF KNOWLEDGE TO THE ECONOMY

The management of the marketing of products and services at NIB is systemically in the domain of the Technology Transfer Office.

Within the framework of the Consortium for Technology Transfer from Public Research Agencies to the Economy, established in 2017, the NIB office also performs various activities for the support of researchers with an intention to accelerate the transfer of knowledge to the economy and to increase the share of market revenues in total NIB revenues.

This includes education, training, and consultations on business planning, marketing of products and services, and intellectual property management.

These activities are performed as part of a five-year CTT project (2017-2022) – the Consortium for Technology Transfer from Public Research Organizations to the Economy, funded by the Ministry of Education, Science and Sport, which aims to encourage strengthening links and cooperation between public research organizations and the economy, and strengthening the competences of technology transfer offices, researchers, and businesses.

Within the framework of and with the support of available project funds in 2020, an Information Day, called Supporting Researchers in Technology Transfer (Accelerating Innovations!), was organized in cooperation with the Project Office. It was aimed at the researchers at the beginning of their careers.

V okviru 60. obletnice NIB je bil septembra 2020 v sodelovanju z Gospodarsko zbornico Slovenije organiziran virtualni dogodek Nacionalni inštitut za biologijo v dialogu z gospodarstvom. Dogodek je bil namenjen srečanju raziskovalcev z deležniki iz industrijskega okolja in drugimi poslovnimi partnerji. V okviru dogodka je bil premierno predstavljen film, ki opisuje raznovrstnost in pomen raziskav na NIB za slovensko industrijo in celotno družbo.

Raziskovalci NIB so na povabilo organizatorjev in naših partnerjev iz konzorcija KTT (Univerza v Ljubljani, Univerza v Mariboru) sodelovali na spletnem festivalu UNI.MINDS (povezovanje med industrijo in univerzo, november 2020).

V letu 2020 se je na področju prenosa znanj v gospodarstvo v sodelovanju z domačimi in tujimi inovativnimi podjetji še posebej okrepilo področje razvoja in izvajanja molekularnih metod za kvantifikacijo virusov za gensko terapijo. V letu 2020 so se ponovno začele aktivnosti za prenos znanja in tehnologij na področju virusne analitike. V ta namen je bila izdelana celovita ocena vrednosti predmetne tehnologije.

Pisarna za prenos tehnologij na NIB nudi raziskovalcem celovito podporo pri komercializaciji rezultatov raziskovalnih projektov. V ta namen sami ali v sodelovanju s partnerji iz projekta KTT za raziskovalce pripravljamo različne brošure (na primer brošura »Pospešujemo inovacije«) (vir: NIB arhiv). The NIB Technology Transfer Office provides researchers with comprehensive support in commercializing the results of their research projects. For this purpose, we prepare various brochures for researchers on our own or in cooperation with our partners from the KTT project (for example internal NIB brochure »Accelerating Innovation«) (Source: NIB archive).

As part of NIB's 60th anniversary celebration, a virtual event called "The National Institute of Biology in Dialogue with the Economy" was held in September 2020. Its objective was to bring together researchers, stakeholders from the industrial environment and other business partners. The event included the premiere of a film about the diversity and importance of researches at NIB for Slovenian industry and society at large.

At the invitation of organizers and our partners from the CTT consortium (University of Ljubljana, University of Maribor), NIB researchers took part in the online festival UNI.MINDS (joining industry and university, November 2020).

In 2020, in the field of knowledge transfer to the economy and in cooperation with domestic and foreign innovative companies, the development and implementation of molecular methods for the quantification of viruses for gene therapy was further strengthened. In 2020, activities for knowledge and technology transfer in the field of virus analysis were reactivated. For this purpose, a comprehensive assessment of the value of the applicable technology was made.

Film, Kostarika – biodiverziteta v tropskem gozdu, ki je nastal v sodelovanju RTV SLO in Nacionalnega inštituta za biologijo je na festivalu Nature without borders prejel nagrado za odlično kinematografijo (vir: NIB arhiv). The film, Costa Rica - Biodiversity in the Tropical Forest, created in collaboration with RTV SLO and the National Institute of Biology, received an award for excellent cinematography at the Nature without borders festival (Source: NIB archive).

SKUPNE SLUŽBE
JOINT SERVICES

Skupne službe izvajajo posamezne poslovne funkcije inštituta, kot so finance in računovodstvo, kadrovske zadeve, javna naročila, splošne zadeve, vodenje informacijskega sistema, administrativna podpora organom NIB-a in podobno. Poleg tega izvajajo podporne dejavnosti za raziskovalne organizacijske enote, zlasti administrativno-tehnično podporo vodenju projektov ter podporo prenosu znanja in tehnologij.

V sklopu Skupnih služb deluje tudi Biološka knjižnica, ki jo upravljata NIB in Oddelek za biologijo Biotehniške fakultete. Deluje na dveh lokacijah: v Biološkem središču v Ljubljani in na Morski biološki postaji Piran.

Joint services manages individual business functions at the Institute, for example finance and accounting, staff administration, public procurement, general affairs, IT system management, administrative support for NIB bodies and the like. It also performs support activities for the research organisational units, particularly administrative technical support for project management and support for the transfer of knowledge and technologies.

The Biology Library operates within Joint Services and is managed jointly by NIB and the Department of Biology of the Biotechnical Faculty. It is situated at two locations: at the Biology Centre in Ljubljana and at Marine Biology Station Piran.

Vrtni čmrlj (*Bombus hortorum*) na čistecu (*Betonica officinalis*) (foto: Davorin Tome).
Bombus hortorum on *Betonica officinalis* (Photo: Davorin Tome).

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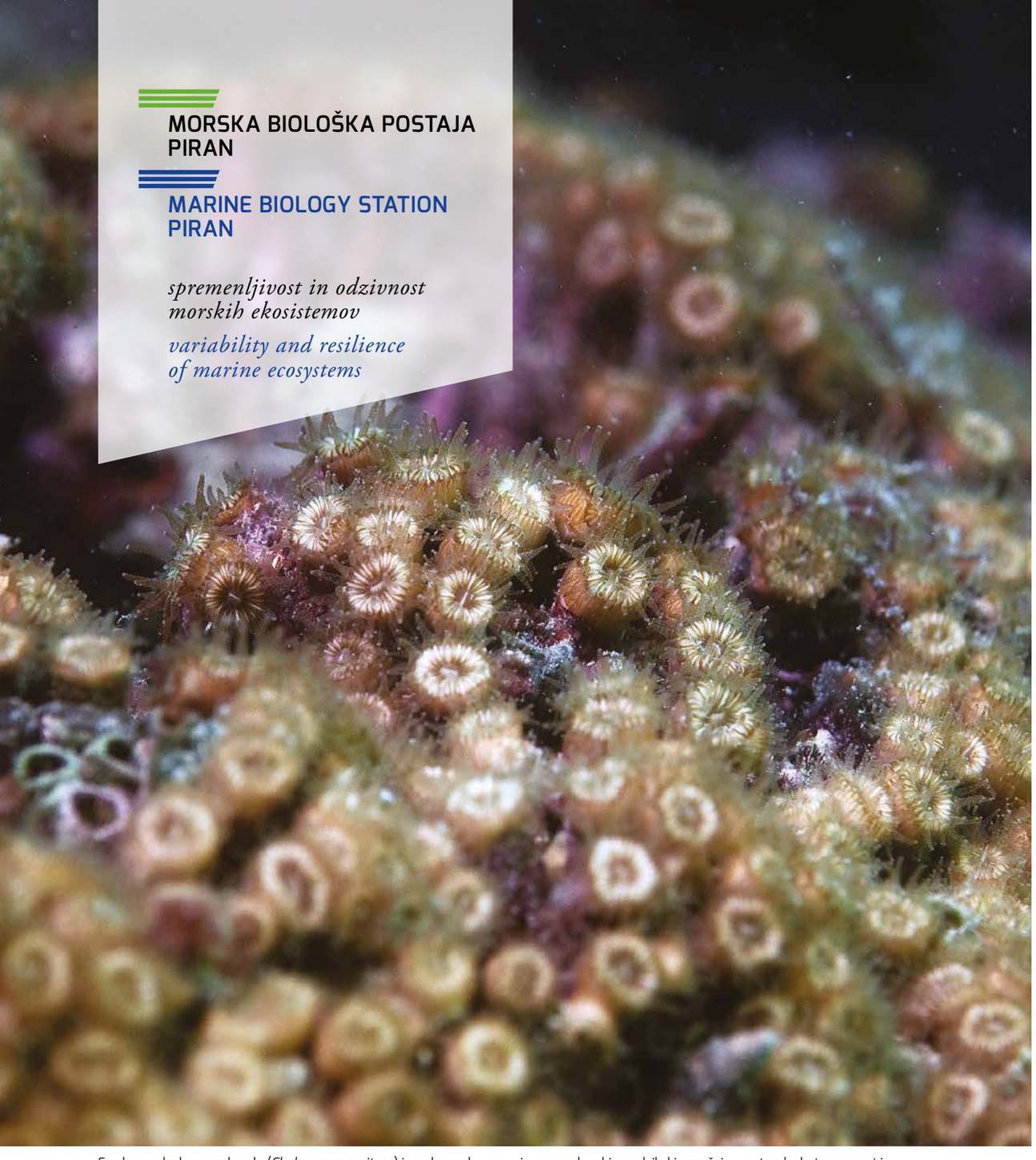
MORSKA BIOLOŠKA POSTAJA PIRAN

MARINE BIOLOGY STATION PIRAN

spremenljivost in odzivnost morskih ekosistemov

variability and resilience of marine ecosystems



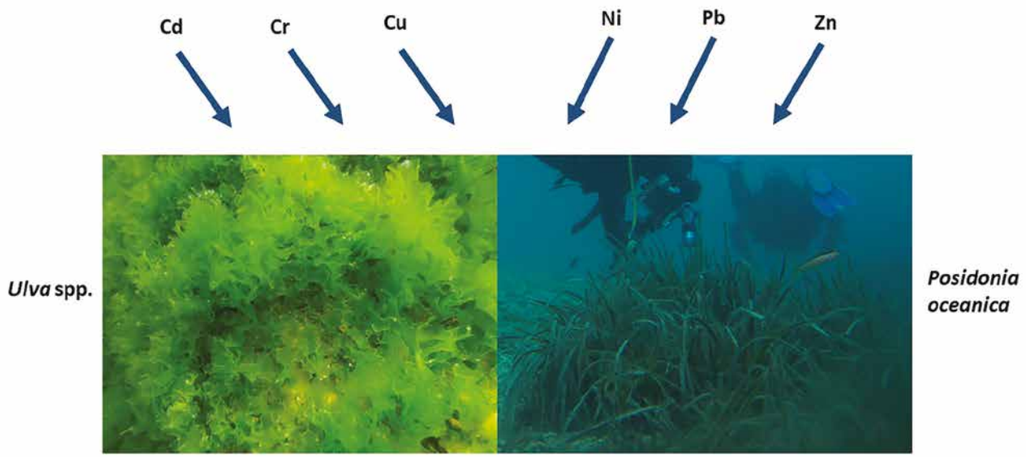
Sredozemska kamena korala (*Cladocora caespitosa*) je v slovenskem morju pomemben biogradnik, ki povečuje prostorsko heterogenost in tvori obsežnejše biogene formacije (foto: T. Makovec). The Mediterranean stony coral (*Cladocora caespitosa*) is an important bioconstructor in the Slovenian Sea, increasing spatial heterogeneity and even forming larger biogenic formations, corallite banks (Photo: T. Makovec).

VODJA: izr. prof. dr. Patricija Mozetič

HEAD: Assoc. prof. dr. Patricija Mozetič

Izr. prof. dr. Patricija Mozetič je od marca 2018 vodja enote Morska biološka postaja Piran in hkrati tudi vodja raziskovalnega programa ARRS Raziskave obalnega morja ter izredna profesorica za področje ekologije na Univerzi na Primorskem. Njeno raziskovalno delo je osredotočeno na ekologijo in fiziologijo fitoplanktona obalnih morij, kar vključuje raziskave dolgoročnih sprememb fitoplanktonske združbe, zlasti v luči podnebnih sprememb, ekologije in taksonomije škodljivih cvetenja alg ter fotosintetskih lastnosti in primarne produkcije. Je predsednica Nacionalnega odbora za Medvladno oceanografsko komisijo (NO IOC) pri Slovenski nacionalni komisiji za UNESCO in zastopa Slovenijo v Medvladnem odboru za škodljiva cvetenja alg (UNESCO/IOC HAB program).

Associate Prof. Dr Patricija Mozetič has been Head of Unit Marine Biological Station Piran since March 2018. She is also Head of the ARRS research program "Coastal Sea Research" and Associate Professor of Ecology at the University of Primorska. Her research work is focused on the ecology and eco-physiology of phytoplankton in coastal seas, which includes research into long-term changes in phytoplankton communities, ecology and the taxonomy of harmful algal blooms, photosynthetic properties and primary production. She is the Chairperson of the National Committee of the Intergovernmental Oceanographic Commission (NO IOC) at the Slovenian National Commission for UNESCO and represents Slovenia in the Intergovernmental Panel on Harmful Algal Blooms (UNESCO/IOC HAB Program).



Zelene alge iz rodu *Ulva* (t. i. zelena solata) in morska trava pozejdonka (*Posidonia oceanica*) odražajo vsebnost elementov v sledovih (Cd, Cr, Cu, Ni, Pb in Zn) v morskem okolju, zato so primerni bioindikatorji onesnaženja morja. Nedavna raziskava je pokazala, da listi pozejdonke kopičijo višje koncentracije elementov v sledovih kot morska solata (foto: M. Orlando Bonaca, B. Mavrič). Green algae of the genus *Ulva* (so-called green lettuce) and the seagrass *Posidonia oceanica* reflect the levels of trace elements (Cd, Cr, Cu, Ni, Pb and Zn) in the marine environment and are therefore suitable bioindicators of marine pollution. A recent study has shown that *P. oceanica* leaves are able to accumulate higher concentrations of trace elements than sea lettuce (Photos: M. Orlando Bonaca, B. Mavrič).

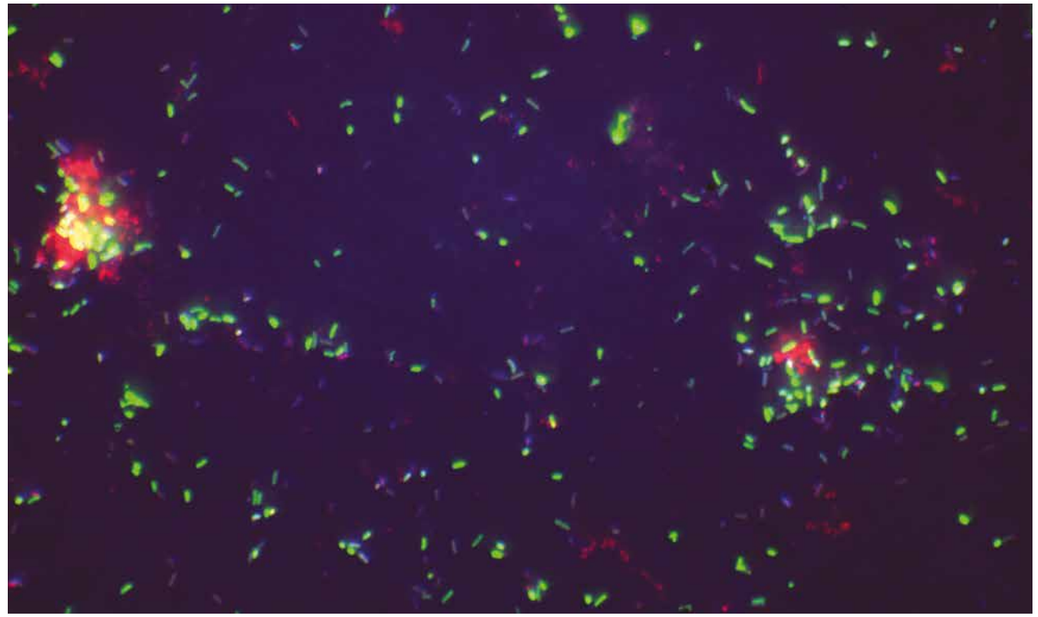
RAZISKAVE OBALNEGA MORJA

KLJUČNE DEJAVNOSTI

Morska biološka postaja Piran (MBP) je kot vodilna enota za raziskave morskih ekosistemov v Sloveniji v letu 2020 vstopila v novo šestletno obdobje raziskav v okviru ARRS programa Raziskave obalnega morja (P1-0237) in se v manjši meri dopolnjuje z raziskovalnim programom, ki v glavnini poteka na IJS (P1-0143). Interdisciplinarne temeljne in uporabne programske raziskave zagotavljajo temeljna znanja o zgradbi in delovanju ekosistemov ter biogeokemičnih procesih v obalnem morju, s poudarkom na proučevanje vplivov podnebnih sprememb in drugih antropogenih dejavnikov na različne strukturne in funkcionalne elemente ekosistema severnega Jadrana.

Programske raziskave so se v letu 2020 dopolnjevale z raziskavami temeljnih in uporabnih ARRS projektov, pri katerih imamo vlogo vodilnega ali sodelujočega partnerja, in evropskih projektov iz različnih shem financiranja (H2020, Interreg, DG, COST akcije).

Z izvajanjem strokovnih nalog za različne uporabnike je MBP tudi v letu 2020 nudila podporo tako državnim institucijam, javnim zavodom kot gospodarskim družbam pri trajnostno usmerjenem gospodarskem in družbenem razvoju obalnega prostora in morja. Raziskovalci MBP sodelujejo pri prenosu znanja in tehnologij v gospodarstvo z izvedbo oceanografskih in ekoloških raziskav, kot je študija za opredelitev možnih lokacij odlaganja privzdignjenega in izkopanega morskega sedimenta v plovnih kanalih v Luki Koper ter monitoring stanja morskih travnikov v luškem bazenu. Potekajoči CRP projekt Uporaba tehnologije DNA za ugotavljanje poneverb v ribiških proizvodih z vrednotenjem socio-ekonomskih vidikov pa omogoča prenos znanja do uporabnikov na področju ribištva in prehrane ter povezovanje s sorodnimi institucijami.



Mikroorganizmi pod epifluorescentnim mikroskopom, ki razgrajujejo odmrli material meduz. Metabolno aktivne bakterije (zeleno obarvane) odigrajo ključno vlogo v razgradnji meduznega detrita, metabolno neaktivne bakterijske celice pa so obarvane vijolično. Povečava 1000x (foto: T. Tinta). Epifluorescence microscopy of microorganisms, breaking down jellyfish detritus. The metabolically inactive bacteria cells are colored purple and in green are the metabolically active ones. As such, they play a key role in microbial processing of jellyfish detritus. 1000x magnification (Photo: T. Tinta).

COASTAL SEA RESEARCH

KEY ACTIVITIES

In 2020, the Marine Biology Station Piran (MBS), as the leading unit for the research of marine ecosystems in Slovenia, entered a new six-year period of research activities within the framework of ARRS "Coastal Sea Research (P1-0237) program, which is to a lesser extent supplemented with the research program P1-0143, otherwise mainly taking place at IJS. An iInterdisciplinary basic and applied program research provides basic knowledge about the structure and functioning of ecosystems and biogeochemical processes in the coastal sea, with an emphasis on studying the effects of climate changes and other anthropological factors on various structural and functional elements of the northern Adriatic ecosystem.

In 2020, program research was supplemented with basic and applied ARRS research programs, where we are in the capacity of the leading or participating partner, as well as with European projects from various financing schemes (H2020, Interreg, DG, COST actions).

By performing professional expertise for various users in 2020 MBS also offered support to state institutions, public institutions, and companies in the sustainable economic and social development, as well as to the social development of the coastal area and the sea. MBS researchers are involved in knowledge and technology transfer to the economy through oceanographic and environmental research, such as the study to find possible dump-site location for lifted or dredged sediments in the navigation channels at the Port of Koper, and monitoring seagrass meadows in the port basin. The current CRP project "The Use of DNA Technology for Detecting Falsity in Fishing Products by Assessing Socio-economic Aspects" allows knowledge transfer to the users in the field of fishery and food, as well as integration with related institutions.

PODROČJA RAZISKAV

- Proučevanje različnih ravni biološke raznovrstnosti – od genoma do vrstne sestave in raznovrstnosti življenjskih združb in okolij (plankton, bentoški nevretenčarji, makroalge, obrežne ribje združbe, podvodni travniki, biogene formacije). V raziskave vključujemo pristope primerjalne genomike in evolucijske vidike ter poleg strukture proučujemo tudi procese.
- Prepoznavanje gonilnih sil sprememb v morskem okolju in biodiverziteti. Poudarek je na antropogenih pritiskih in vplivih, ki so najpomembnejši dejavniki sprememb morskega okolja in biotske raznovrstnosti na lokalni in globalni ravni (onesnaževanje, urbanizacija, promet, marikultura, evtrofikacija, podnebne spremembe in bioinvazija). Posebno mesto med onesnažili ima (mikro)plastika. Učinke onesnažil v organizmih preučujemo predvsem na subcelični ravni.
- Raziskave raznovrstnosti morskih mikrobnih združb ter interakcije mikroorganizmov z organskimi in anorganskimi spojinami ter organizmi, zlasti želatinoznim planktonom.
- Obravnavanje družbenih potreb na področju proizvodnje hrane in biotehnologije, ki v ravnovesju z varstvom narave ohranjajo zdrava morja.
- Raziskujemo dinamiko vodnih mas v obalnem morju z meritvami in z modeliranjem, razvijamo avtomatizirano obdelavo podatkov in krepimo razvoj infrastrukture na morju. Razvijamo inovacije na področju opazovanja morja ter uporabljamo moderno tehnologijo (HF-radar) za opazovanje in napovedovanje tokovanja.
- Na podlagi javnega pooblastila Agencije RS za okolje izvajamo programe monitoringa morja za vrednotenje ekološkega in okoljskega stanja z biološkimi elementi ter fizikalnimi in kemičnimi parametri, v skladu z državno in evropsko okoljsko zakonodajo (ODMS 2008/56/ES in ODV 2000/60/ES) in sodelujemo pri oblikovanju evropskih okoljskih politik.
- Povezujemo se v mrežo evropskih morskih bioloških postaj (MARS), smo člani združenja EuroMarine in EuroGOOS ter partner v slovenskem konzorciju LifeWatch Slovenija, preko katerega vstopamo v evropsko raziskovalno infrastrukturo LifeWatch-ERIC za biodiverziteto in ekosisteme. V okviru teh povezav in evropskih projektov razvijamo inovativne raziskovalne metodologije in raziskovalne koncepte, omogočamo dostop do bioloških virov in zgodovinskih podatkov iz opazovanj, ter nudimo najsodobnejše eksperimentalne in analitske zmogljivosti in napredne možnosti izobraževanja. Zainteresiranim raziskovalcem in študentom ponujamo bivanje v dormitoriju ter delo v sodobnih laboratorijih in na morju.
- Z različnimi stalnimi dejavnostmi, kot so Dan odprtih vrat Morske biološke postaje Piran, objavljanje prispevkov v poljudnih in strokovnih revijah in izvajanje predavanj za različne starostne skupine ter sodelovanje na drugih dogodkih (npr. Dan biotske raznovrstnosti, Znanstival, Dan očarljivih rastlin, Evropska noč raziskovalcev), močno prispevamo k širjenju znanja o morju in dvigu morske pismenosti pri strokovni in laični javnosti. Te dejavnosti so bile v letu 2020 okrnjene – bodisi jih nismo organizirali ali pa so potekale po spletu.

FIELDS OF RESEARCH

- Investigating different levels of biological diversity – from the genome to the species composition and diversity of living communities and environments (plankton, benthic invertebrates, macroalgae, riparian fish communities, underwater meadows, biogenic formations). We include comparative genomics approaches and evolutionary aspects in our research, and we also study processes in addition to the structure.
- Recognizing the main driving force behind the changes in the marine environment and biodiversity. The focus is on anthropogenic impacts, which is the main reason for changes in the marine ecosystem and biodiversity at a local as well as global level (pollution, urbanization, traffic, mariculture, eutrophication, climate changes and bioinvasion). A special place among pollutants belongs to (micro)plastics. The effect of pollutants in organisms is mostly studied at a subcellular level.
- We investigate the diversity of marine microbial communities and the interactions of microorganisms with organic and inorganic compounds and organisms, gelatinous plankton in particular.
- Dealing with social needs in terms of the manufacture of food products and biotechnology that – in balance with nature protection – keep seas healthy.
- We research the dynamics of water masses and modeling in the coastal sea, develop automated data processing, and strengthen the development of infrastructure at sea. We develop innovations in the field of sea observation and we use modern technology (HF-radar) for monitoring and surficial currents assessment.
- Based on the public authorization of the Slovenia Environment Agency, we implement marine monitoring programs for the assessment of ecological and environmental status with biological elements and physical and chemical parameters following national and European environmental legislation (ODMS 2008/56/ EC and ODV 2000/60/EC) and we participate in the planning of international environmental policies.
- We are part of the European Network of Marine Stations (MARS). We are members of the associations EuroMarine and EuroGOOS and a partner in the Slovenian consortium LifeWatch Slovenia through which we enter the European research infrastructure LifeLifeWatch-ERIC for biodiversity and ecosystems. Within the framework of these links and European projects, we develop innovative research methodologies and research concepts and provide access to biological sources and historical data from observations, state-of-the-art experimental and analytical capabilities, and advanced educational opportunities. We offer interested researchers and students living in a dormitory and working in laboratories and at sea.
- Through various ongoing activities, such as the Marine Biology Station Open Day, publishing articles in popular and professional journals, lecturing for different age groups, and participating in other events (e.g. Biodiversity Day, Science Festival, Enchanting Plants Day, European Researchers' Night), we make an important contribution to disseminating knowledge about the sea and raising maritime literacy among the professional and lay public. These activities were impaired in 2020 – either we did not organize them or they took place online.

Večina tujerodnih vrst v slovenskem morju se pojavlja v pristaniščih, (a) v obrasti plovil in drugih trdnih struktur. Ena najbolj razširjenih in pogostih vrst je tudi (b) plaščar *Styela plicata* (foto: B. Mavrič). The majority of non-indigenous species in the Slovenian Sea occur in harbors as part of the fouling community that forms (a) on the hull of ships and other solid objects. One of the most widespread and common non-indigenous species is also (b) the tunicate *Styela plicata* (Photo: B. Mavrič).

GLAVNI DOSEŽKI V LETU 2020

S sodelovanjem v konzorcijih štirih Interreg projektov, katerim se je v letu 2020 pridružil še peti – B-Blue (Interreg Med), smo utrdili svojo vlogo v regiji pri iskanju okoljskih rešitev z uporabo zelenih tehnologij in ohranjanju biotske raznovrstnosti ter pri strategijah upravljanja Sredozemlja s krepitvijo zmogljivosti in izmenjavo znanj. Preko COST akcije OCEAN4BIOTECH (CA18238), ki se je začela oktobra 2020 in v kateri je MBP vodilni partner, vstopamo v evropsko transdisciplinarno mrežo za morsko biotehnologijo. Namen druge COST akcije SEA-UNICORN (CA19107), ki se je prav tako začela leta 2020, je izboljšati politike za trajnostni razvoj s spodbujanjem interakcij med različnimi disciplinami, ki se ukvarjajo s študijem funkcionalne povezanosti v morju.

Na novo sta bila pridobljena dva temeljna ARRS projekta iz sheme Aleša Debeljaka za vračanja slovenskih raziskovalcev iz tujine v Slovenijo. Tako sta se enoti MBP pridružili dr. Nina Bednaršek (do nedavnega na ameriški agenciji Southern California Coastal Waters Research Project) in dr. Tinkara Tinta, ki se je po končanem MSCA projektu na Univerzi na Dunaju ponovno zaposlila na NIB. Pridobili smo bilateralni projekt, ki sofinancira znanstveno-raziskovalno sodelovanje med Slovenijo in Srbijo, vendar v l. 2020 zaradi epidemije izmenjave raziskovalcev niso bile realizirane.

Projekt RI-SI-2 LifeWatch, ki se je začel decembra 2019, izpolnjuje nacionalno prednostno nalogo v okviru Raziskovalne in inovacijske strategije Slovenije 2011–2020. MBP je v okviru projekta RI-SI-2 LifeWatch (MIZŠ in Operativni program za izvajanje evropske kohezijske politike v obdobju 2014–2020) v letu 2020 pridobila pomembno raziskovalno opremo – aparat za pomnoževanje nukleinskih kislin v realnem času (Q-PCR), centrifugo in vrstični elektronski mikroskop (SEM), kar predstavlja nadgradnjo dosedanjega raziskovalnega dela in omogoča uporabo opreme domačim in tujim raziskovalcem.

Ena najbolj razširjenih in pogostih tujerodnih vrst v slovenskem morju je tudi plaščar *Styela plicata* (foto: B. Mavrič).
One of the most widespread and common non-indigenous species in the Slovenian sea is also the tunicate *Styela plicata* (Photo: B. Mavrič).

MAJOR ACHIEVEMENTS IN 2020

Participating in consortiums of four Interreg projects, joined in 2020 by a fifth one – B-Blue (Interreg Med) – we strengthened our role in the region in searching for environmental solutions with the use of green technologies, in preserving biodiversity, and in the strategy for the stewardship of the Mediterranean by enhancing capacities and exchanging knowledge. Via COST Action OCEAN-4BIOTECH (CA18238), which began in October 2020 and with MBS as its leading partner, we are entering European transdisciplinary networking platform for marine biotechnology. The objective of another COST Action SEA-UNICORN (CA19107), which also began in 2020, is to improve sustainable development strategies by promoting interaction between the various disciplines, dealing with research into functional connectivity in the sea.

Acquired were two new ARRS projects from the Aleš Debeljak scheme to repatriate Slovenian researchers. And so, the MBS unit has been joined by Dr. Nina Bednaršek (until recently at the U.S. agency Southern California Coastal Waters Research Project) and Dr. Tinkara Tinta, who has been re-employed by NIB after the MSCA project at the University of Vienna had finished. We acquired a bilateral project to co-fund scientific and research co-operation between Slovenia and Serbia. Due to the epidemic, exchange of researchers did not take place in 2020.

In December 2019, the LifeWatch Slovenia RI-SI-2 LifeWatch project was launched. It fulfills a national priority task within the framework of the Research and Innovation Strategy of Slovenia 2011–2020. As part of the RI-SI-2 LifeWatch project (Ministry of Education, Science and Sport, and Operational Programme for the Implementation of the European Cohesion Policy in the 2014–2020 period), MBS acquired significant research equipment in 2020 – instrument for amplification of nucleic acids in real time (Q-PCR), a centrifuge and a scanning electron microscope (SEM), which means an upgrade of the existing research work and allows the use of equipment by domestic and foreign researchers.

ZNANSTVENA ODLIČNOST

V letu 2020 smo objavili 33 izvirnih in 4 pregledne znanstvene članke. Od skupno 37 znanstvenih člankov jih je bilo 29 kategorije A1/2, večina kategorije A1 oz. A' (25). Izdali smo tudi dve znanstveni monografiji v slovenskem in angleškem jeziku, ki obravnavata biodiverziteto biogenih formacij (COBISS.SI-ID 32921859) in svet v akvariju (COBISS.SI-ID 303692544) ter univerzitetni učbenik z recenzijo – Mikrobna biogeokemija vod (COBISS.SI-ID 40636675). Kar nekaj sodelavcev MBP pa je avtorjev poglavij v znanstveni monografiji Coastal Ecosystems in Transition: A Comparative Analysis of the Northern Adriatic and Chesapeake Bay (Tom C. Malone, Alenka Malej, Jadran Faganeli ur.), ki je izšla pri založbi AGU Wiley.

Večja dosežka predstavljata dva članka iz kategorije A' v revijah Science of Total Environment (COBISS.SI-ID 5317455) in Harmful Algae (COBISS.SI-ID 40469253). Prvi obravnava kopičenje elementov v sledeh, vključno s težkimi kovinami, v morski travi *Posidonia oceanica* in zeleni algi *Ulva lactuca* ter njuno uporabnost kot bioindikatorja v monitoringu onesnaženja morja. Drugi pa razkriva diverziteto potencialno toksičnega fitoplanktonskega rodu *Pseudo-nitzschia* v slovenskem morju z uporabo integrativne taksonomije, ki je kmalu po objavil dosegel odmevnost v znanstveni sferi (CI Scopus = 7). Med najbolj citiranimi članki, ki so bili objavljeni v letu 2020, velja omeniti članek iz Bioinvasion Records o novih tujerodnih in kriptogenih vrstah za Sredozemlje (COBISS.SI-ID 13678595), ki je bil že kar 24-krat citiran (CI Scopus), in pregledni članek projektne skupine GoJelly v Journal of Environmental Management o učinkovitosti čistilnih naprav pri zmanjšanju vnosa mikroplastike v morje (COBISS.SI-ID 14020867) (CI Scopus = 13).

Članek Ten inconvenient questions about plastics in the sea (COBISS.SI-ID 4682063), ki ga je v soavtorstvu objavila raziskovalka MBP dr. Martina Orlando Bonaca, je bil izbran za dosežek ARRS Odlični v znanosti 2019 na področju naravoslovja.

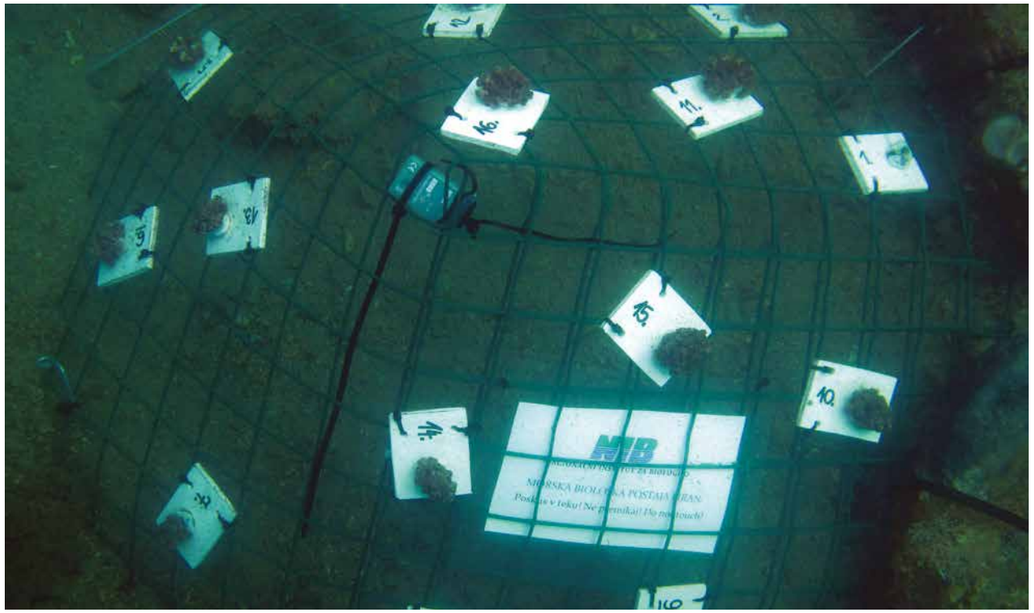
SCIENTIFIC EXCELLENCE

In 2020, we published 33 original and 4 review scientific articles. Out of a total of 37 scientific articles, 29 were of category A1/2, most of them of category A1 or A' (25). We published two scientific monographs in the Slovene and English language on the biodiversity of biogenic formations (COBISS.SI-ID 32921859) and the aquarium world (COBISS.SI-ID 303692544), and a university textbook, containing the review "Microbial Biogeochemistry of Waters" (COBISS.SI-ID 40636675). Several of MBS staff have authored chapters in the scientific monograph "Coastal Ecosystems in Transition: A Comparative Analysis of the Northern Adriatic and Chesapeake Bay" (Tom C. Malone, Alenka Malej, Jadran Faganeli ed.), published by AGU Wiley.

Two articles of category A' in the journals Science of Total Environment (COBISS.SI-ID 5317455) and Harmful Algae (COBISS.SI-ID 40469253) can be considered as major achievements. The first one is about accumulation of trace elements, including heavy metals, in the *Posidonia oceanica* seagrass and *Ulva lactuca* alga and their use as bioindicators in marine monitoring. The other article reveals the diversity of potentially toxic *Pseudo-nitzschia* phytoplankton genus in the Slovenian sea with the use of integrative taxonomy, which attracted considerable attention in the scientific circles soon after its publication (CI Scopus = 7). Among the most cited articles published in 2020 stands out the article from Bioinvasion Records on alien species and cryptogenic species in the Mediterranean (COBISS.SI-ID 13678595), which has been cited 24 times (CI Scopus), and the review article by the GoJelly project group, published in the Journal of Environmental Management on the efficiency of wastewater treatment plants in reducing the immission of microplastics into the sea (COBISS.SI-ID 14020867) (CI Scopus = 13).

The article "Ten Inconvenient Questions about Plastics in the Sea" (COBISS.SI-ID 4682063), published by a MBS researcher Martina Orlando-Bonac as a co-author, was selected for the ARRS achievement "Excellent in Science 2019" in the field of natural sciences.

V okviru projekta TRETAMARA (Interreg Slo-Ita) izvajamo številne aktivnosti, vezane na sredozemsko kameno koralo (*Cladocora caespitosa*), vključno s poskusi, s katerimi želimo raziskati dejavnike, ki vplivajo na rast kolonij (foto: B. Mavrič). Within the TRETAMARA project (Interreg Slo-Ita), numerous activities related to the Mediterranean stony coral (*Cladocora caespitosa*) are being carried out, including experiments to study factors affecting colony growth (Photo: B. Mavrič).



PRISPEVEK K POPULARIZACIJI IN PROMOCIJI ZNANOSTI

- Raziskave in druge dejavnosti MBP so bile tudi v letu 2020 deležne velike odmevnosti v javnosti in medijih. Projekt GoJelly (H2020), ki proučuje uporabo meduz za različne namene, med drugim tudi za zmanjšanje vnosa mikroplastike v morje, je bil odmeven tudi v tujih medijih. Dr. Katja Klun je predstavila projekt na Euronews v sklopu programa Futuris, angleška nacionalna televizija BBC pa je posnela prispevek o projektu za podcast People fixing the world.
- Zaradi odpovedi Dneva odprtih vrat Morske biološke postaje Piran, ki po navadi poteka 8. junija ob Svetovnemu dnevu oceanov, smo kot okrnjeno obliko popularizacije znanosti septembra organizirali dve virtualni predavanji: dr. Vesna Flander-Putrle je predstavila MBP in raziskave slovenskega morja, predavanje dr. Andrej Gasparija, predstojnika Oddelka za arheologijo na Filozofski fakulteti UL, pa je bilo posvečeno podvodni kulturni dediščini v slovenskem morju.
- Sodelavci MBP (dr. Lovrenc Lipej, dr. Martina Orlando-Bonaca, dr. Valentina Pitacco, dr. Borut Mavrič) so s pomočjo finančne podpore Urada za UNESCO objavili knjigo Biodiverziteta biogenih formacij: zakladnica slovenskega morja, ki je rezultat raziskav dveh Interreg projektov Italija–Slovenija (TRECORALA in TRETAMARA). Knjiga je lahko dragocen učbenik za študente morske biologije in ekologije ter varstvene biologije.
- Ob koncu leta je izšel učbenik Mikrobna biogeokemija vod v knjižni zbirki Vse živo, ki so ga napisali dr. Jadran Faganeli, dr. Ingrid Falnoga in dr. Nives Kovač. Delo obravnava osnovne mikrobne biogeokemijske procese v vodnih ekosistemih, predvsem v morju, in bo dragocena literatura za študente naravoslovnih ved različnih študijskih programov.
- Raziskovalci MBP - NIB smo sodelovali v aktivnostih, povezanih z obeleženjem 60-letnice Nacionalnega inštituta za biologijo (1960–2020). Naši prispevki v obliki intervjujev in uvodnikov so objavljeni v knjigi (Marjan Žiberna, ur.), ki je izšla ob tej priložnosti.
- Skupina raziskovalk MBP (dr. Janja Francé, dr. Nives Kovač, dr. Patricija Mozetič) in grafična oblikovalka Branka Smodiš so bile s strani Slovenske znanstvene fundacije izbrane za prejemnice priznanja Prometej znanosti v letu 2019 za izjemno usklajeno znanstveno sporočilo z vizualno komunikacijo v publikaciji Pol stoletja dolga pot Morske biološke postaje Piran 1969–2019. Slavnostna podelitev nagrad je bila 28. 1. 2020 v Državnem svetu RS.

ORGANIZACIJA DELOVNIH SREČANJ IN DELAVNIC TER OBISKI VISOKIH GOSTOV

Organizirali smo več sestankov in delavnic mednarodnih projektov, pri katerih sodelujemo kot partner. Zaradi epidemije je večina dogodkov potekala po spletu. Kljub neugodnim razmeram za druženje v živo pa sta MBP v septembru vseeno obiskala visoka gosta – minister za okolje in prostor mag. Andrej Vizjak in evropski poslanec Franc Bogovič. Sodelavci MBP - NIB so gostoma predstavili raziskave, delo in veliko infrastrukturo ter izzive za prihodnost v kontekstu zelenega dogovora.

- MBP je organizirala dvodnevno letno skupščino evropske mreže EuroMarine, ki se jo je udeležilo 67 delegatov iz vse Evrope. (16. 1.–17. 1. 2020). Na letni skupščini so bili predstavljeni znanstveni dosežki delavnic in delovnih skupin, ki delujejo pod okriljem EuroMarine. Dr. Andreja Ramšak je tudi članica nadzornega odbora EuroMarine. Dva dni pred srečanjem je pod okriljem Euromarine potekalo srečanje Oyster, ki združuje raziskovalce na začetku kariere (z MBP Timotej Turk Dermastia). Delavnice z naslovom Opportunities and challenges of young marine scientists se je udeležilo 20 mladih znanstvenikov, ki so izpostavili težave, s katerimi se raziskovalci v morski znanosti soočajo na začetku kariere in možnosti reševanja le-teh.

CONTRIBUTION TO THE POPULARIZATION AND PROMOTION OF SCIENCE

- MBS's research and other activities attracted considerable attention in 2020 by both the public and the media. The GoJelly (H2020) project, studying the use of jellyfish for different purposes, including immission reduction of microplastics into the sea, received attention also in international media. Dr. Katja Klun presented the project on the Euronews's Futuris program, and the British national broadcaster, BBC, made an episode about the project for its "People Fixing the World" podcast.
- Due to the cancelation of MBS Piran's Open Day, usually taking place on 8 June, on World Oceans Day, we held two virtual lectures in September as a simplified form of the popularization of science: Dr. Vesna Flander-Putrle gave a presentation of MBS and researches on the Slovenian sea, while the lecture by Dr. Andrej Gaspari, head of the Department of Archaeology at the University of Ljubljana's Faculty of Arts, was dedicated to underwater cultural heritage in the Slovenian sea.
- MBS staff members (Dr Lovrenc Lipej, Dr. Martina Orlando-Bonaca, Dr. Valentina Pitacco, Dr. Borut Mavrič) published the book "Biodiversity of Biogenic Formations: a Treasure Trove of Slovenian Sea" with the assistance of financial support by UNESCO Office. It is the result of two Interreg projects Italy – Slovenia (TRECORALA and TRETAMARA). It can serve as a valuable textbook for the students of marine biology and ecology, and conservation biology.
- At the end of the year, we published the textbook "Microbial Biogeochemistry of Water" as part of the "Vse živo" book series. It was written by Dr. Jadran Faganeli, Dr. Ingrid Falnoga and Dr. Nives Kovač. It deals with the basics of microbial biogeochemical processes in water ecosystems, mainly in the sea, and will be valuable literature for the students of natural sciences over a range of courses.
- MBS-NIB researchers took part in the activities around the celebration of the 60th anniversary of the National Institute of Biology (1960–2020). Our contributions in the form of interviews and editorials were published in a book (edited by Marjan Žiberna) that came out on this occasion.
- A team of MBS researchers (Dr. Janja Francé, Dr. Nives Kovač, Dr. Patricija Mozetič) and graphic designer Branka Smodiš received the 2019 Prometheus of Science Award from the Slovene Science Foundation for their highly balanced scientific report and visual communication in the publication "Half a Century of Marine Biology Station Piran 1969 – 2019". The award ceremony was held at the National Council of the Republic of Slovenia on 28 January, 2020.

ORGANIZING MEETINGS, WORKSHOPS AND VISITS OF DISTINGUISHED GUESTS

We organized several meetings and workshops for international projects in which we participate as a partner. Due to the epidemic, most of the events took place online. In spite of the unfavorable circumstances to meet in person, two distinguished guests visited MBS – the minister of the environment and spatial planning, MSc Andrej Vizjak, and Franc Bogovič, a member of the European Parliament. The MBS-NIB staff presented their research, work and facilities to the guests, as well as future challenges in the context of the green deal.

- MBS organized a two-day annual assembly of the European EuroMarine network, which was attended by 67 delegates from all over Europe (16 – 17 January, 2020). Scientific results of the workshops and working groups who work under the umbrella of EuroMarine were presented at the assembly. Dr. Andreja Ramšak is also a member of EuroMarine's Steering Commitee. Two days before the meeting, a EuroMarine-sponsored Oyster meeting took place. It brings together early-career researchers (the MBS attendee was Timotej Turk Dermastia). Twenty young scientists attended the workshop called "Opportunities and Challenges of Young Marine Scientists". They exposed problems that researchers are faced with at the beginning of their careers in marine science, and possible solutions to these problems.

Zanesljive informacije o vrsti rib, ribolovnem orodju in lokaciji ulova so pomembne za potrošnike in za upravljalce v ribištvu. CRP projekt Uporaba tehnologije DNA za ugotavljanje poneverb v ribiških proizvodih z vrednotenjem socio-ekonomskih vidikov omogoča prenos znanja do uporabnikov na področju ribištva in prehrane ter povezovanje s sorodnimi institucijami (foto: B. Marčeta).
Reliable information on fish species, fishing gear and fishing sites is important for consumers and fishery management. The CRP project "DNA based technology for fraud detection in fishery products with socieconomic impact assessment" allows knowledge transfer to the users in the field of fishery and food industry, as well as integration with related institutions (Photo: B. Marčeta).

- Od 4. do 7. 2. 2020 je na MBP potekal 3. sestanek COST akcije Ocean4Biotech (organizacija dr. Ana Rotter, Ernesta Grigalionyte-Bembič). Organizirane so bile delavnice delovnih skupin, virtualno pa je potekal tudi 3. sestanek upravnega odbora akcije.
- MBP je 12. 2. 2020 organizirala javno predstavitev končnega poročila projektne naloge Možnosti za povečanje potenciala lokacij za marikulturo na obali in v slovenskem morju (vodja projektne naloge dr. Vesna Flander Putrle), ki predstavlja strokovno podlago pri pripravi Pomorskega prostorskega plana Slovenije. Srečanja so se udeležili tudi predstavniki MKGP in MOP.
- Dr. Ana Rotter je 14. 5. 2020 organizirala in vodila telekonferenco o sodelovanju in komuniciranju raziskovalcev z oblikovalci politik na področju raziskav. Dogodek je bil organiziran v okviru projekta CHANGE (H2020).
- 25. 9. 2020 je na MBP potekalo prvo srečanje koordinacijske skupine projekta GreenHull' (Interreg Slo-Ita), v katerem nastopamo kot partnerji (dr. Vlado Malačič). Raziskovalci MBP so na srečanju aktivno sodelovali.
- V okviru projekta SHAREMED (Interreg Med) je bila dr. Andreja Ramšak moderator delavnice Designing the future system of observing systems to assess and address to the Mediterraneanmarine ecosystem, State of the art, needs and future direction, ki je potekala na platformi ZOOM in je imela preko 200 udeležencev (webinar 14. do 15. 12. 2020).
- MBP je bila vključena v pripravo projekta Piran4Istria, s katerim je konzorcij obalnih občin PIKA kandidiral na izboru za Evropsko prestolnico kulture 2025 (EPK2025). Pri projektih za EPK je pomemben element prizadevanje za trajnostni razvoj.

Februarja 2020 smo na Morski biološki postaji Piran gostili okoli 60 uglednih evropskih strokovnjakov s področja morske biotehnologije, ki so vključeni v COST akcijo Ocean4Biotech. Sestanki, kot je bil piranski, so pomembni tako z znanstvenega, turističnega, kakor tudi z gospodarskega vidika, saj morska biotehnologija v prihodnosti obeta razvoj in odprtje novih delovnih mest. Udeležence je pred piransko mestno hišo pozdravil tudi piranski župan, g. Đenio Zadković (foto: NIB arhiv). In February, 2020, the Marine Biology Station Piran hosted around 60 distinguished European specialists in marine biotechnology, members of the COST Action Ocean4Biotehc. The meetings, such as this one in Piran, are important from the science, tourist and economic points of view, as marine biotechnology promises development and creation of new jobs in the future. The participants were addressed by the Mayor of Piran, Mr. Đenio Zadković (Photo: NIB archive).

- Between 4 and 7 February, 2020, MBS hosted the 3rd COST Action OCEAN4BIOTECH meeting (organized by Dr. Ana Rotter and Ernesta Grigalionyte-Bembič). Working groups workshops were organized, and the 3rd meeting of the Action's Management Committee took place online.
- On 12 February, 2020, MBS organized public presentation of the final report of the project assignment "Possibilities for Increasing the Potential of Mariculture Locations on the Coast and in the Slovenian Sea" (project assignment leader: Dr. Vesna Flander Putrle), which represents the technical basis for the Maritime Spatial Plan Slovenia. The meeting was attended by representatives of the Ministry of Agriculture, Forestry and Food and the Ministry of the Environment and Spatial Planning.
- On 14 May, 2020, Dr. Ana Rotter organized and hosted a teleconference on cooperation and communication between researchers and policy makers in the field of research work. The event was organized within the CHANGE (H2020) project.
- On 25 September, 2020, MBS hosted the first meeting of the coordination group of the GreenHull' (Interreg Slo-Ita) project, where we participate as partners (Dr Vlado Malačič). MBS researchers took and active part at the meeting.
- Under the umbrella of the SHAREMED (Interreg Med) project, Dr. Andreja Ramšak conducted the workshop "Designing the Future System of Observing Systems to Assess and Address to the Mediterranean Marine Ecosystem, State-of-the-art, Needs and Future Direction", taking place on the ZOOM platform and was attended by over 200 people. (Webinar 14 and 15 December, 2020)
- MBS was involved in preparing the Piran4Istria project, which a consortium of PIKA coastal local communities will use to run for a European Capital of Culture 2025 (ECC2025). Efforts for sustainable development form an important part of ECC projects.

NIB je partner v slovenskem konzorciju LifeWatch Slovenija, preko katerega vstopamo v evropsko raziskovalno infrastrukturo LifeWatch-ERIC za biodiverziteto in ekosisteme. MBP je v okviru projekta RI-SI-2 LifeWatch v letu 2020 pridobila pomembno raziskovalno opremo, med drugim tudi vrstični elektronski mikroskop, ki bo kot del raziskovalne infrastrukture na voljo partnerjem konzorcija in ostalim zainteresiranim (foto: P. Mozetič).
NIB is a partner in the Slovenian LifeWatch Slovenia consortium, through which we have access to the European LifeWatch-ERIC research infrastructure for biodiversity and ecosystems. In 2020 and within the RI-SI-2 LifeWatch project, MBS acquired significant research equipment, including a scanning electron microscope. As an integral part of research infrastructure, it will be available to the consortium partners and other interested parties (Photo: P. Mozetič).

BIBLIOGRAFIJA
BIBLIOGRAPHY

33	Izvirni znanstveni članek Original Scientific Article
4	Pregledni znanstveni članek Review Article
2	Kratki znanstveni prispevek Short Scientific Article
5	Strokovni članek Professional Article
5	Poljudni članek Popular Article
4	Objavljeni znanstveni prispevek na konferenci Published Scientific Conference Contribution
1	Objavljeni strokovnii prispevek na konferenci Published Professional Conference Contribution
16	Objavljeni povzetek znanstvenega prispevka na konferenci Published Scientific Conference Contribution Abstract
4	Samostojni znanstveni sestavek ali poglavje v monografski publikaciji Independent Scientific Component Part or a Chapter in a Monograph
1	Samostojni strokovni sestavek ali poglavje v monografski publikaciji Independent Professional Component Part or a Chapter in a Monograph
3	Recenzija, prikaz knjige, kritika Review, Book Review, Critique
1	Polemika, diskusijski prispevek, komentar Polemic, Discussion, Commentary
10	Intervju Interview

1	Drugi sestavni deli Other Component Parts
2	Znanstvena monografija Scientific Monograph
1	Univerzitetni, visokošolski ali višješolski učbenik z recenzijo Reviewed University, Higher Education or Higher Vocational Education Textbook
1	Slovar, enciklopedija, leksikon, priročnik, atlas, zemljevid Dictionary, Encyclopaedia, Lexicon, Manual, Atlas, Map
1	Doktorska disertacija Doctoral Dissertation
2	Končno poročilo o rezultatih raziskav Final Research Report
3	Elaborat, predštudija, študija Treatise, Preliminary Study, Study
16	Radijska ali televizijska oddaja Radio or Television Broadcast
9	Druge monografije in druga zaključena dela Other Monographs and Other Completed Works
7	Radijski ali TV dogodek Radio or Television Event
1	Prispevek na konferenci brez natisa Unpublished Conference Contribution
2	Druga izvedena dela Other Performed Works
18	Uredništvo Editorship

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Vascotto, Ivano

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ODDELEK ZA BIOTEHNOLOGIJO IN SISTEMSKO BIOLOGIJO

DEPARTMENT OF BIOTECHNOLOGY AND SYSTEMS BIOLOGY

Ničesar v življenju se nam ni treba bati, le razumeti moramo. Zdaj je čas, da razumemo več, da se bomo manj bali.

Marie Skłodowska-Curie (1867–1934), poljsko-francoska fizičarka in kemičarka, dobitnica dveh Nobelovih nagrad, za fiziko in kemijo

Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less.

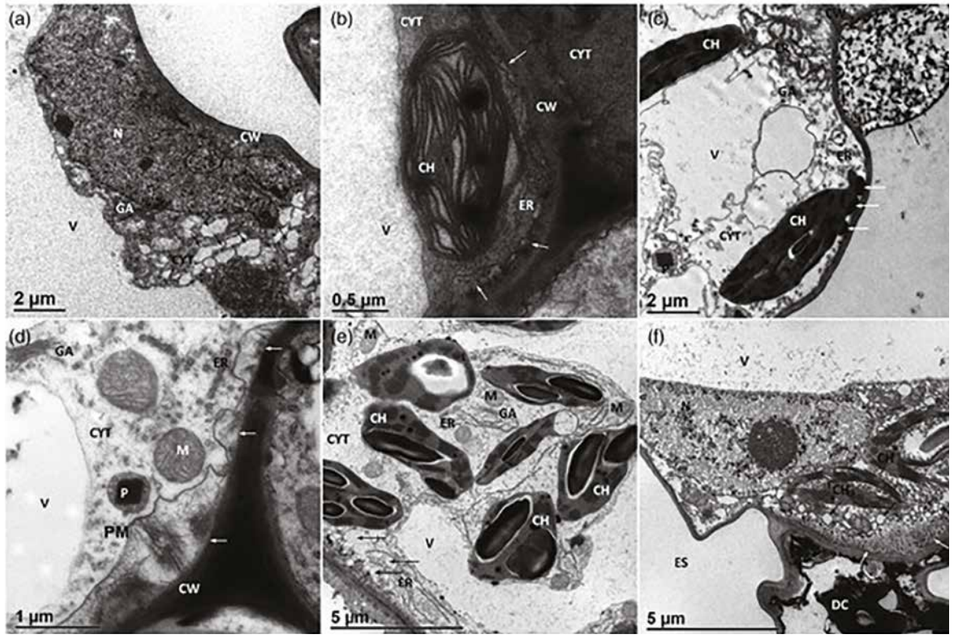
Marie Skłodowska-Curie (1867–1934), Polish and French physicist and chemist, the winner of Nobel prize for physics and chemistry.

Hrošča z imenom Beastie je ob mednarodnem letu zdravja rastlin 2020 po svetu poslala Evropska in mediteranska organizacija za varstvo rastlin (EPPO). Predstavljal naj bi invazivnega škodljivca, ki je zelo nevaren divjim in gojenim rastlinam ter se širi po svetu. Ujeli smo ga tudi v rastni komori na FITO, ki pa ga je preteklo leto zaznamoval drug *beastie* z imenom SARS-CoV-2 (foto: FITO arhiv). The beetle, named Beastie, was shipped worldwide by the European and Mediterranean Plant Protection Organization (EPPO) to mark the International Year of Plant Health. It is considered an invasive pest that is very dangerous to wild and cultivated plants and is spreading worldwide. We also caught it in the growth chamber at FITO, which was scarred by another "beastie" called SARS-CoV-2 last year (Photo: FITO archive).

VODJA: prof. dr. Maja Ravnikar
HEAD: Prof. Dr. Maja Ravnikar

Prof. dr. Maja Ravnikar, znanstvena svetnica, je bila v letu 2020 vodja Oddelka za biotehnologijo in sistemsko biologijo ter redna profesorica na univerzi v Novi Gorici. Njene raziskave so odmevne predvsem na področjih virologije, in sicer proučevanja raznolikosti, diagnostike in epidemiologije virusov, razvoja metod za nekemično eliminacijo mikrobov ter določitev lastnosti virusov za različne biotehnološke aplikacije.

Prof. Dr. Maja Ravnikar, scientific counselor, is the head of the Department of Biotechnology and Systems Biology and professor at the University Nova Gorica. Her research met high response in the field of virology, especially in virus diversity, diagnostics and epidemiology studies and in development of nonchemical methods for microbe elimination and characterization of viruses, developed for different biotechnological applications.

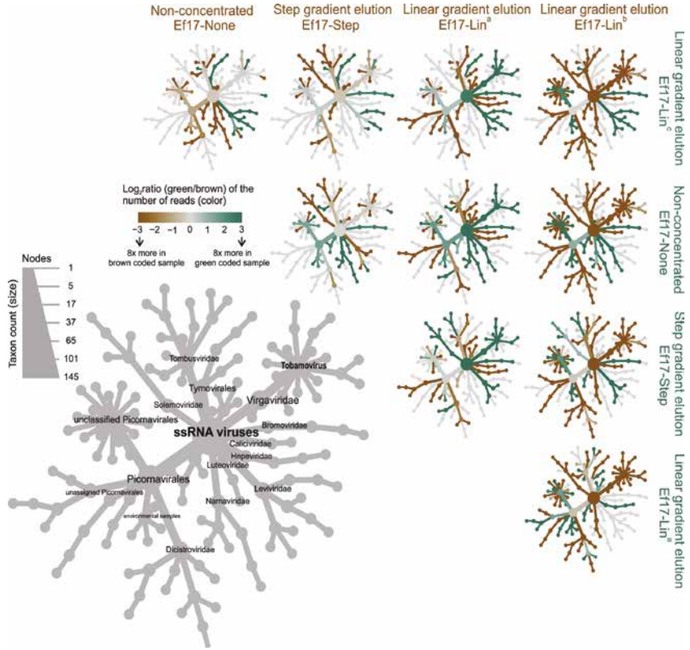


Spremembe pri preobčutljivostnem odgovoru, vidne na ultrastrukturni ravni, so neodvisne od salicilne kisline (vir: *The Plant Journal* 2020; 104: 645–661). Ultrastructural features of the hypersensitive response are not dependent on salicylic acid (Source: *The Plant Journal* 2020; 104: 645-661).

KLJUČNE DEJAVNOSTI

Glavne raziskovalne usmeritve FITO so:

- s pristopi sistemske biologije pridobivati novo znanje o mehanizmih rastlinskih odgovorov na stres;
- raziskovati biologijo mikrobov v različnih okoljih (zrak, voda, tla) za boljše razumevanje raznolikosti, patogenosti in epidemiologije le-teh ter njihove vloge v rastlinskih gostiteljih in pomena za zdravje ljudi;
- na osnovi pridobljenih rezultatov razvijati učinkovite in trajnostne metode za biotehnološki in biološki nadzor mikrobov;
- določati molekularne in morfološke lastnosti virusov z metodami, ki omogočajo celosten vpogled v viruse in s katerimi lahko določimo in odstranimo šibke točke pri sledenju virusov v biomedicinskih proizvodnih procesov, kot sta proizvodnja cepiv in virusnih vektorjev za genske terapije;
- razvijati nove strategije za zaščito rastlin, varno hrano in vodo;
- graditi tehnološko platformo, ki podpira raziskave sistemske biologije rastlin;
- razvijati bioinformatska orodja, ki olajšajo interpretacijo ogromnih količin podatkov (*big data*), pridobljenih s pristopi sistemske biologije;
- razvijati in vzdrževati meroslovno naravnane tehnološke podpore za učinkovitejšo identifikacijsko in detekcijo mikrobov in gensko spremenjenih organizmov, ki bi bile uporabne tudi na področjih kmetijstva, farmacije, zdravja ljudi in varovanja okolja;
- partnersko sodelovanje z drugimi raziskovalnimi skupinami na NIB ali zunaj njega v Sloveniji in po svetu pri komplementarnih raziskavah za pridobivanje vrhunskega znanja;
- partnersko povezovanje z državnimi in evropskimi institucijami, visokošolskimi organizacijami in industrijo za skupni prispevek k reševanju aktualnih problemov s področja delovanja oddelka.

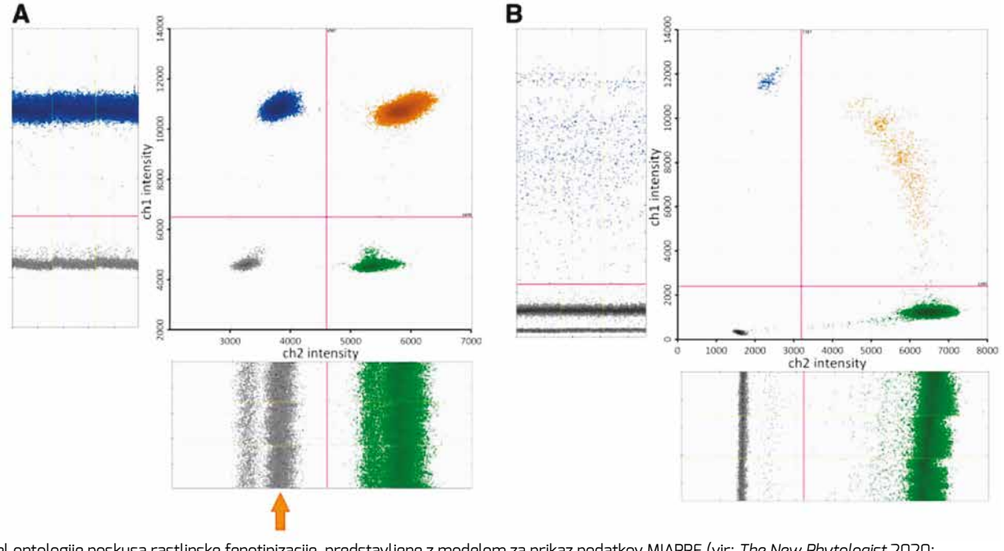


Primerjava viromov ssRNA iz različno koncentriranih vzorcev iztoka odpadne vode (vir: *Water Research* 2020; 177: 1–11). Pairwise comparisons between ssRNA viromes of differently concentrated wastewater effluent samples (Source: *Water Research* 2020; 177: 1-11).

KEY ACTIVITIES

FITO's research agenda includes:

- generating the latest knowledge on mechanisms of plant stress responses using systems biology approaches;
- exploring the biology of microbes in different environments (water, air, soil) for a comprehensive understanding of the diversity, pathogenicity and epidemiology of microbes and thus the role of microbes in plant hosts and the role of microbes in human health;
- developing more efficient and sustainable methods for biotechnological and biological control of microbes based on new knowledge;
- molecular and morphological characterization of viruses using methods that allow a holistic view of viruses and thus provide a basis for eliminating critical points in virus tracing in biomedical processes, i.e. in the production of vaccines and gene therapy viruses;
- developing new strategies for crop protection and safe food and water;
- expanding a technology platform that supports plant systems biology;
- developing bioinformatics tools to interpret "Big Data" generated by systems biology approaches;
- developing and maintaining measurement-oriented technological support for more effective identification and detection of microbes and genetically modified organisms that would also be appropriate in agriculture, pharmaceuticals, human health, and environmental protection;
- cooperative partnerships with other research groups at or outside NIB, in Slovenia and worldwide in complementary research to acquire state-of-the-art knowledge;
- partnerships with Slovenian and European institutions, academic organizations and industry for joint contribution to solving current problems in the fields of activity of the department.



Del ontologije poskusa rastlinske fenotipizacije, predstavljene z modelom za prikaz podatkov MIAPPE (vir: *The New Phytologist* 2020; 227: 260–273). Subset of the Plant Phenotyping Experiment Ontology representing the MIAPPE data model (Source: *The New Phytologist* 2020; 227: 260-273).

GLAVNI DOSEŽKI V LETU 2020

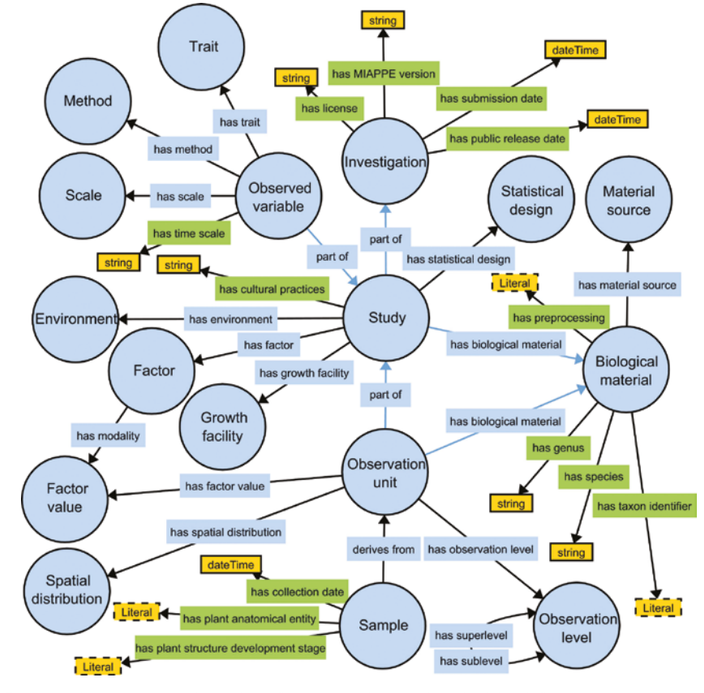
NAŠI REZULTATI SO DEL SVETOVNE ZAKLADNICE ZNANJA

»Znanost je poznavanje posledic in odvisnosti enega dejstva od drugega.«

Thomas Hobbes (1588–1679), angleški filozof

Naše dolgoletne raziskave krompirjevega virusa Y (PVY) smo nadgradili z natančno transkriptomsko analizo mest okužbe z virusom. Ta je pokazala, da je uravnavanje genov, povezanih z imunsko signalizacijo prostorsko uravnavano in da v nekompatibilni interakciji med PVY in krompirjem igra pomembno vlogo protein D, homologen oksidazi respiratornega izbruha (RBOHD). Izsledke smo objavili v odlični znanstveni reviji *The Plant Journal* z visokim dejavnikom vpliva.

V odpadnih vodah sta količina in raznolikost rastlinskih virusov veliki, v njih se pojavljajo tudi virusi, ki do raziskave v tem območju niso bili poznani. Z odpadnimi vodami rastlinski virusi vstopajo v ekosistem iz urbanih okolij. Pri konvencionalnem čiščenju odpadnih vod se infektivnost rastlinskih virusov ohrani. Vse to in še več je del znanstvene raziskave, ki smo jo objavili v reviji Water Research, uvrščeni v skupino najodličnejših revij po kategorizaciji ARRS, A'', z izjemno visokim dejavnikom vpliva.



Primeri prikaza dvo- ali trobarvnih grafov po uporabi razčnih multipleksnih formatov.
(vir: *Clinical Chemistry* 2020; 66: 1012–1029). Examples of two and three color plot outputs using different multiplex format (Source: *Clinical Chemistry* 2020; 66: 1012-1029).

MAJOR ACHIEVEMENTS IN 2020

OUR RESULTS ARE PART OF THE WORLD'S TREASURE TROVE OF KNOWLEDGE

»Science is the knowledge of consequences, and dependence of one fact upon another.«

Thomas Hobbes (1588 – 1679), English philosopher

Our long-term study of potato virus Y (PVY) was upgraded with precision transcriptomics of viral foci. The analysis uncovered spatial regulation of immune signaling genes and identified respiratory burst oxidase homolog protein D (RBOHD) as a key player in the incompatible interaction between potato and PVY. The results were published in the excellent *The Plant Journal* with very high impact factor.

Plant viruses are a rich and highly diverse component of the wastewater virome. The study of the wastewater virome reveals emerging plant viruses that have not been previously reported in the region. Infectious plant viruses are released into the ecosystem by wastewater from urban environments. Plant viruses remain infectious even after conventional wastewater treatment. These and many other facts are part of a study published in *Water Research*, a journal listed in the category A'' of the Slovenian Research Agency and with a very high impact factor.

V stoletju po Newtonu so izjemni posamezniki še vedno lahko obvladovali vsa področja znanosti. Po letu 1800 je to postalo popolnoma nemogoče.

Isaac Asimov (1920–1992), ameriški pisatelj in profesor biokemije na Bostonski univerzi

V dveh odmevnih znanstvenih člankih, objavljenih v prestižnih znanstvenih revijah The New Scientist in Clinical Chemistry, je s skupnimi močmi 37 in 32 raziskovalcev iz različnih raziskovalnih skupin, vključno z našo, opisalo, kako ponovno uporabiti podatke rastlinske fenomike in pripravilo digitalne MIQE smernice, ki vključujejo minimalne informacije za objavo poskusov s kvantitativnim digitalnim PCR.

Z NAŠIM ZNANJEM OBLIKUJEMO BOLJŠI SVET ZA VSE

Z našim znanjem o virusih v odpadnih vodah smo se v letu pandemije bolezni COVID-19 dejavno vključili v sledenje njenega povzročitelja virusa SARS-CoV-2. Od začetke pandemije smo razvijali metode za detekcijo virusa in septembra pričeli s slednjem na čistilnih napravah v Sloveniji. Pridobili smo certifikat za kvalitativno in kvantitativno analizo virusa in sodelovali v mednarodni meroslovni študiji za vrednotenju merilnega sistema za SARS-CoV-2.

Delo v virusnem laboratoriju (foto: FITO arhiv).
Working in the virus laboratory (Photo: FITO archive).

During the century after Newton, it was still possible for a man of unusual attainments to master all fields of scientific knowledge. But by 1800, this had become entirely impracticable.

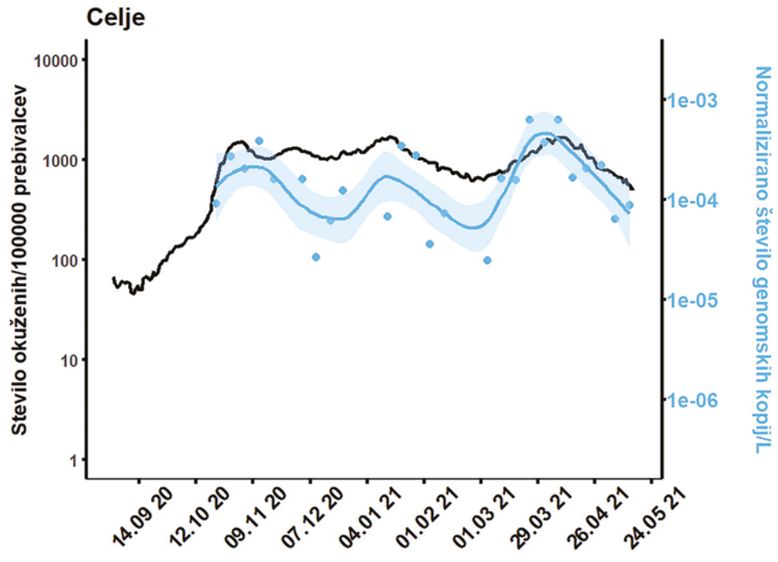
Isaac Asimov (1920 – 1992), an American writer and professor of biochemistry at Boston University

In two high-profile scientific articles published in the prestigious journals *The New Scientist* and *Clinical Chemistry*, 37 and 32 scientists, respectively, from different research groups, including ours, described how to reuse plant phenomic data and provided the digital MIQE guidelines that contain minimum information for publishing quantitative digital PCR experiments.

WITH OUR KNOWLEDGE, WE HELP TO SHAPE A BETTER WORLD FOR ALL

With our knowledge of viruses in waste waters, we actively participated in the tracking of the SARS-CoV-2 virus in the year of the COVID -19 pandemic. Since the beginning of the pandemic, we have developed methods to detect the virus and in September we started to do so at wastewater treatment plants in Slovenia. We received a certificate for qualitative and quantitative analysis of the virus and participated in an international metrological study to evaluate the measurement system for SARS-CoV-2.

Količina SARS-CoV-2 v odpadnih vodah (vir: NIB arhiv)
SARS-CoV-2 in waste waters (Source: NIB archive).



Izsek iz slavnostnega videa, posnetega ob 60-letnici NIB (vir: MATADOR produkcija).
Excerpt from the gala video, recorded on the occasion of the 60th anniversary of NIB (Source: MATADOR produkcija).

USTVARJAMO KULTURO PRIZNANJ

Ni važno, kolikokrat dobiš nagrado,
vedno je zelo posebna.

Zinedine Zidane, bivši francoski nogometaš

V letu 2020 so bili člani FITO večkrat nagrajeni za svoje študijsko in raziskovalno delo, kot tudi za dosežke na področju komunikacije znanosti. Mojca Juteršek je za svoje magistrsko delo prejela fakultetno Prešernovo nagrado, Karmen Pogačar pa Krkino priznanje. Katarini Bačnik je Slovensko mikrobiološko društvo podelilo nagrado mladim mikrobiologom za izjemne znanstveno-raziskovalne dosežke. Marina Dermastia je postala finalistka izbora za častni naslov Komunikator znanosti 2020, ki ga podeljuje Slovenska znanstvena fundacija; prejela pa je tudi Zeijevo nagrado za življenjsko delo. Zeijevo nagrado za izjemne dosežke na področju dejavnosti NIB v zadnjih petih letih je prejel Ion Gutierrez; Marjana Camloh, Lidija Matičič in Aleš Blatnik pa so prejeli Zeijevo zahvalo za dolgoletno uspešno delo na NIB.

FITO je v Državnem svetu organiziral dogodek v počastitev mednarodnega leta zdravja rastlin, ki ga je za leto 2020 razglasila Organizacija za prehrano in kmetijstvo pri OZN (FAO). Ob svetovnem dnevu hrane, ki ga je prav tako razglasila FAO, je Marina Dermastia pripravila v glavni avli Biološkega središča in vzporedno zelo obiskano virtualno razstavo umetniških fotografij cvetov in plodov udomačenih trav priznanega fotografa Marka Trebušaka, ki so pred razstavo ilustrirale njen članek v slovenski izdaji revije National Geographic. Članek je bil izbran kot najboljši v vseh tujih izdajah revije in si je vanje že utrl pot. Ob 60-letnici NIB so člani FITO sodelovali kot pisci in intervjuvanci v knjigi Rastvejitev, Marina Dermastia pa je bila njena glavna urednica.

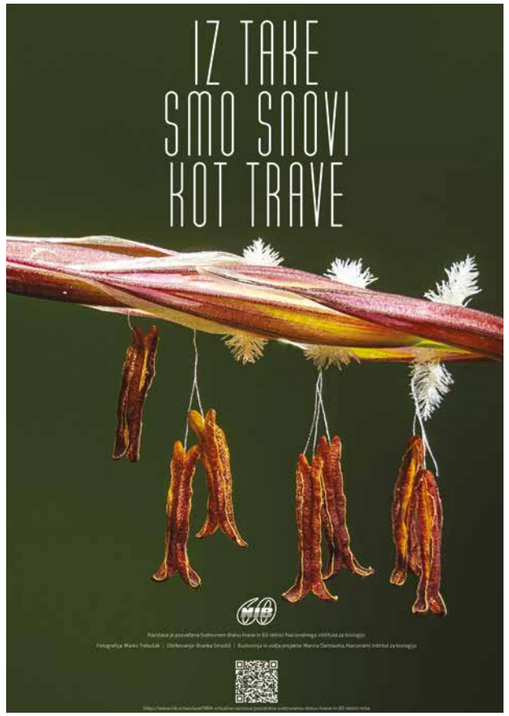
CREATING A CULTURE OF RECOGNITION

It doesn't matter how many times
you win an award, it is always very special.

Zinedine Zidane, French former football player

In 2020, FITO members received several awards for their academic and research achievements and for their achievements in science communication. Mojca Juteršek received the Prešeren Award and Karmen Pogačar the Krka Award for their Master's theses. Slovenian Microbiological Society presented the Young Microbiologist Award to Katarina Bačnik for her outstanding research work. Marina Dermastia was among the two finalists for the honorary title of the Science Communicator 2020, awarded by the Slovene Science Foundation. She was also awarded the Zei Award for lifetime achievement in science and science communication. The Zei Award for outstanding scientific achievements in the last five years went to Ion Gutierrez, while Marjana Camloh, Lidija Matičič and Aleš Blatnik received the Zei Acknowledgements for their long and successful work at NIB.

FITO organized a special event at the National Council in honor of the International Year of Plant Health, declared by the Food and Agricultural Organization (FAO). FAO also declared the World Food Day, which was celebrated at NIB with an exhibition in its hall, as well as with its virtual version, both curated by Marina Dermastia. The exhibition consisted of photos of flowers and fruits of domesticated grasses by well-known photographer Marko Trebušak. The photos were also part of the article in the Slovenian edition of National Geographic on grass domestication by Marina Dermastia. It was chosen as the best article from all foreign editions and has been published by several foreign editions of National Geographic magazine. For the 60th anniversary of NIB, several FITO members contributed to the book Rastvejitev, for which Marina Dermastia was the chief editor.



Plakat ob otvoritvi razstave Iz take smo snovi kot trave. Oblikovanje: Branka Smodiš Poster for the opening of the exhibition We Are of the Same Matter as Grass Is Made of. Design: Branka Smodiš

Dogodek v Državnem zboru ob mednarodnem letu zdravja rastlin (foto: FITO arhiv).
Event at the National Council in honor of the International Year of Plant Health (Photo: FITO archive).

BIBLIOGRAFIJA
BIBLIOGRAPHY

38	Izvirni znanstveni članek Original Scientific Article
5	Pregledni znanstveni članek Review Article
4	Kratki znanstveni prispevek Short Scientific Article
8	Strokovni članek Professional Article
12	Poljudni članek Popular Article
4	Objavljeni znanstveni prispevek na konferenci Published Scientific Conference Contribution
44	Objavljeni povzetek znanstvenega prispevka na konferenci Published Scientific Conference Contribution Abstract
3	Objavljeni povzetek strokovnega prispevka na konferenci Published Professional Conference Contribution Abstract
3	Samostojni znanstveni sestavek ali poglavje v monografski publikaciji Independent Scientific Component Part or a Chapter in a Monograph
3	Samostojni strokovni sestavek ali poglavje v monografski publikaciji Independent Professional Component Part or a Chapter in a Monograph
1	Predgovor, spremna beseda Preface, Afterword
11	Intervju Interview
9	Drugi sestavni deli Other Component Parts
3	Srednješolski, osnovnošolski ali drugi učbenik z recenzijo Reviewed Secondary and Primary School Textbook or Other Textbook
4	Drugo učno gradivo Other Educational Material
2	Slovar, enciklopedija, leksikon, priročnik, atlas, zemljevid Dictionary, Encyclopaedia, Lexicon, Manual, Atlas, Map
1	Magistrsko delo Master's Thesis
5	Končno poročilo o rezultatih raziskav Final Research Report
9	Elaborat, predštudija, študija Treatise, Preliminary Study, Study
20	Radijska ali televizijska oddaja Radio or Television Broadcast
1	Patentna prijava Patent Application
1	Patent Patent
16	Druge monografije in druga zaključena dela Other Monographs and Other Completed Works
8	Radijski ali TV dogodek Radio or Television Event
1	Predavanje na tuji univerzi Invited Lecture at Foreign University
6	Prispevek na konferenci brez natisa Unpublished Conference Contribution
1	Druga izvedena dela Other Performed Works
13	Uredništvo Editorship

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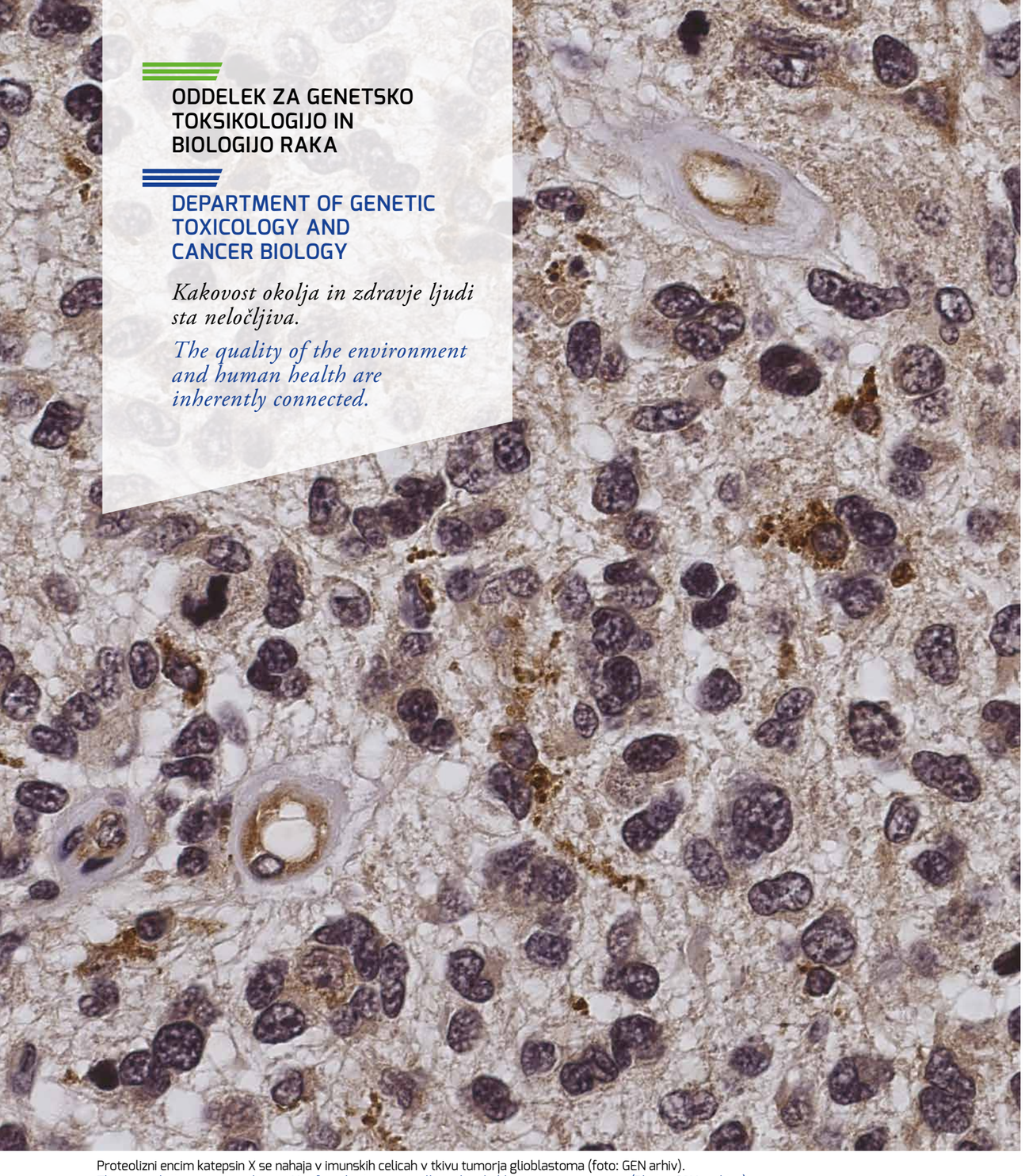


ODDELEK ZA GENETSKO TOKSIKOLOGIJO IN BIOLOGIJO RAKA

DEPARTMENT OF GENETIC TOXICOLOGY AND CANCER BIOLOGY

Kakovost okolja in zdravje ljudi sta neločljiva.

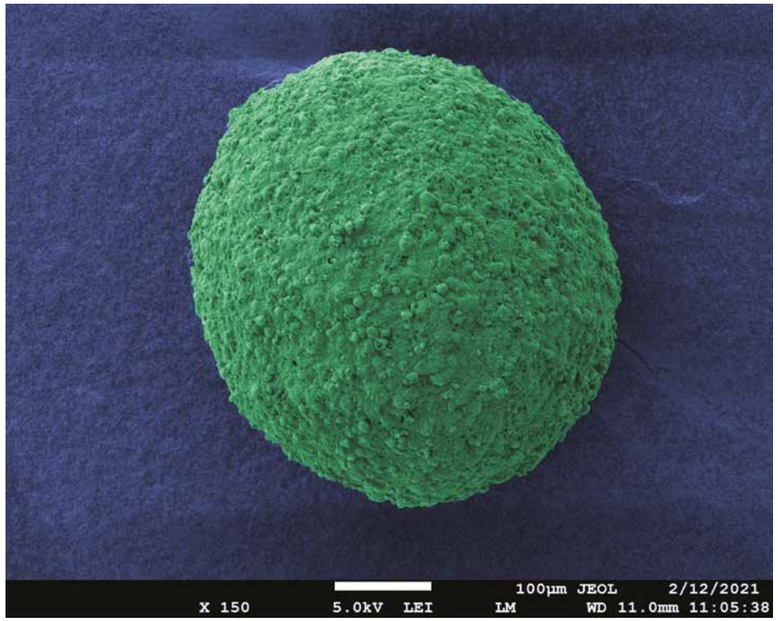
The quality of the environment and human health are inherently connected.

Proteolizni encim katepsin X se nahaja v imunskih celicah v tkivu tumorja glioblastoma (foto: GEN arhiv).
The proteolytic enzyme cathepsin X is found in immune cells in the glioblastoma tumor tissue (Photo: GEN archive).

VODJA: prof. dr. Metka Filipič
HEAD: Prof. Dr. Metka Filipič

Prof. dr. Metka Filipič, znanstvena svetnica, je od leta 2005 vodja Oddelka za genetsko toksikologijo in biologijo raka ter redna profesorica toksikološke kemije na Fakulteti za farmacijo Univerze v Ljubljani. Njeno raziskovalno področje so raziskave mehanizmov genotoksičnega in potencialno karcinogenega delovanja antropogenih in naravnih onesnažil okolja in hrane, raziskave potencialnih antigenotoksičnih snovi ter razvoj novih *in vitro* testnih sistemov za proučevanje genotoksičnosti. Njene raziskave so pomembno doprinesle tudi na področju znanosti o okolju, predvsem k razumevanju škodljivih vplivov ostankov zdravil na okolje in zdravje ljudi za kar je prejela Zoisovo priznanje za pomembne dosežke.

Prof. Dr Metka Filipič, scientific councillor, is the Head of the Department of Genetic Toxicology and Cancer Biology since 2005 and professor of Toxicological chemistry at the Faculty of Pharmacy, University of Ljubljana. Her research is focused on the studies of the mechanisms of genotoxicity and potential carcinogenicity of man-made and natural environmental and food pollutants, studies of potential anti-genotoxic substances and development of new *in vitro* test systems in genetic toxicology. She is recognised also for her important contribution in the field of environmental sciences particularly in understanding of the adverse effects of residues of pharmaceuticals on the environment and human health for which she received the national Zois award for important achievements.



Organoid možganskega tumorja glioblastoma, posnet z elektonskim vrstičnim mikroskopom (foto: GEN arhiv).
An organoid of a glioblastoma brain tumor, photographed with a scanning electron microscope (Photo: GEN archive).

KLJUČNE DEJAVNOSTI

Raziskovalno delo na Oddelku za genetsko toksikologijo in biologijo raka poteka v okviru raziskovalnega programa ARRS (P1–0245) z naslovom Ekotoksiologija, toksikološka genomika in karcinogeneza ter več domačih in mednarodnih raziskovalnih projektov. Raziskave so usmerjene v razumevanje kompleksnih mehanizmov, prek katerih okolje vpliva na zdravje ljudi in obratno, kako človekove dejavnosti vplivajo na okolje.

SPECIFIČNA PODROČJA NAŠIH RAZISKAV

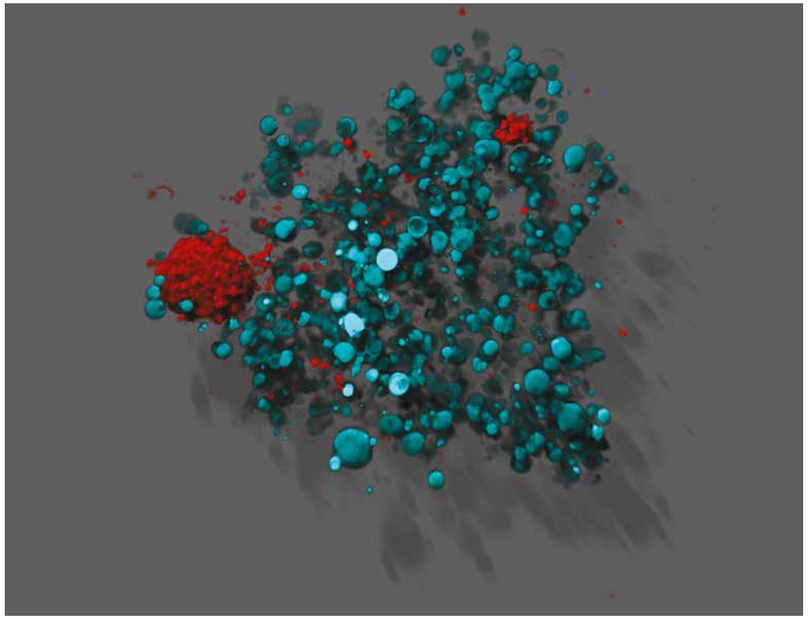
Raziskave molekularnih mehanizmov toksičnega in genotoksičnega delovanja okoljskih onesnažil. Osredotočamo se na proučevanje potencialnih škodljivih učinkov tako posameznih onesnažil (bisfenoli, cianobakterijski toksini, ostanki zdravil itd.) kot tudi njihovih zmesi na zdravje ljudi in vodne organizme.

Raziskave napredovanja možganskih tumorjev – gliomov, glioblastomskih matičnih celic in njihove vloge pri napredovanju in odpornosti proti zdravljenju. Raziskave osredotočamo na proučevanje vloge rakavih matičnih celic in mikrookolja tumorjev na odpornost proti zdravljenju s kemo- in radioterapijo ter iskanje novih terapevtskih pristopov za kombinatorno zdravljenje.

Razvoj novih *in vitro* testnih sistemov za nadomeščanje uporabe poskusnih živali v genetski toksikologiji in raziskavah raka. Razvijamo tridimenzionalne (3D) celične modele in modele z zarodki rib cebric (*Danio rerio*).

Ekološki monitoring kakovosti površinskih voda in razvoj novih metodologij ekološkega vrednotenja kakovosti voda na osnovi analiz okolijske DNK v vodnih telesih.

V letu 2020 smo uvedli novo raziskovalno področje Imunologija in celična imunoterapija.



Sferoidni model tumorskih celic in celic mikrookolja po obsevanju (foto: GEN arhiv).
A spheroid model of tumor cells and the cells of the microenvironment after radiation (Photo: GEN archive).

KEY ACTIVITIES

Research at the Department of Genetic Toxicology and Cancer Biology is performed within the framework of the research program (P1-0245) and several national and international projects. Research is focused on understanding the complex mechanisms through which the environment affects human health and vice versa and how human activities affect the environment.

SPECIFIC AREAS OF OUR RESEARCH INCLUDE:

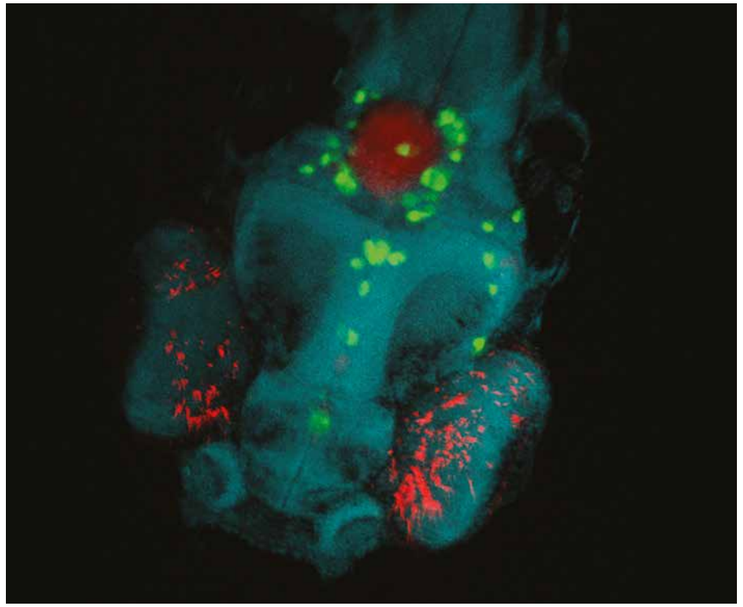
Investigation of the molecular mechanisms of toxic and genotoxic activity of environmental contaminants. We focus on studying the potential adverse effects of individual contaminants (bisphenols, cyanobacterial toxins, drug residues, etc.) as well as their mixtures on human health and aquatic organisms.

Research on the development of brain tumors – gliomas, glioblastoma stem cells and their role in tumor progression and therapeutic resistance. Our research focuses on the study of the role of cancer stem cells and the tumor microenvironment in chemo- and radioresistance as well as the search for new therapeutic approaches.

Development of new *in vitro* test systems to replace experimental animal use in genetic toxicology and cancer research. We are developing three-dimensional (3D) cell models and models with zebrafish embryos (*Danio rerio*).

Ecological monitoring of surface water quality and development of new methodologies for ecological assessment of water quality based on the analysis of environmental DNA in water bodies.

In 2020, we introduced a new research area, Immunology and Cellular Immunotherapy.



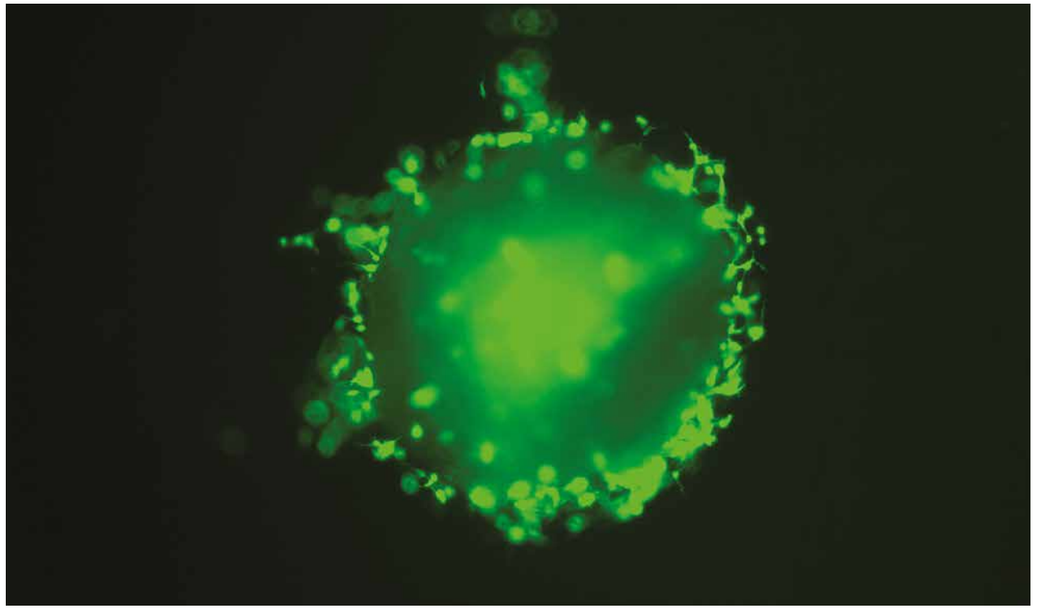
Tumorji glioblastoma v možganih zarodkov cebric (foto: GEN arhiv).

Na vseh področjih partnersko sodelujemo z raziskovalnimi skupinami v Sloveniji in tujini. Za potrebe državnih institucij ter partnerje iz gospodarstva izvajamo naročniške raziskovalne projekte in svetovanje. Izvajamo testiranja varnosti proizvodov za potrebe registracij (testiranje mutagenosti v skladu z OECD načeli dobre laboratorijske prakse (DLP) ter testiranje biokompatibilnosti medicinskih pripomočkov v skladu z ISO-standardi). V letu 2020 smo na področju testiranja zaščitnih obraznih mask zaradi epidemije COVID-19 in povečanega povpraševanja po zaščitnih maskah na trgu vzpostavili učinkovito sodelovanje s podjetjem Lotrič Meroslovje d. o. o., v sklopu katerega na našem oddelku izvajamo testiranje biokompatibilnosti različnih tipov zaščitnih mask in materialov za izdelavo le teh, v skladu z ISO 10993-5.

GLAVNI RAZISKOVALNI DOSEŽKI V LETU 2020

RAZISKAVE MOLEKULARNIH MEHANIZMOV TOKSIČNEGA IN GENOTOKSIČNEGA DELOVANJA OKOLJSKIH ONESNAŽIL

Onesnaževanje okolja s toksičnimi snovmi je eden izmed glavnih problemov današnjega časa in predstavlja resno grožnjo za ekosisteme in zdravje ljudi. Izvor kemičnega onesnaženja so kemikalije, ki nastanejo zaradi dejavnosti človeka in se sproščajo v okolje kot tudi naravne spojine, ki jih proizvajajo različni organizmi. Kljub vse večjim dokazom o prisotnosti teh spojin v okolju ter posledično v živilih, ki jih uživamo, še vedno obstajajo vrzeli v našem razumevanju, kako te kemikalije vplivajo na žive organizme, kar nam preprečuje ustrezno oceno tveganja za okolje in zdravje ljudi, zlasti oceno tveganja za nastanek rakavih obolenj. Že vrsto let proučujemo škodljivo delovanje naravnih toksinov, kot so cianotoksini, ki jih proizvajajo cianobakterije. Le-te so v okolju vseprisotni mikroorganizmi, ki se zaradi povečane evtrofikacije celinskih voda in globalnega segrevanja vse pogosteje pojavljajo tudi v vodah zmernega pasu. Te raziskave so potekale v sodelovanju s številnimi mednarodnimi partnerji. V sodelovanju s kolegi iz Univerze v Debrecenu, Madžarska, smo prvi opisali, da so mikroginini genotoksični, kar smo objavili v reviji Chemosphere (https://doi.org/10.1016/j.chemosphere.2019.124880), medtem ko smo v sodelovanju s Univerzo Pablo de Olavide v Sevilli, Španija, proučevali kombinirane učinke delovanja cilindrospermopsina in bisfenolov ter pokazali, da imajo onesnažila vzajemne toksične učinke (Toxins, https://doi.org/10.3390/toxins12040219).



Fluorescentne tumorske celice, ki rastejo v sferoidu (foto: GEN arhiv).

In all areas, we work in partnership with research groups in Slovenia and abroad. For the needs of state institutions and industrial partners, we carry out contract research projects and consulting. We perform product safety testing for registration purposes (mutagenicity testing in accordance with the OECD standards of Good Laboratory Practice (GLP), biocompatibility testing of medical devices in accordance with ISO standards). In 2020, due to the COVID-19 epidemic and increased demand for protective face masks on the market, we established an effective cooperation with the company Lotrič Meroslovje d.o.o. in the field of testing of protective face masks, as part of which we perform biocompatibility testing of various types of protective masks and materials for their manufacture, in accordance with ISO 10993-5.

MAJOR RESEARCH ACHIEVEMENTS IN 2020

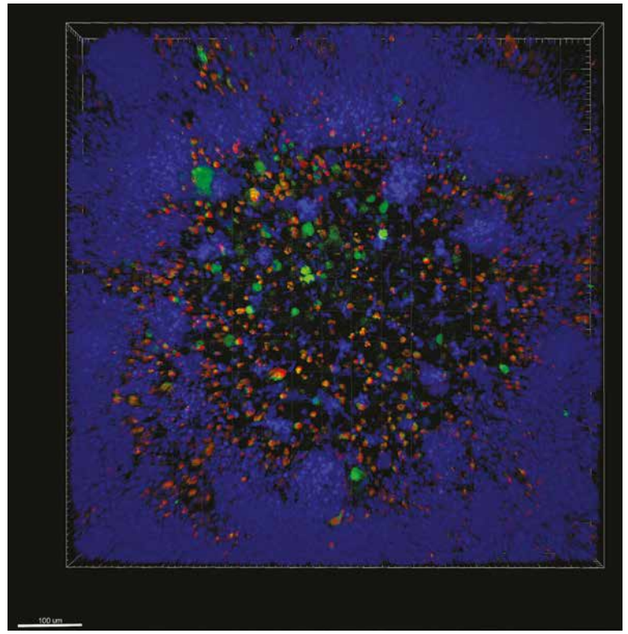
RESEARCH OF MOLECULAR MECHANISMS OF TOXIC AND GENOTOXIC ACTIVITY OF ENVIRONMENTAL POLLUTANTS

Pollution of the environment with toxic substances is one of the main problems of our time and poses a serious threat to ecosystems and human health. The sources of chemical pollution are chemicals formed by human activities and are released into the environment, as well as natural compounds produced by various organisms. Despite growing evidence of the presence of these compounds in the environment and consequently in the food we eat, there are still knowledge gaps in our understanding of how these chemicals affect living organisms, which prevents us from proper risk assessment for the environment and human health, particularly related to the cancer development. For many years, we have been studying the adverse effects of natural toxins, such as cyanotoxins that are produced by cyanobacteria. These are ubiquitous microorganisms, which are due to the increased eutrophication of inland waters and global warming, increasingly occurring in aquatic environments in temperate climate. In collaboration with colleagues from the University of Debrecen, Hungary, we were the first to describe that microginins are genotoxic, which we published in the journal *Chemosphere* (https://doi.org/10.1016/j.chemosphere.2019.124880), while in collaboration with the University of Pablo de Olavide in Seville, Spain, we studied the combined effects of cylindrospermopsin and bisphenols and showed that pollutants induce combined toxic effects (*Toxins*, https://doi.org/10.3390/toxins12040219).

V okviru raziskav potencialnih škodljivih učinkov zdravil na vodno okolje smo nadaljevali z raziskavami inhibitorjev tirozinskih kinaz (TKI), njihovi ostanki se zaradi vse večje uporabe pojavljajo v vodnem okolju. V mednarodnem sodelovanju z Inštitutom za medicinske raziskave in medicino dela iz Zagreba, Hrvaška, in Univerzo Szent István iz Gödöllo, Madžarska, smo v študiji kronične izpostavljenosti rib cebric (*Danio rerio*) imatinib mesilatu (IM) pokazali, da le-ta pri koncentracijah pomembnih za vodno okolje ni vplival na živost rib in ni povzročil histopatoloških sprememb, medtem ko je analiza transkriptoma celotnega genoma pokazala, da IM lahko deluje kot motilec hormonov. To so povsem novi znanstveni izsledki, ki so objavljeni v reviji Chemosphere (https://doi.org/10.1016/j.chemosphere.2020.128097).

V okviru raziskav ARRS programa, projekta Eco-AlpsWater, evropske mreže DNAqaNet COST in pogodbe z Ministrstvom RS za Obrambo smo nadaljevali z raziskavami zgodnjega zaznavanja toksičnih cianobakterij na osnovi okoljske DNA (eDNA), katerih cilj je sistematično, podrobno in celovito ovrednotiti različne molekularne metode za zaznavanje potencialno strupenih cianobakterij v vodnih telesih. Pojav cianobakterij v vodah in z njimi povezano sproščanje toksinov v okolje namreč ogroža zdravje ljudi in živali, uničuje vodna okolja ter s tem povzroča tudi ekonomsko škodo. Naše preliminarne raziskave so pokazale, da z molekularnimi metodami v nekaterih vodnih telesih zaznamo toksigen cianobakterijski potencial, ki do sedaj s tradicionalnim biomonitoringom še ni bil zaznan. Izsledki so bili objavljeni v reviji Toxins (https://doi.org/10.3390/toxins13020133). Le z zgodnjo in specifično zaznavo te toksične grožnje lahko pristojne inštitucije dovolj hitro ukrepajo in tako zmanjšajo razsežnosti in negativne posledice tega pojava. Zgodnje odkrivanje nevarnih toksinov je nujno potrebno za upravljanje z vodami in z vidika gospodarstva tudi za turistična območja, npr. jezera, reke, jame.

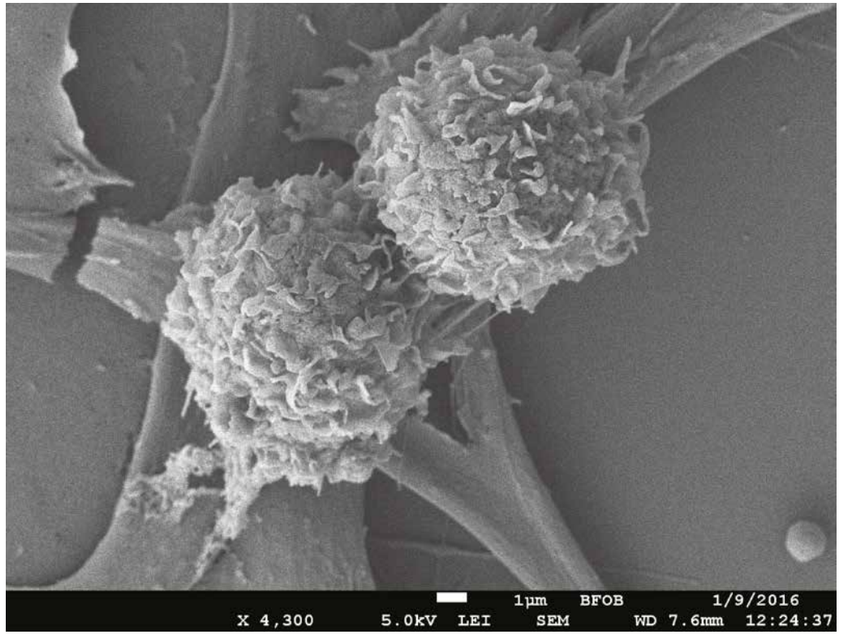
Naravne celice ubijalke (modra barva) ubijajo celice glioblastoma (zelene). Z rdečo barvo so prikazane mrtve celice.
Slika je posneta s konfokalnim mikroskopom (foto: GEN arhiv). Natural killer cells (in blue) killing glioblastoma cells (in green).
The red color indicates dead cells. The image was taken with a confocal microscope (Photo: GEN archive).

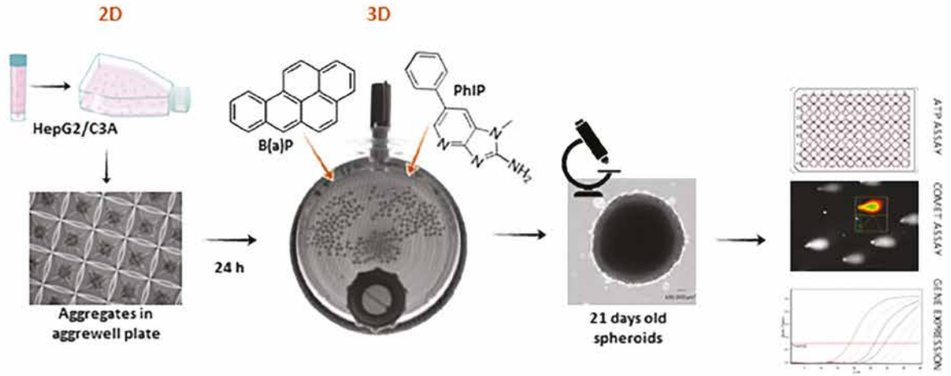


Within the framework of the research on potential adverse effects of drugs on aquatic environment, we continued to study the harmful effects of tyrosine kinase inhibitors (TKIs), the residues of which – due to their increasing use – occur in the aquatic environment. In the study of chronic exposure of zebrafish (*Danio rerio*) to imatinib mesylate (IM), we showed that IM in concentrations, relevant for the aquatic environment, did not affect the survival of fish and did not cause histopathological changes, while the whole genome transcriptome analysis showed that it could act as a hormone disruptor. This study was conducted within an international collaboration with the Institute for Medical Research and Occupational Health in Zagreb, Croatia and Szent István University in Gödöllo, Hungary and the entirely new scientific findings are published in the journal *Chemosphere* (https://doi.org/10.1016/j.chemosphere.2020.128097).

As part of the ARRS program research, the Eco-AlpsWater project, the European DNAqaNet network COST and the contract with the Ministry of Defense, we have continued research into the early detection of toxic cyanobacteria based on environmental DNA (eDNA), which aims to systematically evaluate in detail and comprehensively different molecular methods for detecting potentially toxic cyanobacteria in aquatic environments. The occurrence of cyanobacteria in water bodies and the associated release of toxins into the environment endangers human and animal health, destroys the aquatic environment and thus causes economic damage. Our preliminary investigations have shown that molecular methods can detect toxic cyanobacterial potential in some water bodies, which has not been detected by traditional biomonitoring so far. The results were published in the journal Toxins (https://doi.org/10.3390/toxins13020133). Only through early and specific detection of this toxic threat can the responsible institutions act quickly enough to reduce the extent and negative consequences of this phenomenon. Early detection of dangerous toxins is essential for water management and, from an economic point of view, also for tourist areas, e.g. lakes, rivers, caves.

Celice glioblastoma, posnete z elektonskim vrstičnim mikroskopom (foto: GEN arhiv).
Glioblastoma cells, photographed with a scanning electron microscope (Photo: GEN archive).





Potek priprave 3D kultur v dinamičnih pogojih in možnosti aplikacij (vir: GEN arhiv).
Preparing 3D cultures in dynamic conditions and possible applications (Source: GEN archive).

RAZISKAVE INICIACIJE IN RAZVOJA RAKA

Glioblastom (GBM) je najagresivnejši in najpogostejši možganski tumor, sedanji pristopi zdravljenja pa niso uspešni. Mikrookolje tumorjev, še posebej tkivne niše, kjer se nahajajo rakave matične celice, je izrednega pomena pri vzdrževanju malignosti teh celic, saj so izjemno odporne na terapijo in povzročijo ponovno razrast tumorja. Najnovejše ugotovitve o biologiji in zdravljenju GBM smo objavili v znanstveni reviji Biochimica et Biophysica Acta - Molecular Cell Research (https://doi.org/10.1016/j.bbamcr.2020.118782). Skupaj z raziskovalci iz Univerze v Amsterdamu smo dokazali, da se kemokin CXCL12 (SDF-1α) nahaja v tkivnih nišah GBM in je pomemben dejavnik pri privabljanju rakavih celic v nišo, saj poveča migracijo ter invazijo diferenciranih in rakavih matičnih celic (Biotechniques, https://doi.org/10.2144/btn-2020-0046). V seriji GBM vzorcev in GB celičnih linij smo z uporabo imunohistokemije glioblastoma identificirali kemokin CCL5 in njegov receptor CCR5 kot pomembni tarči pri invaziji rakavih celic (IJMS, https://doi.org/10.3390/ijms21124199). Nadaljevali smo z raziskavami na področju imunoterapije z naravnimi celicami ubijalkami (NK) v sodelovanju s prof. Anahid Jewett iz Univerze v Kaliforniji Los Angeles (UCLA). NK celice so namreč edine imunske celice, ki prepoznajo in ubijejo rakave matične celice in so tako zelo obetaven pristop za zdravljenje glioblastoma (Criticals Reviews in Immunology, DOI: 10.1615/CritRevImmunol.2020033391).

NOVE ALTERNATIVE ZA POSKUSE NA ŽIVALIH

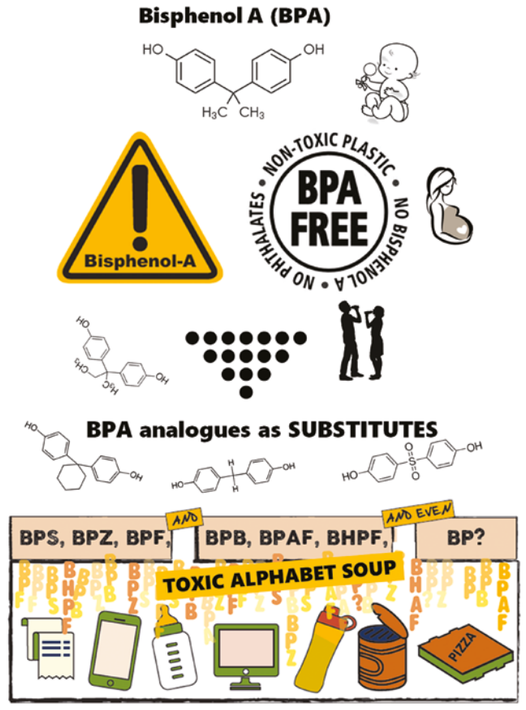
V okviru razvoja novih alternativnih *in vitro* testnih sistemov za nadomestitev laboratorijskih živali za preučevanje in testiranje genotoksičnosti spojin smo uspešno razvili napredni *in vitro* tridimenzionalni (3D) eksperimentalni model (tj. sferoide) s celicami človeškega hepatocelularnega karcinoma in pokazali, da imajo višjo presnovno aktivnost v primerjavi z dvodimenzionalnimi (2D) kulturami (Cells, https://doi.org/10.3390/cells9122557). Novo razviti *in vitro* 3D celični model smo nadalje uporabili za proučevanje mehanizmov škodljivega delovanja cianobakterijskega toksina, cilindrospermopsina (Environmental Pollution, https://doi.org/10.1016/j.envpol.2020.114965).

CANCER INITIATION AND DEVELOPMENT:

Glioblastoma (GBM) is the most aggressive and frequent brain tumor, however the current treatment protocols are not successful. The tumor microenvironment (TME), especially at the tissue niches where cancer stem cells are located, is of paramount importance in maintaining their malignancy, as these cells are extremely resistant to therapy and cause tumor regrowth. The latest findings on the biology and treatment of GBM have been published in the scientific journal *Biochimica et Biophysica Acta - Molecular Cell Research* (https://doi.org/10.1016/j.bbamcr.2020.118782). Together with researchers from the University of Amsterdam, we demonstrated that the chemokine CXCL12 (SDF-1α) is located in GBM tissue niches and is an important factor in attracting cancer cells to the niche as it increases migration and invasion of differentiated and cancerous stem cells (*Biotechniques*, https://doi.org/10.2144/btn-2020-0046). In a series of GBM samples and GB cell lines, using the immunohistochemistry method, we identified the chemokine CCL5 and its CCR5 receptor as important targets for cancer cell invasion (*IJMS*, https://doi.org/10.3390/ijms21124199). We continued with research in the field of immunotherapy with natural killer cells (NK) in collaboration with Prof. Anahid Jewett of the University of California Los Angeles (UCLA). Namely, NK cells are the only immune cells that recognize and kill cancer stem cells and are thus a very promising approach for the treatment of glioblastoma (*Criticals Reviews in Immunology*, DOI: 10.1615/CritRevImmunol.2020033391).

NEW ALTERNATIVES TO ANIMAL EXPERIMENTS:

Within the framework of the development of new alternative *in vitro* test systems for the replacement of laboratory animals for studying and testing the genotoxic activity of compounds, we have successfully developed an advanced *in vitro* three-dimensional (3D) experimental model (i.e. spheroids) with hepatocellular carcinoma cells and have demonstrated its higher metabolic activity compared to monolayer 2D cultures (*Cells*, https://doi.org/10.3390/cells9122557). The newly developed *in vitro* 3D cell model was further applied for studying the mechanisms of adverse effects of cyanobacterial toxin, cylindrospermopsin (*Environmental Pollution*, https://doi.org/10.1016/j.envpol.2020.114965).



Izpostavljenost različnih starostnih skupin razširjenemu bisfenolu A in njegovim analogom (vir: GEN arhiv). Exposure of different age groups to the ubiquitous bisphenol A and its analogues (Source: GEN archive).

GLAVNI PROJEKTI V LETU 2020

V letu 2020 smo pridobili dva ARRS projekta. Projekt Napredni 3D celični modeli: Premostitev vrzeli med *in vitro* in *in vivo* poskusnimi sistemi (hep3DGenTox) se osredotoča na razvoj novih *in vitro* 3D celičnih modelov, ki imajo izboljšane lastnosti v primerjavi s tradicionalnimi enoslojnimi *in vitro* celičnimi modeli. V okviru projekta Razkrivanje niše matičnih glioma celic v iskanju novih terapevtskih ciljev pri bolnikih z glioblastomom raziskujemo molekularne mehanizme vpliva mikrookolja in tkivnih niš na odpornost rakavih matičnih celic na terapijo in s tem iščemo inovativne pristope zdravljenja GBM.

Nadaljevali smo večji raziskovalni projekt Diagnostična platforma za precizno zdravljenje bolnikov z rakom s kanabinoidi z multinacionalnim biofarmacevtskim podjetjem MGC Pharmaceuticals Ltd. s sedežem v Avstraliji. Splošni cilj projekta je razvoj formulacij in določitev protokolov za zdravljenje možganskih tumorjev glioblastomov s kanabinoidi kot samostojno zdravljenje ali kot dodatna terapija *in vitro* s ciljem prenosa v klinično prakso.

Nadaljevali smo s projektom Interreg Alpski prostor (2018–2021) Eco-AlpsWater, ki na osnovi pilotnih vzorčnih mest in testiranja novih molekularnih orodij na osnovi eDNA vpeljuje inovativno oceno ekološkega stanja in strategijo upravljanja z vodami za varovanje ekosistemskih storitev v alpskih jezerih in rekah.

Uspešno smo pridobili mednarodni EU H2020-MSCA-RISE-2020 projekt z naslovom Nanomaterials for Enzymatic Control of Oxidative Stress Toxicity and Free Radical Generation (NESTOR).

Pri vzorčenju okoljske DNA za določanje vrst planktonskih organizmov v jezerih je potrebno vodo prefiltrirati čez sterilen filter s pomočjo siringe. S filtra lahko nato izoliramo DNA, ki jo uporabimo v nadaljnjih analizah (foto: M. Zupančič). When collecting environmental DNA to determine the species of planktonic organisms in lakes, the water must be filtered through a sterile filter using a syringe. The DNA can then be isolated from the filter and used for further analysis (Photo: M. Zupančič).

MAJOR PROJECTS IN 2020

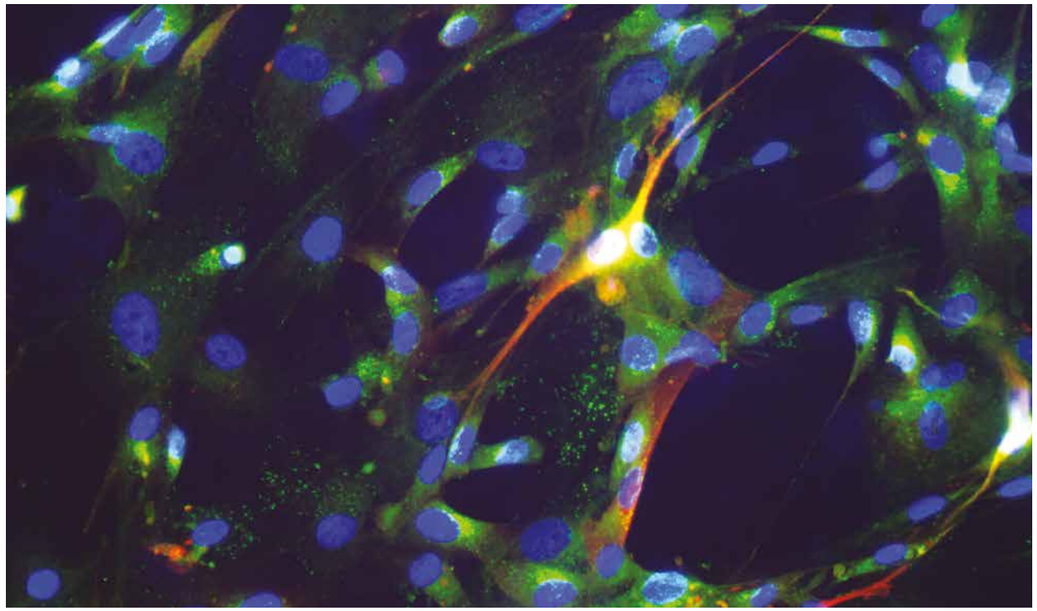
In 2020, we acquired two ARRS projects. The project "Advanced 3D cell models: Bridging the gap between in vitro and in vivo experimental systems (hep3DGenTox)" focuses on the development of new *in vitro* 3D cell models with improved hepatic properties compared to traditional *in vitro* 2D cell models. The project "Unravelling glioma stem cell niches for novel therapeutic targets in glioblastoma patients" investigates the molecular mechanisms of the influence of microenvironment and tissue niches on the resistance of cancer stem cells to therapy and thus seeks innovative approaches to GBM treatment.

We continued a major research project "Diagnostic platform for the precision cannabinoids treatment of cancer patients" with the multinational biopharmaceutical company MGC Pharmaceuticals Ltd., based in Australia. The overall goal of the project is to develop formulations and establish protocols for the treatment of glioblastoma brain tumors with cannabinoids as a stand-alone treatment or as adjunctive *in vitro* therapy with the aim of transfer to clinical practice.

We continued with the Interreg Alpine Space (2018–2021) Eco-AlpsWater project, which introduces an innovative ecological status assessment and water management strategy to protect ecosystem services in Alpine lakes and rivers, based on pilot sampling sites and testing of new molecular tools based on eDNA.

We have successfully acquired the international EU project H2020-MSCA-RISE-2020 entitled "Nanomaterials for enzymatic control of toxic oxidative stress and free radical formation (NESTOR)."

Kot odgovor na pomankanje osebne zaščitne opreme na začetku pandemije SARS-COV-2, smo vzpostavili testiranje zaščitnih mask in materialov na njihovo biološko združljivost - citotoksičnost in vitro v skladu z standardom ISO 10993-5. Slika prikazuje različne stopnje testiranja od priprave vzorcev do testiranja citotoksičnosti za modelne celice mišjih fibroblastov (L929) (foto: S. Žabkar in A. Štern).
In response to the general shortage of personal protective equipment at the beginning of the SARS-COV-2 pandemic, the testing of protective facemasks for their biocompatibility – cytotoxicity in vitro was established in accordance with the standard ISO 10993-5. The photo shows different phases of the testing procedure from sample preparation to the cytotoxicity testing in the model system – mouse fibroblast cell line L929 (Photo: S. Žabkar and A. Štern).



Imunsko barvanje celične kulture glioblastoma (foto: GEN arhiv).
Immunostaining of cell culture of glioblastoma (Photo: GEN archive).

BIBLIOGRAFIJA
BIBLIOGRAPHY

14	Izvirni znanstveni članek Original Scientific Article
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2	Polemika, diskusijski prispevek, komentar Polemic, Discussion, Commentary
4	Intervju Interview
2	Drugi sestavni deli Other Component Parts
1	Doktorska disertacija Doctoral Dissertation
1	Magistrsko delo Master's Thesis
3	Končno poročilo o rezultatih raziskav Final Research Report

5	Radijska ali televizijska oddaja Radio or Television Broadcast
2	Druge monografije in druga zaključena dela Other Monographs and Other Completed Works
3	Radijski ali TV dogodek Radio or Television Event
10	Uredništvo Editorship

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ODDELEK ZA RAZISKAVE ORGANIZMOV IN EKOSISTEMOV

DEPARTMENT OF ORGANISMS AND ECOSYSTEMS RESEARCH

Neokrnjeni naravni ekosistemi so naše bogastvo

Pristine Natural Ecosystems are our Asset

Travnik na Ljubljanskem barju. Krajinski park Ljubljansko Barje je bil eden od pilotnih območij projekta BID-REX (Interreg Europe 2016-2021). Cilj projekta je bil okrepiti povezave med relevantnimi podatki o biodiverziteti ter procesi odločanja na področju varstva narave (foto: Davorin Tome). Meadow on Ljubljansko Barje. Nature Park Ljubljansko Barje was one of the pilot areas included in the project BID-REX (Interreg Europe 2016-2021). The aim of the project was to enhance the link between relevant biodiversity data and conservation decision-making process (Photo: Davorin Tome).

VODJA: izr. prof. dr. Meta Virant-Doberlet
HEAD: Assoc. Prof. Dr. Meta Virant-Doberlet

Izr. prof. dr. Meta Virant-Doberlet, znanstvena svetnica, je vodja Oddelka za raziskave organizmov in ekosistemov, ki je bil ustanovljen leta 2016. Je ena od vodilnih svetovnih avtoritet na področju vibracijske komunikacije nevretenčarjev in njeno raziskovalno delo je usmerjeno na procese, ki so ključnega pomena ne-le za evolucijo vibracijske komunikacije temveč tudi za razumevanje splošnih osnovnih procesov sporazumevanja. Ima tudi pomembno vlogo pri razvoju in uporabi vibracijskih signalov kot novega, okolju prijaznega pristopa za nadzor žuželčjih škodljivcev. Kot priznanje za njene prelomne raziskave je prejela mednarodno nagrado 'Insect Drummer Lifetime Achievement Award' ter nagrado Miroslava Zeia za izjemne znanstvene dosežke na področju dejavnosti NIB.

Assoc. Prof. Dr Meta Virant-Doberlet, scientific councillor, is the Head of the Department of Organisms and Ecosystems Research, which has been established in 2016. She is a leading authority on arthropod vibrational communication and her research is focused on processes shaping not only the evolution of vibrational communication, but are also central to understanding the communication in general. She also played an important role in developing the exploitation of vibrational signals as a new, alternative, environmentally-friendly approach for managing insect pests. In recognition of her groundbreaking studies she has been awarded international 'Insect Drummer Lifetime Achievement Award' and the Miroslav Zei award for Exceptional Scientific Achievements within the fields of Research at NIB.

Zeleni travniški škržatek *Cicadella viridis* (Hemiptera: Cicadellidae) je pogosta vrsta travniških habitatov. Na Oddelku za raziskave organizmov in ekosistemov proučujemo vibracijsko komunikacijo te vrste (foto: Jernej Polajnar).
The green leafhopper *Cicadella viridis* (Hemiptera: Cicadellidae) is a common species found in grassland habitats. At the Department of Organisms and Ecosystems Research we study vibrational communication of this species (Photo: Jernej Polajnar).

KLJUČNE DEJAVNOSTI ODDELKA

Na Oddelku za raziskave organizmov in ekosistemov s temeljnimi in aplikativnimi raziskavami ustvarjamo vrhunsko znanje, potrebno za celostno razumevanje organizmov in njihove vloge v okolju – od nevronalnih mehanizmov zaznavanja okolja in komunikacije med celicami do evolucijskih procesov, ki so osnova biodiverziete ter interakcij v ekosistemih. Naše interdisciplinarno znanje in izkušnje uporabljamo za predloge učinkovitejših in bolj trajnostnih posegov v okolje.

Specifična področja raziskav so naslednja:

- biodiverziteta kopenskih in ekosistemov celinskih voda, vključno s podzemnimi ekosistemi;
- filogenija, taksonomija in biogeografija izbranih skupin pajkov in rakov;
- evolucija ekstremnih fenotipov;
- vibracijska komunikacija, v sklopu katere analiziramo naravno vibracijsko zvočno krajino, proučujemo komunikacijska omrežja, raziskujemo mehanizme produkcije vibracijskih signalov, analiziramo vedenjske odzive ter izvajamo nevrobiološke in ekofiziološke študije;
- vpliv podnebnih sprememb na biodiverziteto;
- prilagojenost izbranih vrst na spremembe dejavnikov v okolju na osnovi ekofizioloških študij;
- odnosi med tuje- in domorodnimi vrstami s podobnimi ekološkimi nišami;
- biologija in ekologija hroščev s seznama vrst evropskega varstvenega pomena;
- ekosistemske storitve, v sklopu katerih raziskujemo ekološke procese v vodonosnikih in ekologijo opraševanja s poudarkom na divjih opraševalcih;
- biofilmi celinskih voda in njihov odziv na podnebne spremembe in nova onesnažila (npr. mikroplastika);
- interakcije človeka z okoljem v travniškem in mestnem okolju;
- razvoj alternativnih pristopov za nadzor žuželčjih škodljivcev in monitoring ogroženih vrst.

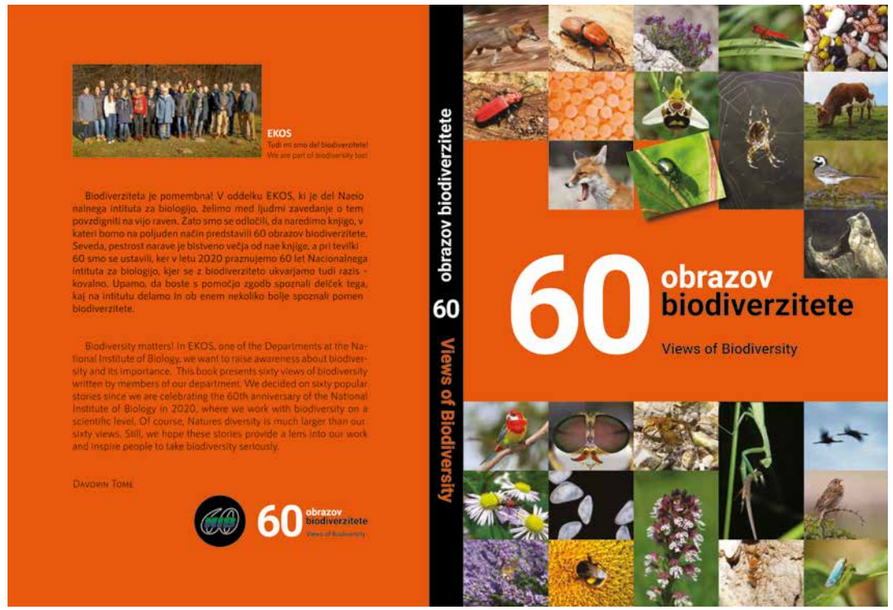
KEY ACTIVITIES OF THE DEPARTMENT:

Through basic and applied research, the Department of Organisms and Ecosystems Research creates top-level knowledge necessary for comprehensive understanding of organisms and their role in the environment – from neural mechanisms underlying perception of the environment and intercellular communication to evolutionary processes creating biological diversity and interactions in ecosystems. We use our interdisciplinary know-how to propose more effective and more sustainable nature conservation approaches.

Our specific areas of research include:

- biodiversity of terrestrial and freshwater ecosystems, including underground ecosystems;
- phylogeny, taxonomy and biogeography of selected groups of spiders and crustaceans;
- evolution of extreme phenotypes;
- vibrational communication, where we analyze the natural vibrational soundscape, study communication networks, explore the generation mechanisms of vibration signals, analyze behavioral responses and perform neurobiological and eco-physiological studies;
- effect of climate changes on biodiversity;
- adaptation of selected species to changes in environmental factors based on eco-physiological studies;
- relationships between non-native and indigenous species with similar ecological niches;
- biology and ecology of beetles from the Natura 2000 European list of species of European conservation importance;
- ecosystem services, in which we explore the processes in aquifers and the ecology of pollination with an emphasis on wild pollinators;
- freshwater biofilms and their response to climate change and newly emerging pollutants (i.e. microplastics);
- human interaction with the environment in grassland and urban environments;
- development of alternative approaches for the control of insect pests and monitoring of endangered species.

Preučevanje vplivov onesnaženja s plastiko na mikrobne združbe v rečnih sedimentov v Kamniški Bistrici (foto: Neja Medvešček).
Studying of the effects of plastic pollution on microbial communities in riverbed sediments in the river Kamniška Bistrica (Photo: Neja Medvešček).



V knjigi *60 obrazov biodiverzitete* smo zbrali 60 kratkih, poljudnih zgodb o naravi (vir: EKOS arhiv).
In the book '*60 Views of Biodiversity*' we collected 60 short stories from the natural world (Source: EKOS archive).

GLAVNI DOSEŽKI V LETU 2020

Izdali smo knjigo 60 obrazov biodiverzitete. V knjigi je zbranih 60 prispevkov sodelavcev Oddelka za raziskave in ekosistemov, v katerih smo na poljuden način predstavili tematike, s katerimi se srečujemo pri vsakodnevnem raziskovalnem delu. Kratki prispevki so napisani v slovenskem in angleškem jeziku. Uredniki knjige Davorin Tome, Nataša Mori in Al Vrezec so prejeli priznanje Prometej znanosti za odličnost v komuniciranju.

V okviru projekta NAT2CARE (Spodbujanje skupnosti za ohranjanje in obnavljanje čezmejnih območij Natura 2000, Interreg V-A Italija-Slovenija 2014–2020) smo izdali znanstveno monografijo z naslovom Čezmejni pristop k ohranjanju in upravljanju z območji Natura 2000 (urednica dr. Alenka Žunič Kosi). S publikacijo smo želeli predstaviti vzajemne čezmejne aktivnosti, ki smo jih izvajali tekom projekta za namen spremljanja stanja izbranih vrst in habitatnih tipov, kartiranja in vrednotenja ekosistemskih storitev ter ozaveščanja o pomenu ohranjanja biodiverzitete, saj vse to pomembno prispeva k učinkovitemu čezmejnemu upravljanju z območji Natura 2000.

V preglednem članku z naslovom Spolni velikostni dimorfizem: evolucija in nevarnosti ekstremnih fenotipov pri pajkih objavljenem v Annual Review of Entomology sta Kuntner in Coddington povzela znanje o ekstremnem spolnem velikostnem dimorfizmu (eSSD), ki je ena najbolj presenetljivih lastnosti organizmov. Med kopenskimi živalmi je SSD najbolj skrajno izražen pri nekaterih vrstah pajkov, znanih po samicah velikankah. Avtorja podajata kritičen pregled med seboj konfliktnih empiričnih rezultatov, ki nakazujejo na aberantne evolucijske vzorce pri pajkih ter raziščeta vzroke za pomanjkanje konsenza o splošni razlagi evolucije eSSD. Trdita, da te zapletene vzorce lahko razloži le spolno specifična kombinacija selekcijskih pritiskov. Zato predlagata ravnotežni model, ki vključuje kladno in kontekstno specifiko gonilnikov velikostne variacije obeh spolov. Pregledni članek torej povzame teoretsko ozadje za razumevanje nastanka in evolucijskega vzdrževanje spolno specifičnih lastnosti organizmov.

Samica rogača (*Lucanus cervus*). Rogač je vrsta, ki je v skladu z evropsko Direktivo o habitatih vključena v redni letni monitoring hroščev evropskega varstvenega pomena, ki ga NIB izvaja za Ministrstvo za okolje in prostor (foto: Al Vrezec).
Female stag beetle (*Lucanus cervus*). This species is listed in the European Habitat Directive and is included into regular monitoring of species of European conservation concern conducted by NIB for the Ministry of the Environment and Spatial Planning (Photo: Al Vrezec).

MAJOR ACHIEVEMENTS IN 2020

In the book "60 Views of Biodiversity" we collected 60 contributions of the members of the Department of Organisms and Ecosystems Research. Short contributions written in a rather informal way in Slovene and English are aimed at sharing the knowledge we have obtained through regular daily research. The Editors Davorin Tome, Nataša Mori and Al Vrezec received the Prometheus of Science Award for excellence in communication.

Within the framework of the NAT2CARE project (Mobilization of citizenship for the recovery and the conservation of the N2K transboundary areas, Interreg V-A Italy-Slovenia 2014–2020) we published a scientific monograph '*Transboundary Approach to Conservation and Management of Natura 2000 Sites*' (Editor Dr. Alenka Žunič Kosi). With this publication, we aimed to present the main transboundary activities we carried out during the project to monitor the status of selected species and habitat types, to map and assess ecosystem services, and to raise awareness of the importance of biodiversity conservation, all of which contribute significantly to the effective management of Natura 2000 sites across borders.

In the article entitled "Sexual Size Dimorphism: Evolution and Perils of Extreme Phenotypes in Spiders" published in *Annual Review of Entomology*, Kuntner and Coddington review the knowledge of extreme sexual size dimorphism (eSSD), representing one of the most striking, but least expected organismal traits. Among terrestrial animals, it is the most extreme in certain spider lineages that are known for giant females. The authors provide a critical review of the conflicting empirical results of published studies that indicate aberrant evolutionary trends in spiders, and explore why the literature does not converge on an overall explanation for eSSD. They argue that the complicated evolutionary patterns can only be explained by a sexually specific combination of selection pressures. They propose an equilibrium model featuring clade- and context specific drivers of gender size variation. This review therefore recaps the theoretical background important for understanding of the origins and evolutionary maintenance of sexually specific organismal traits.

V letu 2020 smo ogrožena vrsta postali ljudje, ostala biodiverziteta pa se za to ni zmenila (foto: Enej Vrezec).
In 2020 humans became endangered species, while the rest of biodiversity was indifferent (Photo: Enej Vrezec).

Negativni vplivi antropizacije in podnebnih sprememb na otoške kuščarje so slabo poznani. V naši raziskavi objavljeni v reviji Science of the Total Environment smo po okoljskem gradientu analizirali tri kazalnike zdravja/stresa pri endemičnih kuščarjih na otoku Tenerife. Kortikosteron in hematični paraziti so se pri kuščarjih spreminjali vzporedno s podnebnimi razmerami in človekovim razvojem v okolju. Njihovo zdravstveno stanje je najbolj izpostavljeno pod izredno sušnim in vročimi razmerami in v bolj antropoziranih okoljih, kar nam omogoča predvidevanje kaskadnih učinkov, ki jih lahko imajo podnebne spremembe in človekov vpliv na degradacijo naravnega okolja.

Članek, ki smo ga objavlili v reviji Global Change Biology, je nastal v širokem italijansko-slovensko-avstrijskem alpskem konzorciju s povezovanjem obstoječih podatkov in ekspertiz o ekologiji in razširjenosti treh vrst sov, kokonogega čuka *(Aegolius funereus)*, lesne sove *(Strix aluco)* in kozače *(Strix uralensis)*, ter črne žolne *(Dryocopus martius)*, z namenom napovedovanja sprememb strukture in razširjenosti tega ekološkega ceha v alpskem prostoru v prihodnosti pod vplivom podnebnih sprememb. Osnova za študijo so bile predhodne raziskave na NIB, ki so pokazale na močne interakcije med sobivajočimi plenilskimi sovami, ki določajo, katera vrsta bo kje obstala in katera ne. Upoštevaje te izsledke smo z naprednim modeliranjem potencialne razširjenosti vrst glede na predvidene podnebne scenarije, ki so vključevali medvrstne interakcije, pokazali na širjenje obeh večji sov rodu *Strix* v alpskem prostoru in na krčenje areala klimatsko in kompeticijsko najbolj občutljive vrste v cehu, kokonogega čuka, pri čemer bomo priča lokalnim izumrtjem, tudi v Sloveniji. Članek je pokazal na pomembne potencialne spremembe v prekrivanju območij razširjenosti vrst, s čimer se bodo interakcije med vrstami še intenzivirale, kar kaže na pomen vključevanja biotskih interakcij v napovedne modele podnebnih sprememb za povečanje natančnosti napovedi.

Skupna kmetijska politika EU (SKP) je za zmanjšanje vplivov kmetijstva na okolje določila niz habitatnih in krajinskih značilnosti, tako imenovanih površin z ekološkim pomenom (PEP). V sodelovanju s strokovnjaki za opraševalce iz 18 različnih evropskih držav smo pregledali PEP, da bi ugotovili, kako dobro podpirajo opraševalce. Čeprav je za PEP namenjenih relativno veliko sredstev, raziskava objavljena v reviji Journal of Applied Ecology kaže, da opraševalcem ne zagotavljajo vseh virov, ki jih potrebujejo. Da bi ohranili opraševalce, naša raziskava poudarja potrebo po ustvarjanju različnih medsebojno povezanih in dobro upravljanih habitatov, ki se med seboj dopolnjujejo v virih, ki jih ponujajo.

Progasti gož (*Elaphe quatuorlineata*) je redka in ogrožena vrsta. Je naša največja kača, vendar je s terenskimi popisi zelo težko zaznavna. Proučevali smo jo na območju Slovenske Istre, v okviru večletnega naravovarstvenega projekta LIFE Integrirani projekt za okrepljeno upravljanje Nature 2000 v Sloveniji, v katerem kot partner sodeluje tudi NIB (foto: Davorin Tome).
The four-lined snake (*Elaphe quatuorlineata*) is a rare and endangered species. Although it is our largest snake, it is difficult to spot during field inventories. In Slovenian Istria, we studied it as part of the multi-year nature conservation project "*LIFE Integrated Project for Enhanced Management of Natura 2000 in Slovenia*". NIB is one of the project partners (Photo: Davorin Tome).

The negative impact of anthropization on insular lizards is scarcely known. In our study published in *Science of the Total Environment* we analyzed three health / stress indicators along an environmental gradient in an endemic lizard species on Tenerife island. Corticosterone and hematic parasites co-vary with human development and climate. The health status of lizards is most at risk under extreme hot temperatures and xeric (very dry) habitats with high anthropization levels. We showed that monitoring lizard populations on islands may allow anticipating cascading effects of human pressure and climate change on insular populations of lizards.

The article, published in the journal *Global Change Biology*, was prepared in a broad Italian-Slovenian-Austrian consortium by pooling existing data and expertise on the ecology and distribution of three owl species: Boreal *(Aegolius funereus)*, Tawny *(Strix aluco)* and Ural Owl *(Strix uralensis)*, as well as Black Woodpecker *(Dryocopus martius)*, in order to predict changes in the structure and distribution of this ecological guild in the Alpine region in the future under the influence of climate changes. The study builds on previous research at NIB, which showed strong interactions between coexisting predatory owls that determine which species stay where and which not. Taking into account these findings, we showed the spread of the two large owls of the genus *Strix* in the Alpine region and the range contraction of the most climatically and competitively sensitive species of the guild, the Boreal Owl, in the Alpine region, which may lead to local extinction events, also in Slovenia. The article pointed to important potential changes in species range overlap that further increase species interactions, suggesting the importance of including biotic interactions in climate change prediction models to increase forecast accuracy.

With the aim of decreasing the environmental impact of agriculture, the EU Common Agricultural Policy (CAP) defined a set of habitat and landscape features (Ecological Focus Areas: EFAs). Together with pollinator experts from 18 different countries we checked EFAs to determine how well they support insect pollinators. Despite significant investment in EFAs, the study published in Journal of Applied Ecology found they are failing to provide all the resources that insect pollinators require. To conserve pollinators, our expert elicitation highlights the need to create a variety of interconnected, well-managed habitats that complement each other in the resources they offer.

Svetli zemeljski čmrlji (*Bombus lucorum*). Na NIB raziskujemo pomen divjih opraševalcev za kmetijstvo (foto: Danilo Bevk).
White-tailed bumblebee (*Bombus lucorum*). At NIB, we are studying the importance of wild pollinators for agriculture (Photo: Danilo Bevk).

BIBLIOGRAFIJA
BIBLIOGRAPHY

28	Izvirni znanstveni članek Original Scientific Article
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8	Drugi sestavni deli Other Component Parts
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2	Slovar, enciklopedija, leksikon, priročnik, atlas, zemljevid Dictionary, Encyclopaedia, Lexicon, Manual, Atlas, Map
1	Magistrsko delo Master's Thesis
8	Končno poročilo o rezultatih raziskav Final Research Report
4	Elaborat, predštudija, študija Treatise, Preliminary Study, Study
8	Radijska ali televizijska oddaja Radio or Television Broadcast
8	Druge monografije in druga zaključena dela Other Monographs and Other Completed Works
3	Radijski ali TV dogodek Radio or Television Event
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Aparatura za pomnoževanje DNA v realnem času (Thermo Fisher QuantStudio 3) (foto: NIB arhiv).
Real-time PCR instrument (Thermo Fisher QuantStudio 3) (Photo: NIB archive).

VODJA: izr. prof. dr. Maruša Pompe Novak
HEAD: Assoc. Prof. Dr. Maruša Pompe Novak

Infrastrukturni center NIB (IC NIB) sestavljata dva programsko in organizacijsko zaključena centra: Infrastrukturni center Planta (IC Planta), ki deluje pod okriljem Oddelka za biotehnologijo in sistemsko biologijo, in Infrastrukturni center MBP (IC MBP) na Morski biološki postaji Piran (MBP). IC NIB sofinancira Agencija za raziskovalno dejavnost RS prek infrastrukturnega programa NIB (IP NIB), v katerega je bilo leta 2020 poleg IC Planta in IC MBP vključeno tudi Slovensko vozlišče evropske infrastrukture za sistemsko biologijo (ISBE.SI). Vsak del IC NIB ponuja uporabo opreme ter storitve javnemu in zasebnemu sektorju.

The NIB Infrastructural Centre (IC NIB) consists of two distinct centers in terms of programs and organization: Infrastructural Centre Planta (IC Planta), which is part of the Department of Biotechnology and Systems Biology, and Infrastructural Centre MBP (IC MBP) as part of Marine Biology Station Piran (MBS). The IC NIB is co-financed by the Slovenian Research Agency through the NIB Infrastructural Program (IP NIB), which in 2020 also included the Slovenian Node of Infrastructure for Systems Biology Europe (ISBE.SI) in addition to IC Planta and the IC MBP. Each part of the IC NIB offers services and equipment to the public and private sector.

Aparatura za digitalni PCR (Biorad QXone) (foto: NIB arhiv).

Veliko infrastrukturno opremo IC Planta so v letu 2020 sestavljali:

- presevni elektronski mikroskop (Talos L120C),
- presevni elektronski mikroskop (Philips CM100) s CCD-kamerama (Gatan Orius SC200 in Gatan BioScan 792), ki je v solastništvu Nacionalnega inštituta za biologijo (NIB) in Oddelka za biologijo Biotehniške fakultete (BF) Univerze v Ljubljani (UL),
- konfokalni stereomikroskop (Leica TCS LSI),
- aparature za PCR v realnem času (ABI 7900HT Fast, Roche Light Cycler 480, ABI PRISM ViiA7 in ABI QuantStudio7),
- aparature za digitalni PCR (Biorad QX100, Biorad QX200, Biorad QXone in Fluidigm BioMark HD),
- robot za pipetiranje (Hamilton Microlab STARlet),
- sistem za hitro pripravo in koncentriranje bioloških vzorcev z možnostjo bioloških analiz na gojiščih,
- komore za gojenje rastlin in tkivnih kultur (Kambič),
- komore za ločeno gojenje rastlin (Kambič) ter
- dva karantenska rastlinjaka.

Poleg tega je mogoča tudi uporaba:

- spektrofluorometrov (SynergyMx, BioTek) in
- sistema za identifikacijo bakterij z analizo celičnih maščobnih kislin s plinsko kromatografijo (Sherlock Microbial Identification System), ki je trenutno lociran na Biotehniški fakulteti (BF) Univerze v Ljubljani (UL).

Veliko infrastrukturno opremo IC MBP so v letu 2020 sestavljali:

- raziskovalno plovilo Sagita s sodobno navigacijsko in raziskovalno opremo, različnimi vzorčevalniki, akustičnim tokomerom in sodobno multiparametrično sondo,
- oceanografska boja Vida z meteorološkimi merilnimi instrumenti, multiparametričnimi sondami in akustičnim tokomerom,
- manjše plovilo Carolina,
- visokofrekvenčni radar Wera,
- Vrstični elektronski mikroskop – SEM (Tescan MIRA LMU) in
- aparatura za pomnoževanje DNA v realnem času (Thermo Fisher QuantiStudio 3).

Aparatura za kromatografijo (CytivaLifesciences AKTA Pure 25M) (foto: NIB arhiv).

In 2020, the large infrastructural equipment of IC Planta consisted of:

- transmission electron microscope (TEM) (Talos L120C);
- transmission electron microscope (TEM) (Philips CM100) with two CCD cameras (Gatan Orius SC200 and Gatan BioScan 792), co-owned by NIB and the Department of Biology at the Biotechnical Faculty of the University of Ljubljana;
- confocal stereomicroscope (Leica TCS LSI);
- Real-time PCR instruments (ABI 7900HT Fast, Roche Light Cycler 480, ABI PRISM ViiA7 and ABI QuantStudio7);
- digital PCR instruments (Biorad QX100, Biorad QX200, Biorad QXone and Fluidigm BioMark HD);
- robot for pipetting (Hamilton Microlab STARlet);
- system for rapid preparation and concentration of biological samples with the possibility of biological analysis on the media;
- growth chambers for plant and tissue culture breeding (Kambič);
- plant growth chambers for separate breeding (Kambič);
- two quarantine greenhouses.

Additionally, it is possible to use:

- Spectrofluorimeters (SynergyMx, BioTek) and
- the system for the identification of microorganisms using fatty acid methyl ester analysis with gas chromatography (Sherlock Microbial Identification System) that is at the moment located at the Biotechnical Faculty of the University of Ljubljana.

In 2020, the large infrastructural equipment of the IC MBP consisted of:

- Sagita research vessel with modern navigation and research equipment, various samplers, an acoustic current meter and a modern multiparametric CTD probe;
- Vida oceanographic buoy with meteorological measuring instruments, multiparametric CTD probes and an acoustic current meter;
- a small Carolina vessel;
- Wera high-frequency radar;
- Scanning electron microscope - SEM (Tescan MIRA LMU)
- Real-time PCR instrument (Thermo Fisher QuantStudio3)

Avtomatiziran sistem za avtoklaviranje in razlivanje gojišč (Mediaclave 10) (foto: NIB arhiv).
Automated media preparation system (Mediaclave 10) (Photo: NIB Archive).

IC Planta je podpora raziskovalni dejavnosti, ministrstvom, inšpektoratom in drugim državnim organom, podjetjem in pedagoški dejavnosti. Vsa velika infrastrukturna oprema IC Planta je tehnološko izjemno zahtevna ter skrbno, redno in strokovno vzdrževana. Veliko infrastrukturno opremo IC Planta uporabljajo tudi uporabniki iz drugih organizacij. Za pogoste uporabnike so organizirani tečaji za uporabo opreme, mogoča pa je tudi uporaba opreme v obliki storitev in naročil analiz.

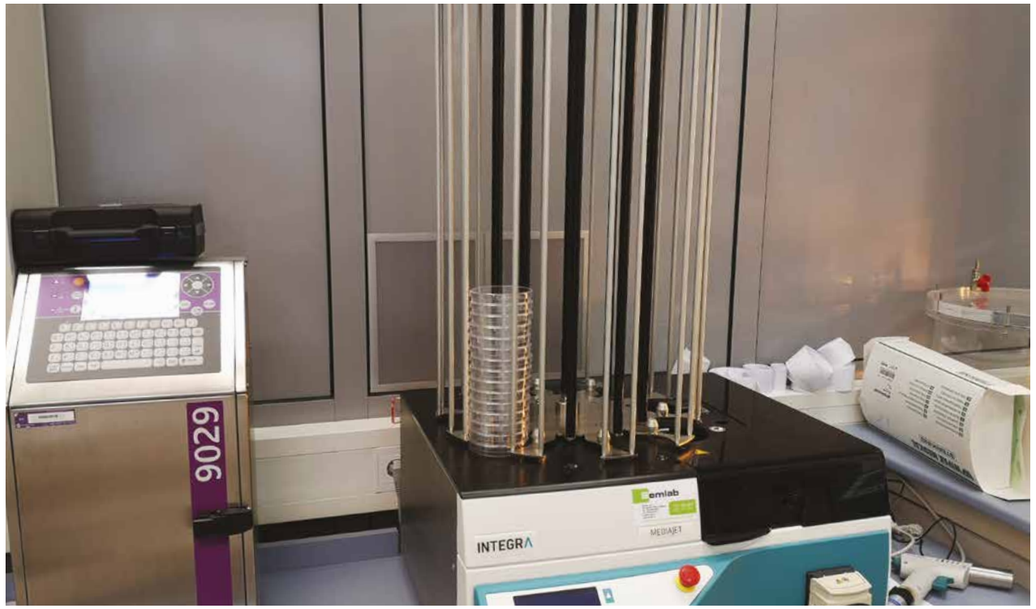
IC MBP je podpora raziskovalni in aplikativni dejavnosti za ministrstva in druge državne organe ter pedagoškim dejavnostim MBP. Tehnološko napredna oprema omogoča najsodobnejše raziskave na morju in uvršča IC MBP med vodilne raziskovalne centre na območju Sredozemlja. MBP je tudi Nacionalni podatkovni center za morske podatke (NODC). Infrastruktura IC MBP zagotavlja visoko kakovost podatkov o stanju na morju, ki so na voljo v skoraj realnem času.

V letu 2020 je veliko infrastrukturno opremo IP NIB uporabljalo kar 128 različnih uporabnikov, s čimer je IP NIB uspel ohraniti in celo povečati izjemno veliko število uporabnikov svoje velike infrastrukturne opreme.

Tematike raziskav in analiz, za katere se je uporabljala velika infrastrukturna oprema IC NIB, so bile izjemno raznovrstne. Tako veliko število uporabnikov in raznovrstnost tematik kaže na izjemen pomen vsebine IP NIB za slovenski prostor, in sicer na zelo raznovrstnih področjih raziskovalnega dela ter aplikacij pri delu za podjetja, državne in vladne organe in resorje ter za pedagoško delo.

Velik prispevek IP NIB k izkoriščenosti infrastrukturne opreme se kaže tudi skozi podatek, da je v letu 2020 25 % uporabnikov IP NIB prihajalo iz drugih RO.

IC NIB svojo veliko infrastrukturno opremo redno dopolnjuje in posodablja. V letu 2020 je IC Planta svojo opremo dopolnil z novo avtomatizirano aparaturo za kapljični digitalni PCR (Biorad QX one), ki je avtomatiziran sistem za pripravo, izvedbo in analizo večtarčne kapljične digitalne verižne reakcije s polimerazo (ddPCR), saj v eni aparaturi združuje celoten potek ddPCR: generiranje kapljic, verižno reakcijo s polimerazo, odčitavanje kapljic in analizo z ustrezno programsko opremo. Aparatura vzorec razdeli na 20.000 kapljic, v katerih potečejo ločene PCR reakcije. Rezultate nato analizira po digitalnem principu, in sicer v štirih valovnih dolžinah, kar omogoča izvedbo analize v najmanj štiritarčnem načinu, lahko pa



Avtomatiziran sistem za avtoklaviranje in razlivanje gojišč (Mediajet vario) (foto: NIB arhiv).
Automated media preparation system (Mediajet vario) (Photo: NIB Archive).

IC Planta supports research activities, ministries, inspection and other state bodies, enterprises and educational activities. All IC Planta's large infrastructural equipment is technologically highly advanced and carefully, regularly and professionally maintained. IC Planta's large equipment is also used by other organizations. Training courses in equipment use are organized for frequent users, but it is also possible to use the equipment on a service-based system or for individual analysis orders.

The IC MBP supports research and applied activities for ministries and other state bodies as well as educational activities carried out at the MBS. The technologically advanced equipment enables state-of-the-art research at sea and places IC MBS among the leading centers in the Mediterranean. The MBS serves as the National Oceanographic Data Centre (NODC). The IC MBS's infrastructure ensures high-quality data on sea conditions that is available in near real-time.

In 2020, the IP NIB's large infrastructural equipment had 128 distinct users, with which the IP NIB achieved to preserve and even enlarge the extremely high number of users of its large infrastructural equipment.

The subjects of research and analyses carried out by the IC NIB's large infrastructural equipment were extremely diverse. The large number of users and the diversity of subjects demonstrate the exceptional significance of IP NIB-based content for Slovenia in a wide variety of research fields and applications for business companies, state and government bodies, line ministries and for educational work.

The IP NIB's large contribution to the utilization of the infrastructural equipment is reflected in the fact that in 2020, 25% of IP NIB users came from other research organizations.

The IC NIB regularly supplements and updates its large infrastructural equipment. In 2020, IC Planta supplemented its equipment with a new Automated Droplet Digital™ PCR System (Biorad QXone). The QXone™ Droplet Digital™ PCR System (Biorad QXone) is an automated system for preparation, execution and analyses of multi target digital droplet polymerase chain reaction, as it integrates a standard ddPCR workflow of droplet generation, thermal cycling, droplet reading, and analysis into a hands-free precision platform. A sample is divided into 20,000 droplets in which PCR reactions are performed

tudi do osemtarčnem načinu. Zaradi velikega števila neodvisnih kvalitativnih PCR se lahko rezultat uporabi za absolutno kvantifikacijo brez uporabe natančno karakteriziranih referenčnih materialov.

Poleg tega je IC Planta v letu 2020 svojo opremo dopolnil tudi s sistemom za hitro pripravo in koncentriranje bioloških vzorcev z možnostjo bioloških analiz na gojiščih. Sistem je sestavljen iz aparature za kromatografijo (CytivaLifesciences AKTA Pure 25M) ter avtomatiziranega sistema za avtoklaviranje in razlivanje gojišč (Integra Mediaclave 10 in Mediajet vario). Aparatura za kromatografijo (CytivaLifesciences AKTA Pure 25M) je fleksibilen in intuitiven kromatografski sistem za hitro purifikacijo proteinov, nukleinskih kislin in virusov na nivoju mikrogramov ali desetin gramov tarčnega produkta. Avtomatiziran sistem za avtoklaviranje in razlivanje gojišč (Integra Mediaclave 10 in Mediajet vario) omogoča hitrejšo, učinkovitejšo in bolj standardizirano pripravo različnih gojišč. Sistem omogoča popoln nadzor nad celotnim postopkom in možnost prilagajanja parametrov potrebam in specifikam posameznega medija. Povezava obeh sistemov omogoča kontinuiran proces priprave in biološke analize vzorcev ter s tem hitrejšo, učinkovitejšo in bolj standardizirano pripravo bioloških vzorcev ter izvedbo bioloških eksperimentov na gojiščih, kar omogoča izvajanje zahtevnih in občutljivih eksperimentov. Tako sistem predstavlja osnovno in ključno opremo pri vseh raziskavah mikroorganizmov, kot so proučevanje antibiotične rezistence, biološke raziskave patogenih in drugih mikroorganizmov, izolacija miroorganizmov iz naravnih virov, določanje bakterijskih povzročiteljev bolezni, razvoju uporaba bakteriofagov za nadzor nad mikroorganizmi, delo s tkivnimi kulturami rastlin ter preverjanje učinkovitosti inaktivacije mikroorganizmov.

IC MBP je v letu 2020 pridobil vrstični elektronski mikroskop (Tescan Mira LMU), aparaturo za pomnoževanje DNA v realnem času (qPCR) (Thermo Fisher QuantiStudio 3) in hlajeno centrifugo, ki so bili nabavljeni v sklopu projekta RI-SI-2 LifeWatch Razvoj raziskovalne infrastrukture za mednarodno konkurenčnost slovenskega RRI prostora, ki sta ga financirala Ministrstvo za izobraževanje, znanost in šport in EU Evropski sklad za regionalni razvoj. Nabavljena oprema predstavlja velik preboj in napredek za nadaljevanje raziskav obalnega morja. Vrstični elektronski mikroskop bo omogočil zelo natančno opazovanje in prepoznavanje morfoloških znakov mikroorganizmov in drugih organizmov z namenom pravilne identifikacije vrst in sprememb površinskih struktur organizmov. Pri tem bo v pomoč tudi način korelacijske mikroskopije, ki je integriran v glavno programsko opremo vrstičnega elektronskega mikroskopa. Aparatura qPCR je namenjena za pomnoževanje nukleinskih kislin v različnih bioloških vzorcih, za zelo občutljivo kvantifikacijo nukleinskih kislin v realnem času, kar omogoča različne aplikacije, kot je detekcija specifičnih delov nukleinskih kislin z vnaprej določenimi začetnimi oligonukleotidi, kvantifikacijo izražanja genov itd. Z integracijo nove infrastrukture v naše raziskave bo omogočeno tudi boljše razumevanje vpliva klimatskih sprememb in antropogenih vplivov na morski ekosistem.

Poleg tega je IC MBP v letu 2020 zagotovil redni servis raziskovalnega plovila PI-800 in je z rednim vzdrževanjem zagotovil nemoteno delovanje oceanografske boje Vida. Po remontu boje leta 2019 se je ob menjavi strojne in programske opreme spremenil tudi format podatkov. Zato je bila potrebna nadgradnja obstoječega nadzornega sistema in zbiranja podatkov (SCADA). S tem smo omogočili konstanten nadzor in upravljanje delovanja inštrumentov in energetskega stanja.

IP NIB je tudi v letu 2020 zagotavljal sodelovanje med raziskovalci različnih raziskovalnih programov, projektov in institucij ter tudi povezovanje raziskovalcev z uporabniki raziskav iz vrst drugih proračunskih uporabnikov in industrije ter stik s pedagoškim procesom. IP NIB je v letu 2020 prav tako pomenil osnovo za sodelovanje pri evropskih in drugih mednarodnih projektih. Z moderno in dobro vzdrževano (v skladu z ISO 17025) raziskovalno opremo IP NIB so se izvajali tudi projekti, katerih naročniki so bila podjetja, ki pričakujejo dokazila o nadzoru kakovosti za izvajanje storitev. Oprema IC NIB je bila tudi podpora tehnološkemu razvoju in razvoju metod ter izvajanju specializiranih analiz.

separately. The results are analyzed in a digital mode at four wavelengths, which allows analyses of up to four or even eight targets simultaneously. Due to the high number of independent qPCR reactions, the system enables absolute quantification of nucleic acids without precisely characterized reference materials.

Besides, IC Planta supplemented its equipment in 2020 also with a System for rapid preparation and concentration of biological samples with the possibility of biological analysis on the media. The system is composed of a Chromatographic instrument (CytivaLifesciences Akta Pure 25M) and a media preparation system (Integra Mediaclave 10 and Mediajet vario). The chromatograpy instrument (CytivaLifesciences Akta Pure 25M) is a flexible and intuitive chromatography system for the rapid purification of proteins, nucleic acids and viruses at the level of micrograms or tens of grams of the target product. The media preparation system (Integra Mediaclave 10 and Mediajet vario) enables more rapid, efficient and standardized preparation of various culture media that allows complete control over the entire process and the possibility of adjusting the parameters to the needs and specifics of a particular medium. The integration of both parts of the system enables a continues process of preparation and biological analyses of samples and therefore faster, more efficient and more standardized preparation of biological samples combined with biological experiments on the media, which enables the performance of difficult and sensitive experiments. The system thus represents basic and key equipment in all research of microorganisms, such as the study of antibiotic resistance, biological research of pathogens and other microorganisms, isolation of microorganisms from natural sources, detection of bacterial pathogens, development of the use of bacteriophages for the control of microorganisms, working with plant tissue cultures and verifying the effectiveness of inactivation of microorganisms.

In 2020, IC MBS acquired a scanning electron microscope (Tescan Mira LMU), a real-time DNA amplification device (qPCR) (Thermo Fisher QuantiStudio 3) and a cold centrifuge, which was purchased as part of the RI-SI-2 LifeWatch project “Development of research infrastructure for the international competitiveness of the Slovenian RDI area”, financed by the Ministry of Education, Science and Sport and the European Regional Development Fund. The purchased equipment represents a major breakthrough and progress for further research of the coastal sea. The scanning electron microscope will enable very accurate observation and recognition of morphological signs of microorganisms and other organisms with the aim of correct identification of species in the altered surface structure of organisms. The correlation microscopy method, is integrated in the main program of a certain type of electron microscope, will also help. The qPCR device is intended for nucleic acid amplification in various biological samples, for very sensitive real-time quantification of nucleic acids, allowing various applications such as detection of specific nucleic acid moieties with predetermined starting oligonucleotides, quantification of gene expression, etc. The integration of new infrastructure into our research will also provide a better understanding of climate change impacts and anthropogenic impacts on the marine ecosystem.

In addition, in 2020, the IC MBP provided regular service to the research vessel PI-800 and, through regular maintenance, ensured smooth operation of the Vida oceanographic buoy. After the overhaul of the buoy in 2019, the format of the data also changed when the hardware and software were changed. Therefore, it was necessary to upgrade the existing Supervisory Control And Data Acquisition (SCADA) system. This enabled constant monitoring and management of instrument operation and energy status.

In 2020, the IP NIB continued to ensure cooperation among the researchers of various research programs, projects and institutions as well as the networking of researchers with the research users from among other budget users and the industry, and contact with the educational process. The IP NIB continued to serve as the basis for cooperation in European and other international projects in 2020. The modern and well-maintained (pursuant to ISO 17025) IP NIB research equipment was also used to carry out other projects for companies that need evidence of quality control for the provision of their services. The IC NIB equipment also served as support for technological development, the development of methods and the performance of specialized analyses.

Obeležili smo 100-letnico obstoja Biološke knjižnice (foto: Barbara Černač).
Celebrating the 100th anniversary of the Biology Library (Photo: Barbara Černač).

OSEBJE
STAFF

VODJA
HEAD
Černač, Barbara

SODELAVCI
STAFF
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Writzl, Petra, Biološka knjižnica - Ljubljana
Gračner, Tadej, Biološka knjižnica – Morska biološka postaja Piran

V razmerah epidemije COVID-19 smo uporabnikom omogočili brezstično vračilo gradiva v namenski predalnik, ki je na voljo ves čas odprtosti stavbe (foto: Barbara Černač). Under the conditions of the COVID -19 epidemic, we introduced contactless borrowing and returning of materials in the drawer, available during building's opening hours (Photo: Barbara Černač).

Biološka knjižnica je specialna in visokošolska javno dostopna knjižnica. Delujemo v okviru Nacionalnega inštituta za biologijo in Oddelka za biologijo Biotehniške fakultete Univerze v Ljubljani ter se kot podporna in servisna služba vključujemo v raziskovalne, razvojne in pedagoške dejavnosti obeh ustanov. Naša knjižnična zbirka obsega 79.500 znanstvenih knjig, znanstvenih revij, zaključnih del študija... Naši tipični uporabniki so raziskovalci, univerzitetni predavatelji in študentje s področja biologije in sorodnih ved. Na voljo pa smo tudi najširši javnosti (raziskovalcem in študentom drugih ved...). Delujemo na dveh lokacijah: v Biološkem središču v Ljubljani in na Morski biološki postaji Piran.

V letu 2020 smo obeležili 100 obletnico obstoja, saj začetki Biološke knjižnice segajo v leto 1920, ko se je kmalu po ustanovitvi Zoološkega inštituta Filozofske fakultete ljubljanske Univerze tam začelo sistematično zbiranje znanstvene literature. Ta literatura je še danes del naše knjižnične zbirke. Žal nam je epidemija COVID-19 preprečila načrtovano razstavo dragocenih knjig iz naše zbirke, smo pa ustvarili priložnostni in trajni logotip knjižnice ter izdali priložnostni promocijski material, ki smo ga razširili med naše uporabnike.

V razmerah epidemije COVID-19 smo prilagodili delovanje: vse storitve smo izvajali nemoteno, kljub temu, da je vsak dan vsaj del osebja delal od doma. Uvedli smo dodatno vodenje dokumentacije in evidenc v e-obliki, individualno usposabljanje uporabnikov po spletnih videokonferenčnih platformah, brezstično izposojo in vračilo gradiva itd.

STORITVE:

- **hranjenje, vzdrževanje in dopolnjevanje knjižnične zbirke;**
- **zagotavljanje spletnega dostopa do e-revij, e-knjig in baz podatkov**: dogovori in sodelovanje z nabavnimi konzorciji, tehnično urejanje dostopov, oddaljeni dostop do e-virov;
- **vzdrževanje in dopolnjevanje knjižničnega kataloga** v sistemu COBISS;
- **izposoja** gradiva notranjim in zunanjim uporabnikom, sprejemanje rezervacij in naročil gradiva (tudi preko spletne storitve Moja knjižnica);
- **medknjižnična izposoja**: dobava gradiva iz knjižnic v Sloveniji in tujini;
- **pomoč in informacijska podpora** našim uporabnikom;
- **informacijske storitve**: izdelovanje analiz, statistik in letnih poročil za oceno raziskovalne uspešnosti;
- **referenčne storitve**: iskanje literature v sistemu COBISS in drugih katalogih, v bazah podatkov, e-revijah, repozitorijih ...;
- **bibliografije raziskovalcev in ocenjevanje raziskovalne uspešnosti**: izdelovanje bibliografij raziskovalcev v sistemu COBISS in sodelovanje pri vrednotenju raziskovalne uspešnosti v sistemu SICRIS za zaposlene v obeh matičnih ustanovah;
- **izobraževanje uporabnikov** o uporabi storitev knjižnice in v samostojnem iskanju informacij po naši knjižnični zbirki in elektronskih informacijskih virih;
- **tehnični pregled oblike zaključnih del študentov** Oddelka za biologijo Bioteniške fakultete Univerze v Ljubljani in **pregled nalog s protiplagiatorskim programom** Turnitin;
- **tehnični pregled znanstvenih knjig** v pripravi za objavo;
- **svetovanje kandidatom za izvolitve v habilitacijskih postopkih** in tehnični pregledi njihovih vlog;
- **svetovanje avtorjem pri izboru revije ali založbe za objavo,** preverjanje potencialno predatorskih revij ini založb;
- **svetovanje avtorjem pri objavljanju v odprtem dostopu**: pri odločitvi za zeleno ali zlato odprto objavo, preverjanje politik založnikov, zniževanje stroškov APC ...;
- **vnosi objav v polnem besedilu v repozitorij Nacionalnega inštituta za biologijo (DiRROS) in Repozitorij Univerze v Ljubljani (RUL)** ob spoštovanju avtorskega prava in zahtev založnikov;
- **izmenjava revij** za Acta Biologica Slovenica (nekdanji Biološki vestnik) in Natura Sloveniae s številnimi slovenskimi in tujimi partnerskimi ustanovami;
- **vzdrževnje spletnega mesta in Facebook profila** za več informacij o Biološki knjižnici in aktualnem dogajanju v slovenski biologiji;
- **čitalnica**: 67 mest za tihi študij;
- **dostop do računalnikov, možnost povezave v brezžično omrežje** (Eduroam).

The Biology Library is special (research) and academic library. We work for National Institute of Biology and Department of Biology, Biotechnical Faculty, University of Ljubljana like the support service. In this way the Library participates in all the functions, research and educational processes of both institutions. The Library holds 79.500 scientific books, journasl, theses... Our tipical users are researchers, profesors and students from the field of biology and related scientific fields. But we are also open to wide public (researchers and students from other scientific fields...). The Library spreads out in two locations: in Ljubljana, The Biology Centre Building and in Piran, The Marine Biology Station.

In 2020 we celebrated our 100th anniversary, as the beginnings of Biological Library date back to 1920, when soon after the establishment of Zoological Institute of the Faculty of Philosophy at the Ljubljana University, a systematic collection of scientific literature began there. This literature is still part of our library collection today. Unfortunately, the COVID -19 epidemic prevented us from planning an exhibition of valuable books from our collection, but we created occasional and permanent library logos and occasionally issued promotional materials which we distributed among our users.

Under the conditions of the COVID -19 epidemic, we adjusted our work: all services were provided smoothly, although at least some of the staff worked from home every day. We introduced additional management of documentation and records in e-form, individual training of users via online video-conferencing platforms, contactless borrowing and returning of materials, etc.

SERVICES

- **keeping, maintaing and building up library collection**
- **online access to e-journals, e-books and databases**: arrangements, cooperation and participation in library purchasing consortia, online access setting, remote access to e-resources
- **library catalogue in the COBISS system keeping**
- **lending documents** to internal and external users, reserving, ordering library materials (also via the online service "My Library")
- **interlibrary lending**: ordering and access to literature from Slovenian and foreign libraries
- **helpdesk**: collection and distribution of information to our users
- **information service**: making analyses, statistics and annual reports for the evaluation of scientific efficiency
- **reference service**: literature search in Cobiss and other catalogues, databases, e-journals, repositories, etc
- **researchers' bibliography and evaluation of scientific efficiency**: keeping the bibliography of publications in the Cobiss system and evaluation of scientific efficiency in the Sicris system for all researchers employed with the National Institute of Biology and the Department of Biology
- **training users to use library services** and to independently search for information in our library collection and electronic information sources
- **technical review and examination with Turnitin (Academic Plagiarism Detector)** of master's theses and dissertations, written by the students of the Department of Biology at the University of Ljubljana's Biotechnical Faculty
- **technical reviewing of scientific books** in the publishing process
- **advising candidates in habilitation procedures** and technical review of their applications
- **advising authors on selecting journals or publishers for their publication**, screening for potentially predatory journals and publishers
- **advising authors on publishing in open access**: green or gold open access, reviewing publishers' policies, reducing APC costs, etc
- **entering full-text publications into the repository** of the National Institute of Biology (DiRROS) and the Repository of the University of Ljubljana (RUL), taking into account copyrights and publishing agreements
- **journal exchange** for our journals Acta Biologica Slovenica (formerly Biološki vestnik) and Natura Sloveniae with a number of exchange partners in Slovenia and abroad
- **library website and Facebook profile** for more information about the Biology Library and the latest news about Slovenian biology
- **reading room** – 67 places for silent study
- **access to computers, wireless network connection** (Eduroam)

IZBRANA BIBLIOGRAFIJA
SELECTED BIBLIOGRAPHY

MORSKA BIOLOŠKA POSTAJA PIRAN
MARINE BIOLOGY STATION PIRAN

IZVIRNI ZNANSTVENI ČLANEK
ORIGINAL SCIENTIFIC ARTICLE

1. BANCHI, Elisa, AMETRANO, Claudio Gennaro, GRECO, Samuele, STANKOVIĆ, David, MUGGIA, Lucia, PALLAVICINI, Alberto. PLANiTS: a curated sequence reference dataset for plant ITS DNA metabarcoding. *Database*, ISSN 1758-0463, 2020, vol. 2020, str. 1-9, doi: 10.1093/database/baz155. [COBISS.SI-ID 5310287]
2. BANCHI, Elisa, AMETRANO, Claudio Gennaro, TORDONI, Enrico, STANKOVIĆ, David, ONGARO, Silvia, TRETIACH, Mauro, PALLAVICINI, Alberto, MUGGIA, Lucia, VERARDO, Pierluigi (sodelavec pri raziskavi), TASSAN, Francesca (sodelavec pri raziskavi), TROBIANI, Nadia (sodelavec pri raziskavi), MORETTI, Olga (sodelavec pri raziskavi), BORNEY, Maria Francesca (sodelavec pri raziskavi), LAZZARIN, Stefania (sodelavec pri raziskavi). Environmental DNA assessment of airborne plant and fungal seasonal diversity. *Science of the total environment*, ISSN 0048-9697, 10 Oct. 2020, vol. 738, 140249, str. 1-14, ilustr., doi: 10.1016/j.scitotenv.2020.140249. [COBISS.SI-ID 23552771]
3. BARICHE, Michel, AL-MABRUK, Sara A. A., ATEŞ, Maria A., BÜYÜK, Adnan, CROCETTA, Fabio, DRITSAS, Michail, EDDE, Diala, FORTIČ, Ana, LIPEJ, Lovrenc, et al. New alien Mediterranean biodiversity records 2020. *Mediterranean Marine Science*, 2020, vol. 21, no. 1, str. 129-145, ilustr. https://ejournals.epublishing.ekt.gr/index.php/hcmr-med-mar-sc/article/view/21987. [COBISS.SI-ID 40618757]
4. BARTH, Alexander, ALVERA-AZCÁRATE, Aida, LIČER, Matjaž, BECKERS, Jean-Marie. DINCAE 1.0: a convolutional neural network with error estimates to reconstruct sea surface temperature satellite observations. *Geoscientific model development*, ISSN 1991-959X, 2020, vol. 13, iss. 3, str. 1609-1622, ilustr., doi: 10.5194/gmd-13-1609-2020. [COBISS.SI-ID 13432835]
5. BERTO, Daniela, FORMALEWICZ, Margherita Malgorzata, GIORGI, Giordano, RAMPAZZO, Federico, GION, Claudia, TRABUCCO, Benedetta, GIANI, Michele, LIPIZER, Marina, MATIJEVIĆ, Slavica, KABERI, Helen, ZERI, Christina, BAJT, Oliver, MIKAC, Nevenka, JOKSIMOVIĆ, Danijela, ARAVANTINOU, Andriana, POJE, Mateja, CARA, Magdalena, MANFRA, Loredana. Challenges in harmonized assessment of heavy metals in the Adriatic and Ionian Seas. *Frontiers in marine science*, ISSN 2296-7745, 4 Sep. 2020, vol. 7, article 717, str. 1-11, ilustr., doi: 10.3389/fmars.2020.00717. [COBISS.SI-ID 27704323]
6. BETTOSO, Nicola, FARESI, Lisa, FELLUGA, Alessandro, LIPEJ, Lovrenc. On the occurrence of the wreckfish Polyprion americanus in the Gulf of Trieste (northern Adriatic Sea). *Acta Adriatica*, ISSN 0001-5113, 2020, 61, 1, str. 107-112, ilustr., doi: 10.32582/aa.61.1.9. [COBISS.SI-ID 23378179]
7. BONANNO, Giuseppe, ORLANDO-BONACA, Martina. Marine plastics: what risks and policies exist for seagrass ecosystems in the Plasticene?. *Marine pollution bulletin*, ISSN 0025-326X, Sep. 2020, vol. 158, [article] 111425, str. 1-7, ilustr., doi: 10.1016/j.marpolbul.2020.111425. [COBISS.SI-ID 22207491]
8. BONANNO, Giuseppe, VENEZIANO, Vincenzo, ORLANDO-BONACA, Martina. Comparative assessment of trace element accumulation and biomonitoring in seaweed Ulva lactuca and seagrass Posidonia oceanica. *Science of the total environment*, ISSN 0048-9697, 2020, vol. 718, str. 1-10., doi: 10.1016/j.scitotenv.2020.137413. [COBISS.SI-ID 5317455]
9. BONANNO, Giuseppe, VENEZIANO, Vincenzo, RACCUIA, Salvatore Antonino, ORLANDO-BONACA, Martina. Seagrass Cymodocea nodosa and seaweed Ulva lactuca as tools for trace element biomonitoring: a comparative study. *Marine pollution bulletin*, ISSN 0025-326X, Dec. 2020, vol. 161, 111743, str. 1-12, ilustr., doi: 10.1016/j.marpolbul.2020.111743. [COBISS.SI-ID 33651459]
10. BOŠKOVIĆ, Neda, JOKSIMOVIĆ, Danijela, PEKOVIĆ, Milica, BAJT, Oliver. Microplastics in sediments from the coastal area of the Boka Kotorska Bay on the Montenegrin coast. *Studia marina*, ISSN 0585-5349, 2020, vol. 33, no. 1, str. 18-25, ilustr. http://www.studiamarina.ac.me/. [COBISS.SI-ID 27020547]
11. CHERIF, El Khalil, VODOPIVEC, Martin, MEJJAD, Nezha, ESTEVES DA SILVA, Joaquim C.G, SIMONOVIČ, Simona, BOULAASSAL, Hakim. COVID-19 pandemic consequences on coastal water quality using WST Sentinel-3 Data: case of Tangier, Morocco. *Water*, ISSN 2073-4441, 2020, 12, 9, str. 1-18, ilustr., doi: 10.3390/w12092638. [COBISS.SI-ID 31856131]
12. FERRARIN, Christian, VALENTINI, Andrea, VODOPIVEC, Martin, KLARIC, Dijana, MASSARO, Giovanni, BAJO, Marco, DE PASCALIS, Francesca, FADINI, Amedeo, GHEZZO, Michol, MENEGON, Stefano, BRESSAN, Lidia, UNGUENDOLI, Silvia, FETTICH, Anja, JERMAN, Jure, LIČER, Matjaž, FUSTAR, Lidija, PAPA, Alvise, CARRARO, Enrico. Integrated sea storm management strategy: the 29 October 2018 event in the Adriatic Sea. *Natural hazards and earth system sciences*, ISSN 1561-8633, 2020, vol. 20, iss. 1, str. 73-93, doi: 10.5194/nhess-20-73-2020. [COBISS.SI-ID 5301327]
13. GEROVASILEIOU, Vasilis, AKYOL, Okan, AL-HOSNE, Zinah, ALSHIKH RASHEED, Reem, ATAÇ, Eylül, BELLO, Giambattista, ĆETKOVIĆ, Ilija, CORSINI-FOKA, Maria, CROCETTA, Fabio, DENITTO, Francesco, GUIDETTI, Paolo, GÜL, Benal, INSACCO, Gianni, LIPEJ, Lovrenc, TRKOV, Domen, et al. New records of rare species in the Mediterranean Sea (May 2020). *Mediterranean Marine Science*, 2020, vol. 21, iss. 2, str. 340-359, ilustr. https://ejournals.epublishing.ekt.gr/index.php/hcmr-med-mar-sc/article/view/22148/19595. [COBISS.SI-ID 17656067]
14. GREGO, Mateja, MALEJ, Alenka, DE TROCH, Marleen. The depleted carbon isotopic signature of nematodes and harpacticoids and their place in carbon processing in fish farm sediments. *Frontiers in marine science*, ISSN 2296-7745, Jul. 2020, vol. 7, article 572, str. 1-15, ilustr., doi: 10.3389/fmars.2020.00572. [COBISS.SI-ID 24147971]
15. KATSANEVAKIS, Stelios, POURSANIDIS, Dimitris, TRKOV, Domen, LIPEJ, Lovrenc, FORTIČ, Ana, ORLANDO-BONACA, Martina, MAVRIČ, Borut, et al. Unpublished Mediterranean records of marine alien and cryptogenic species. *BioInvasions Records*, ISSN 2242-1300, 2020, vol. 9, iss. 2, str. 165-182, ilustr., doi: 10.3391/bir.2020.9.2.01. [COBISS.SI-ID 13678595]
16. KOVAČIĆ, Marcelo, LIPEJ, Lovrenc, DULČIĆ, Jakov. Evidence approach to checklists: critical revision of the checklist of the Adriatic Sea fishes. *Zootaxa*, ISSN 1175-5326, 2020, vol. 4767, no. 1, str. 1-55, ilustr., doi: 10.11646/zootaxa.4767.1.1. [COBISS.SI-ID 14230019]
17. LIČER, Matjaž, ESTIVAL, Solène, REYES-SUAREZ, Catalina, DEPONTE, Davide, FETTICH, Anja. Lagrangian modelling of a person lost at sea during the Adriatic scirocco storm of 29 October 2018. *Natural hazards and earth system sciences*, ISSN 1561-8633, 2020, vol. 20, iss. 8, str. 2335-2349, ilustr., doi: 10.5194/nhess-20-2335-2020. [COBISS.SI-ID 27506435]
18. LIPEJ, Lovrenc, FRANCÉ, Janja, TRKOV, Domen, MAVRIČ, Borut, BOLJE, Aleš. The occurrence and status of tresher shark (Alopias vulpinus) in waters of Slovenia = Presenza e stato dello squalo volpe (Alopias vulpinus) in acque al largo della Slovenia. *Annales: anali za istrske in mediteranske študije, Series historia naturalis*, ISSN 1408-533X. [Tiskana izd.], 2020, letn. 30, št. 2, str. 165-174, ilustr. https://zdjp.si/wp-content/uploads/2021/01/ASHN_30-2020-2_LIPEJ.pdf. [COBISS.SI-ID 46202371]
19. MANFRA, Loredana, VIRNO LAMBERTI, Claudia, CERACCHI, Silvia, GIORGI, Giordano, BERTO, Daniela, LIPIZER, Marina, GIANI, Michele, BAJT, Oliver, FAFAŊDEL, Maja, CARA, Magdalena, MATIJEVIĆ, Slavica, MITRIĆ, Milena, PAPAZISIMOU, Stefanos, POJE, Mateja, ZERI, Christina, TRABUCCO, Benedetta. Challenges in harmonized environmental impact assessment (EIA), monitoring and decommissioning procedures of offshore platforms in Adriatic-Ionian (ADRION) region. *Water*, ISSN 2073-4441, 2020, vol. 12, iss. 9, str. 1-14, ilustr., doi: 10.3390/w12092460. [COBISS.SI-ID 27552003]
20. MATJAŠIČ, Tjaša, DREO, Tanja, SAMARDŽIJA, Zoran, BAJT, Oliver, KANDUČ, Tjaša, SIMČIČ, Tatjana, MORI, Nataša. Preliminary experiments into colonization of microorganisms from activated sludge on different types of plastics = Preliminarni poskusi kolonizacije različnih tipov plastike z mikroorganizmi iz aktivnega blata. *Acta biologica slovenica: ABS*, ISSN 1408-3671. [Tiskana izd.], 2020, vol. 63, no. 1, str. 45-61, ilustr. [COBISS.SI-ID 26885379]
21. MOLINA JACK, Maria-Eugenia, BAKIU, Rigers, CASTELLI, Ana, ĆERMELJ, Branko, FAFAŊDEL, Maja, GEORGOPOULOU, Christina, GIORGI, Giordano, IONA, Athanassia, IVANKOVIC, Damir, KRALJ, Martina, PARTESCANO, Elena, ROTINI, Alice, VELIKONJA, Melita, LIPIZER, Marina. Heavy metals in the Adriatic-Ionian Seas: a case study to illustrate the challenges in data management when dealing with regional datasets. *Frontiers in marine science*, ISSN 2296-7745, Sep. 2020, vol. 7, article 571365, str. 1-9, ilustr., doi: 10.3389/fmars.2020.571365. [COBISS.SI-ID 34221059]
22. OBST, Matthias, EXTER, Katrina, ALLCOCK, A. Louise, ARVANITIDIS, Christos, AXBERG, Alizz, BUSTAMANTE, Maria, FORTIČ, Ana, MAVRIČ, Borut, RAMŠAK, Andreja, et al. A marine biodiversity observation network for genetic monitoring of hard-bottom communities (ARMS-MBON). *Frontiers in marine science*, ISSN 2296-7745, Nov. 2020, vol. 7, str. 1-9, ilustr., doi: 10.3389/fmars.2020.572680. [COBISS.SI-ID 40033027]
23. ORLANDO-BONACA, Martina, TRKOV, Domen. After more than forty-five years a new finding of Cystoseira foeniculacea f. latiramosa in the coastal sea of Slovenia = Dopo oltre 45 anni un nuovo ritrovamento di Cystoseira foeniculacea f. latiramosa nelle acque costiere della Slovenia. *Annales: anali za istrske in mediteranske študije, Series historia naturalis*, ISSN 1408-533X. [Tiskana izd.], 2020, letn. 30, št. 2, str. 233-238, ilustr. https://zdjp.si/p/annalesshn/. [COBISS.SI-ID 44355587]
24. PAVONI, Elena, CROSERA, Matteo, PETRANICH, Elisa, ADAMI, Gianpiero, FAGANELI, Jadran, COVELLI, Stefano. Partitioning and mixing behaviour of trace elements at the Isonzo/Soča River mouth (Gulf of Trieste, northern Adriatic Sea). *Marine Chemistry*, ISSN 0304-4203. [Print ed.], 20 Jun. 2020, vol. 223, 103800, str. 1-14, ilustr., doi: 10.1016/j.marchem.2020.103800. [COBISS.SI-ID 14224899]
25. PAVONI, Elena, CROSERA, Matteo, PETRANICH, Elisa, OLIVERI, Paolo, KLUN, Katja, FAGANELI, Jadran, COVELLI, Stefano, ADAMI, Gianpiero. Trace elements in the estuarine systems of the Gulf of Trieste (northern Adriatic Sea): a chemometric approach to depict partitioning and behaviour of particulate, colloidal and truly dissolved fractions. *Chemosphere*, ISSN 0045-6535. [Print ed.], Aug. 2020, vol. 252, article 126517, str. 1-11, ilustr, doi: 10.1016/j.chemosphere.2020.126517. [COBISS.SI-ID 40664069]
26. RAGKOUSIS, Michail, ABDELALI, Nardjes, AZZURRO, Ernesto, BADREDDINE, Ali, BARICHE, Michel, BITAR, Ghazi, CROCETTA, Fabio, DENITTO, Francesco, FORTIČ, Ana, MAVRIČ, Borut, et al. New alien Mediterranean biodiversity records (October 2020). *Mediterranean Marine Science*, 2020, vol. 21, no. 3, str. 631-652, ilustr., doi: 10.12681/mms.23673. [COBISS.SI-ID 36777731]
27. ROTTER, Ana, BACU, Ariola, BARBIER, Michèle, BERTONI, Francesco, BONES, Atle M., CANCELA, M. Leonor, CARLSSON, Jens, CARVALHO, Maria F., CEGŁOWSKA, Marta, DALAY, Meltem Conk, SABOTIČ, Jerica, et al. A new network for the advancement of marine biotechnology in Europe and beyond. *Frontiers in marine science*, ISSN 2296-7745, May 2020, vol. 7, article 278, str. 1-9, ilustr., doi: 10.3389/fmars.2020.00278. [COBISS.SI-ID 16264707]
28. ROTTER, Ana, KLUN, Katja, FRANCÉ, Janja, MOZETIČ, Patricija, ORLANDO-BONACA, Martina. Non-indigenous species in the Mediterranean Sea: turning from pest to source by developing the 8Rs model, a new paradigm in pollution mitigation. *Frontiers in marine science*, ISSN 2296-7745, 24 Mar. 2020, vol. 7, article 178, str. 1-16, ilustr., doi: 10.3389/fmars.2020.00178. [COBISS.SI-ID 40492293]
29. RUBINO, Angelo, GAČIĆ, Miroslav, BENSI, Manuel, KOVACEVIC, Vedrana, MALAČIČ, Vlado, MENNA, Milena, NEGRETTI, Maria Eletta, SOMMERIA, Joel, ZANCHETTIN, Davide, BARRETO, Ricardo V., URSELLA, Laura, CARDIN, Vanessa, CIVITARESE, Giuseppe, ORLIĆ, Mirko, PETELIN, Boris, SIENA, Giuseppe. Experimental evidence of long-term oceanic circulation reversals without wind influence in the North Ionian Sea. *Scientific reports*, ISSN 2045-2322, 2020, vol. 10, str. 1-9., doi: 10.1038/s41598-020-57862-6. [COBISS.SI-ID 5309519]
30. SCHROEDER, Anna, STANKOVIĆ, David, PALLAVICINI, Alberto, GIONECHETTI, Fabrizia, PANSERA, Marco, CAMATTI, Elisa. DNA metabarcoding and morphological analysis - assessment of zooplankton biodiversity in transitional waters. *Marine environmental research*, ISSN 0141-1136. [Print ed.], Sep. 2020, vol. 160, [article] 104946, str. 1-15, ilustr., doi: 10.1016/j.marenvres.2020.104946. [COBISS.SI-ID 16269571]
31. TINTA, Tinkara, ZHAO, Zihao, ESCOBAR, Alvaro, KLUN, Katja, BAYER, Barbara, AMANO, Chie, BAMONTI, Luca, HERNDL, Gerhard J. Microbial processing of jellyfish detritus in the ocean. *Frontiers in microbiology*, ISSN 1664-302X, 2020, vol. 11, str. 1-18, ilustr., doi: 10.3389/fmicb.2020.590995. [COBISS.SI-ID 32282883]

32. TURK DERMASTIA, Timotej, CERINO, Federica, STANKOVIĆ, David, FRANCÉ, Janja, RAMŠAK, Andreja, TUŠEK-ŽNIDARIČ, Magda, BERAN, Alfred, NATALI, Vanessa, CABRINI, Marina, MOZETIČ, Patricija. Ecological time series and integrative taxonomy unveil seasonality and diversity of the toxic diatom Pseudo-nitzschia H. Peragallo in the northern Adriatic Sea. *Harmful algae*, ISSN 1568-9883, Mar. 2020, vol. 93, 101773, str. 1-20, ilustr., doi: 10.1016/j.hal.2020.101773. [COBISS.SI-ID 40469253]

33. ZAVRTANIK, Vitjan, VODOPIVEC, Martin, KRISTAN, Matej. A segmentation-based approach for polyp counting in the wild. *Engineering applications of artificial intelligence*, ISSN 0952-1976. [Print ed.], 2020, vol. 88, str. 1-9, ilustr., doi: 10.1016/j.engappai.2019.103399. [COBISS.SI-ID 5238607]

PREGLEDNI ZNANSTVENI ČLANEK
REVIEW ARTICLE

34. BARRECA, Marilia, SPANÒ, Virginia, MONTALBANO, Alessandra, CUETO, Mercedes, DÍAZ MARRERO, Ana R., DENIZ, Irem, ERDOĞAN, Ayşegül, LUKIĆ-BILELA, Lada, ROTTER, Ana, et al. Marine anticancer agents: an overview with a particular focus on their chemical classes. *Marine drugs*, ISSN 1660-3397, Dec. 2020, vol. 18, no. 12, str. [1-28]., doi: 10.3390/md18120619. [COBISS.SI-ID 41150723]

35. EMADODIN, Iraj, REINSCH, Thorsten, ROTTER, Ana, ORLANDO-BONACA, Martina, TAUBE, Friedhelm, JAVIDPOUR, Jamileh. A perspective on the potential of using marine organic fertilizers for the sustainable management of coastal ecosystem services. *Environmental sustainability*, ISSN 2523-8922, 2020, vol. 3, iss. 1, str. 105-115., doi: 10.1007/s42398-020-00097-y. [COBISS.SI-ID 5311567]

36. FREEMAN, Shirra, BOOTH, Andy M., SABBAH, Isam, TILLER, Rachel, DIERKING, Jan, KLUN, Katja, ROTTER, Ana, BEN DAVID, Eric, JAVIDPOUR, Jamileh, ANGEL, Dror. Between source and sea: the role of wastewater treatment in reducing marine microplastics. *Journal of environmental management*, ISSN 0301-4797, 15 Jul. 2020, vol. 266, 110642, str. 1-11, ilustr., doi: 10.1016/j.jenvman.2020.110642. [COBISS.SI-ID 14020867]

37. OLIVEIRA, Juliana, BELCHIOR, Afonso, DA SILVA, Verônica D., ROTTER, Ana, PETROVSKI, Željko, ALMEIDA, Pedro L., LOURENÇO, Nídia D., GAUDÊNCIO, Susana P. Marine environmental plastic pollution: mitigation by microorganism degradation and recycling valorization. *Frontiers in marine science*, ISSN 2296-7745, Dec. 2020, vol. 7, article 567126, str. 1-35, ilustr. https://www.frontiersin.org/articles/10.3389/fmars.2020.567126/full. [COBISS.SI-ID 43591171]

KRATKI ZNANSTVENI PRISPEVEK
SHORT SCIENTIFIC ARTICLE

38. JOVANOVIĆ, Milica, MAČIĆ, Vesna, TRKOV, Domen, ORLANDO-BONACA, Martina, LIPEJ, Lovrenc. First records of five opisthobranch mollusc species (Gastropoda: Heterobranchia) from South Adriatic Waters, Montenegro. *Acta zoologica bulgarica*, ISSN 0324-0770, 2020, 72, 3, str. 491-494, ilustr. http://www.acta-zoologica-bulgarica.eu/002355. [COBISS.SI-ID 30256131]

39. PITACCO, Valentina. First record of the echiurid Maxmuelleria gigas (M. Müller, 1852) in Slovenian waters: (Northern Adriatic) = Prima segnalazione dell'echiuride Maxmuelleria gigas (M. Müller, 1852) nelle acque slovene (Nord Adriatico). *Annales: anali za istrske in mediteranske študije, Series historia naturalis*, ISSN 2591-1783. [Spletna izd.], 2020, 30, 2, str. 239-242, ilustr. https://zdjp.si/wp-content/uploads/2021/01/ASHN_30-2020-2_PITACCO.pdf [COBISS.SI-ID 51354371]

OBJAVLJENI ZNANSTVENI PRISPEVEK NA KONFERENCI
PUBLISHED SCIENTIFIC CONFERENCE CONTRIBUTION

40. BAJT, Oliver. Aliphatic and polycyclic aromatic hydrocarbons in mussels (mytilus galloprovincialis) from the gulf of Trieste (Northern Adriatic) - the impact of maritime traffic. V: ZANNE, Marina (ur.), BAJEC, Patricija (ur.), TWRDY, Elen (ur.). *ICTS 2020: 19. mednarodno posvetovanje o prometni znanosti = 19th International Conference on Transport Science: pomorstvo, promet in logistika = maritime, transport and logistics: zbornik referatov = conference proceedings: 17.-18. September 2020, Portoroz, Slovenia*. Elektronska izd. Portorož: Fakulteta za pomorstvo in promet = Portoroz: Faculty of Maritime Studies and Transport. 2020, str. 27-33, ilustr. https://icts.sdzp.org/wp/wp-content/uploads/2020/09/Proceedings-ICTS-2020.pdf. [COBISS.SI-ID 29960963]

41. MATJAŠIČ, Tjaša, SIMČIČ, Tatjana, BAJT, Oliver, MORI, Nataša. Plastika kot onesnaževalo v rečnih sedimentih in njen vpliv na mikrobni metabolizem. V: CERKVENIK, Stanka (ur.). *Vodni dnevi 2020: simpozij z mednarodno udeležbo: zbornik referatov: 17.-18. september 2020, Rimske Toplice, Kongresni center Rimske terme*. Ljubljana: Slovensko društvo za zaščito voda. 2020, str. 229-238, ilustr. https://sdzv-drustvo.si/vodni-dnevi/arhiv-vodnih-dnevov/. [COBISS.SI-ID 29036035]

42. MAVRIČ, Alex, RAMŠAK, Andreja, BOJNEC, Štefan. Trg rib in ribištvo v Sloveniji. V: PRIŠENK, Jernej (ur.). *Razvojni vidiki prenosa znanja v skupni kmetijski politiki po letu 2020: 8. konferenca DAES: Maribor, 20.-21. februar 2020*, 8. konferenca DAES, Maribor, 20.-21. februar 2020. 1. izd. Maribor: Društvo agrarnih ekonomistov Slovenije - DAES. 2020, str. 137-148, ilustr. http://www.daes.si/Splet/8.%20konferenca%20DAES%20-%20Zbornik.pdf. [COBISS.SI-ID 1541983172]

43. TURK DERMASTIA, Timotej, STANKOVIĆ, David, FRANCÉ, Janja, TUŠEK-ŽNIDARIČ, Magda, RAMŠAK, Andreja, MOZETIČ, Patricija. Diversity of Pseudo-nitzschia H. Pergallo, 1900 along the Slovenian coast, Adriatic Sea, with insights into seasonality, toxicity and potential introductions. V: HESS, Philipp (ur.). *ICHA 2018: harmful algae 2018 - from ecosystems to socio-ecosystems: proceedings of the 18th International Conference on Harmful algae: 21-26 October 2018, Nantes, France*. Nantes: International Society for the Study of Harmful Algae. 2020, str. 72-75, ilustr. https://issha.org/wp-content/uploads/2020/09/ICHA18-Proceedings.pdf. [COBISS.SI-ID 30753539]

SAMOSTOJNI ZNANSTVENI SESTAVEK ALI POGLAVJE V MONOGRAFSKI PUBLIKACIJI
INDEPENDENT SCIENTIFIC COMPONENT PART OR A CHAPTER IN A MONOGRAPH

44. DOLENC-ORBANIĆ, Nataša, KVAS, Špela, KOVAČ, Nives. Uporaba raziskovalnih škatel v naravi kot primer učinkovitega medpredmetnega povezovanja. V: VOLK, Marina (ur.), et al. *Medpredmetno povezovanje: pot do uresničevanja vzgojno-izobraževalnih ciljev = Cross-curricular integration: the path to the realisation of educational goals*, (Knjižnica Ludus, ISSN 2536-1937, 25). Koper: Založba Univerze na Primorskem. 2020, str. 289-304, ilustr. [COBISS.SI-ID 30890243]

45. KOVAČ, Nives. Kako dobro študentje poznajo medpredmetno povezovanje in kakšne izkušnje imajo z njim?. V: VOLK, Marina (ur.), et al. *Medpredmetno povezovanje: pot do uresničevanja vzgojno-izobraževalnih ciljev = Cross-curricular integration: the path to the realisation of educational goals*, (Knjižnica Ludus, ISSN 2536-1937, 25). Koper: Založba Univerze na Primorskem. 2020, str. 69-82. [COBISS.SI-ID 30611971]

46. LIPEJ, Bojana, LIPEJ, Lovrenc, KERMA, Simon. Škocjanski Zatok Nature Reserve: a case study of protected urban wetland area and tourist attraction. V: KODERMAN, Miha (ur.), OPAČIĆ, Vuk Tvrtko (ur.). *Challenges of tourism development in protected areas of Croatia and Slovenia*. Koper: Založba Univerze na Primorskem; Zagreb: Hrvatsko geografsko društvo. 2020, str. 173-192, ilustr., doi: 10.26493/978-961-7055-08-5.173-191. [COBISS.SI-ID 36496387]

47. VODOPIVEC, Martin, KOGOVŠEK, Tjaša, MALEJ, Alenka. Ocean sprawl causes jellyfish outbreaks. V: TSING, Anna Lowenhaupt (ur.). *Feral atlas: the more-than-human Anthropocene*. [Stanford]: Stanford University Press, 2020, [6] str., ilustr. https://feralatlas.supdigital.org/poster/ocean-sprawl-causes-jellyfish-outbreaks . [COBISS.SI-ID 37861635]

ZNANSTVENA MONOGRAFIJA
SCIENTIFIC MONOGRAPH

48. LIPEJ, Lovrenc (avtor, fotograf), ORLANDO-BONACA, Martina (avtor, fotograf), PITACCO, Valentina (avtor, fotograf), MAVRIČ, Borut (avtor, fotograf). *Biodiverziteta biogenih formacij: zakladnica narave slovenskega morja*. Piran: Nacionalni inštitut za biologijo, Morska biološka postaja, 2020. 230 str., ilustr. ISBN 978-961-94802-5-0. [COBISS.SI-ID 32921859]

49. LIPEJ, Lovrenc, ROGELJA, Manja, MAVRIČ, Borut. *A miniature ocean*. Piran: GEPŠ, 2020. VI, 223 str., ilustr., zvd. ISBN 978-961-94179-2-8. [COBISS.SI-ID 303692544]

UNIVERZITETNI, VISOKOŠOLSKI ALI VIŠJEŠOLSKI UČBENIK Z RECENZIJO
REVIEWED UNIVERSITY, HIGHER EDUCATION OR HIGHER VOCATIONAL EDUCATION TEXTBOOK

50. FAGANELI, Jadran, FALNOGA, Ingrid, KOVAČ, Nives. *Mikrobna biogeokemija vod*, (Knjižna zbirka Vse živo, 7). Ljubljana: Nacionalni inštitut za biologijo, 2020. 360 str., ilustr. ISBN 978-961-94802-6-7. [COBISS.SI-ID 40636675]

UREDNIK
EDITOR

51. *Acrocephalus: glasilo Društva za opazovanje in proučevanje ptic Slovenije*. Lipej, Lovrenc (član uredniškega odbora 2011-). [Tiskana izd.]. Ljubljana: Društvo za opazovanje in proučevanje ptic Slovenije, 1980-. ISSN 0351-2851. [COBISS.SI-ID 7679234]

52. *Acta Adriatica*. Lipej, Lovrenc (član uredniškega odbora 2016-). Split: Institut za oceanografiju i ribarstvo, 1932-. ISSN 0001-5113. http://www.izor.hr/acta/. [COBISS.SI-ID 5792514]

53. *Annales: anali za istrske in mediteranske študije, Series historia naturalis*. Lipej, Lovrenc (odgovorni urednik 1994-). [Tiskana izd.]. Koper: Zgodovinsko društvo za južno Primorsko: Znanstveno raziskovalno središče Republike Slovenije = Capodistria: Società storica del Litorale: Centro di ricerche scientifiche della Repubblica di Slovenia = Koper: Science and Research Centre of the Republic of Slovenia, 1994-. ISSN 1408-533X. http://zdjp.si/p/annalesshn/. [COBISS.SI-ID 71951360]

54. *Annales: anali za istrske in mediteranske študije, Series historia naturalis*. Orlando-Bonaca, Martina (član uredniškega odbora 2009-, urednik 2016-), Mozetič, Patricija (član uredniškega odbora 1999-). [Tiskana izd.]. Koper: Zgodovinsko društvo za južno Primorsko: Znanstveno raziskovalno središče Republike Slovenije = Capodistria: Società storica del Litorale: Centro di ricerche scientifiche della Repubblica di Slovenia = Koper: Science and Research Centre of the Republic of Slovenia, 1994-. ISSN 1408-533X. http://zdjp.si/p/annalesshn/. [COBISS.SI-ID 71951360]

55. *Frontiers in marine science*. Rotter, Ana (področni urednik 2020). Lausanne: Frontiers Media S.A., 2014-. ISSN 2296-7745. http://www.frontiersin.org/Marine_Science/archive. [COBISS.SI-ID 523094809]

56. *Geologija*. Faganeli, Jadran (član uredniškega odbora 2005-). [Tiskana izd.]. Ljubljana: Geološki zavod Slovenije: Slovensko geološko društvo, 1953-. ISSN 0016-7789. http://www.geologija-revija.si/. [COBISS.SI-ID 5636866]

57. *Marine drugs*. Rotter, Ana (urednik 2020). Basel: MDPI, 2003-. ISSN 1660-3397. http://www.mdpi.org/marinedrugs/. [COBISS.SI-ID 23578841]

58. *National geographic junior: revija za mlade raziskovalce in pustolovce*. Lipej, Lovrenc (član uredniškega odbora 2003-). [Slovenska izd.]. Ljubljana: Rokus, 2003-2019. Ljubljana: Rokus, 2003-2008. Ljubljana: Rokus Klett, 2009-2019. ISSN 1581-6869. http://junior.si/arhiv/. [COBISS.SI-ID 124339712]

59. *Natura Sloveniae: revija za terensko biologijo*. Francé, Janja (član uredniškega odbora 2013-), Lipej, Lovrenc (član uredniškega odbora 2013-). [Tiskana izd.]. Ljubljana: Zveza za tehnično kulturo Slovenije, 1999-. Ljubljana: Zveza za tehnično kulturo Slovenije, 1999-2011. Ljubljana: Biotehniška fakulteta Univerze: Nacionalni inštitut za biologijo, 2012-. ISSN 1580-0814. http://web.bf.uni-lj.si/bi/NATURA-SLOVENIAE/. [COBISS.SI-ID 102784768]

60. *Potapljač: slovenska potapljaška revija*. Lipej, Lovrenc (član uredniškega sveta 2009-). Murska Sobota: Tiskarna AIP Praprotnik, 2002-. ISSN 1580-853X. [COBISS.SI-ID 117052928]

61. *Studia marina*. Lipej, Lovrenc (član uredniškega odbora 2017-). Kotor: Zavod za biologiju mora. ISSN 0585-5349. [COBISS.SI-ID 29730]

62. FLANDER-PUTRLE, Vesna (avtor, urednik, fotograf), MALEJ, Alenka, ROGELJA, Manja, MOZETIČ, Patricija (urednik). *"Dangerous" sea creatures which are usually not dangerous!*. Piran: Marine Biology Station Piran of the National Institute of Biology, 2020. 1 USB ključ (1 PDF datoteka ([2] str.)), ilustr. [COBISS.SI-ID 28811523]

63. FLANDER-PUTRLE, Vesna (avtor, urednik, fotograf), MALEJ, Alenka, ROGELJA, Manja, MOZETIČ, Patricija (urednik). *I pericoli nel mare, che per lo più non sono tali*. [Piran]: Stazione di biologia marina dell'Istituto nazionale di biologia, 2020. 1 USB ključ (1 PDF datoteka ([2] str.)), ilustr. [COBISS.SI-ID 28813315]

64. FLANDER-PUTRLE, Vesna (avtor, urednik, fotograf), MALEJ, Alenka, ROGELJA, Manja, MOZETIČ, Patricija (urednik). *Nevarnosti v morju, ki večinoma to niso*. Piran: Morska biološka postaja Nacionalnega inštituta za biologijo, 2020. 1 USB ključ (1 PDF datoteka ([2] str.)), ilustr. [COBISS.SI-ID 28808195]

65. GAUDÊNCIO, Susana P. (urednik), VASQUEZ, Marlen I. (urednik), ROTTER, Ana (urednik). *Ocean4Biotech: CA18238 - European transcidiplinary networking platform for marine biotechnology: book of abstracts*. [Piran: s. n.], 2020. 67 str. [COBISS.SI-ID 5176440]

66. JOVIČEVIĆ KLUG, Patricia (urednik), DEŽMAN, Miha (urednik), BAČNIK, Katarina (urednik), NOVAK, Rok (urednik), TURK DERMASTIA, Timotej (urednik), MARINKO, Živa (urednik), KIKAJ, Adem (urednik), JUROV, Andrea (urednik), TOPOLE, Martin (urednik), 12. študentska konferenca Mednarodne podiplomske šole Jožefa Stefana in 14. dan mladih raziskovalcev (Konferenca KMBO) = 12th Jožef Stefan International Postgraduate School Students' Conference and 14th Young Researchers' Day, 15th May 2020. *Knjiga povzetkov = Book of abstracts*. Ljubljana: Mednarodna podiplomska šola Jožefa Stefana: = Jožef Stefan International Postgraduate School: Inštitut Jožef Stefan: = Jožef Stefan Institute, 2020. http://ipssc.mps.si/BookOfAbstracts.pdf. [COBISS.SI-ID 15815939]

67. KUHAR, Miran (urednik, recenzent), VREČA, Polona (urednik, avtor dodatnega besedila), ZUPANČIČ, Polona (urednik), ČOP, Rudi (urednik), ŠRAJ, Mojca (urednik, recenzent), LIČER, Matjaž (urednik), SKOK, Gregor (urednik, recenzent), STOPAR, Bojan (urednik), ČARMAN, Martina (urednik), TRIGLAV ČEKADA, Mihaela (urednik), 25. srečanje Slovenskega združenja za geodezijo in geofiziko, Ljubljana, 30. januar 2020. *Raziskave s področja geodezije in geofizike 2019: zbornik del*. Ljubljana: Slovensko združenje za geodezijo in geofiziko, 2020. 146 str., ilustr., zvd. http://fgg-web.fgg.uni-lj.si/SUGG/referati/2020/SZGG_Zbornik_2020.pdf. [COBISS.SI-ID 303479552]

68. NEWTON, Isaac, VESEL, Matjaž (urednik, avtor dodatnega besedila, redaktor prevoda), LIČER, Matjaž (urednik), LIKAR, Vojislav (urednik). Matematični principi filozofije narave: kratek izbor. *Filozofski vestnik*, ISSN 0353-4510. [Tiskana izd.], 2020, letn. 41, št. 3, str. 7-79, ilustr. https://ojs.zrc-sazu.si/filozofski-vestnik/article/view/9872/9065. [COBISS.SI-ID 57274371]

Nanos kapljic soka okuženih rastlin krompirja na zdrave rastline s ciljem proučevanja njihovega odziva (foto: A. Rosa).
Application of drops of juice of infected potato plants on healthy plants with the aim of studying their response (Photo: A. Rosa).

ODDELEK ZA BIOTEHNOLOGIJO IN SISTEMSKO BIOLOGIJO

DEPARTMENT OF BIOTECHNOLOGY AND SYSTEMS BIOLOGY

IZVIRNI ZNANSTVENI ČLANEK
ORIGINAL SCIENTIFIC ARTICLE

1. ALSAHELI, Zeinab, CONTALDO, Nicoletta, MEHLE, Nataša, DERMASTIA, Marina, ELBEAINO, Toufic, BERTACCINI, Assunta. First detection of "Candidatus Phytoplasma asteris" - and "Candidatus Phytoplasma solani" -related strains in fig trees. *Journal of phytopathology*, ISSN 0931-1785. [Print ed.], 2020, vol. 168, iss. 1, str. 63-71, ilustr., doi: 10.1111/jph.12868. [COBISS.SI-ID 5206607]
2. BAČNIK, Katarina, KUTNJAK, Denis, PECMAN, Anja, MEHLE, Nataša, TUŠEK-ŽNIDARIČ, Magda, GUTIÉRREZ-AGUIRRE, Ion, RAVNIKAR, Maja. Viromics and infectivity analysis reveal the release of infective plant viruses from wastewater into the environment. *Water research*, ISSN 0043-1354, 2020, vol. 177, str. 1-11, doi: 10.1016/j.watres.2020.115628. [COBISS.SI-ID 5318735]
3. BOGOŽALEC KOŠIR, Alexandra, CVELBAR, Tašja, KAMMEL, Martin, GRUNERT, Hans-Peter, ZEICHHARDT, Heinz, MILAVEC, Mojca. Digital PCR method for detection and quantification of specific antimicrobial drug-resistance mutations in human cytomegalovirus. *Journal of virological methods*, ISSN 0166-0934. [Print ed.], Jul. 2020, vol. 281, [article] 113864, str. 1-16, ilustr., doi: 10.1016/j.jviromet.2020.113864. [COBISS.SI-ID 15879683]
4. BRIGATTI, Edgardo, GONZÁLEZ, Rubén, BUTKOVIĆ, Anamarija, RIVAREZ, Mark Paul Selda, ELENA, Santiago F. Natural variation in Arabidopsis thaliana rosette area unveils new genes involved in plant development. *Scientific reports*, ISSN 2045-2322, Oct. 2020, vol. 10, str. 1-10, ilustr., doi: 10.1038/s41598-020-74723-4. [COBISS.SI-ID 59829251]
5. BURGOON, Lyle, ANGRISH, Michelle, GARCIA-REYERO, Natàlia, POLLESCH, Nathan, ŽUPANIČ, Anže, PERKINS, Edward J. Predicting the probability that a chemical causes steatosis using Adverse outcome pathway Bayesian networks (AOPBNs). *Risk analysis*, ISSN 0272-4332, 2020, vol. 40, iss. 3, 512-523, doi: 10.1111/risa.13423. [COBISS.SI-ID 5228879]
6. BURKARD, Michael, BETZ, Alexander, SCHIRMER, Kristin, ŽUPANIČ, Anže. Common gene expression patterns in environmental model organisms exposed to engineered nanomaterials: a meta-analysis. *Environmental science & technology*, ISSN 0013-936X. [Print ed.], 2020, vol. 54, no. 1, str. 335-344, doi: 10.1021/acs.est.9b05170. [COBISS.SI-ID 5246799]
7. CORRÊA, Régis L., SANZ-CARBONELL, Alejandro, KOGEJ, Zala, MÜLLER, Sebastian Y., AMBRÓS, Silvia, LÓPEZ-GOMÓLLON, Sara, GÓMEZ, Gustavo, BAULCOMBE, David C., ELENA, Santiago F. Viral fitness determines the magnitude of transcriptomic and epigenomic reprograming of defense responses in plants. *Molecular biology and evolution*, ISSN 0737-4038, 2020, vol. 37, iss. 7, str. 1866-1881, ilustr., doi: 10.1093/molbev/msaa091. [COBISS.SI-ID 17727747]
8. DI FRANCESCO, Alessandra, DI FOGGIA, Michele, ZAJC, Janja, GUNDE-CIMERMAN, Nina, BARALDI, Elena. Study of the efficacy of Aureobasidium strains belonging to three different species: A. pullulans, A. subglaciale and A. melanogenum against Botrytis cinerea of tomato. *Annals of Applied Biology*, ISSN 0003-4746, 2020, vol. 177, iss.2, article no. 12627, str. 266-275, doi: 10.1111/aab.12627. [COBISS.SI-ID 25698819]
9. DI FRANCESCO, Alessandra, ZAJC, Janja, GUNDE-CIMERMAN, Nina, APREA, Eugenio, GASPERI, Flavia, PLACI, N., CARUSO, Fabio, BARALDI, Elena. Bioactivity of volatile organic compounds by Aureobasidium species against gray mold of tomato and table grape. *World journal of microbiology & biotechnology*, ISSN 1573-0972, 2020, vol. 36, iss. 11, 1-11, art. no 171, ilustr., doi: 10.1007/s11274-020-02947-7. [COBISS.SI-ID 33944323]
10. GHATAK, Arindam, CHATURVEDI, Palak, BACHMANN, Gert, VALLEDOR, Luis, RAMŠAK, Živa, BAZARGANI, Mitra Mohammadi, BAJAJ, Prasad, JAGADEESAN, Sridharan, LI, Weimin, SUN, Xiaoliang, GRUDEN, Kristina, VARSHNEY, Rajeev K., WECKWERTH, Wolfram. Physiological and proteomic signatures reveal mechanisms of superior drought resilience in pearl millet compared to wheat. *Frontiers in plant science*, ISSN 1664-462X, 2020, vol. 11, article no.600278, str. 1-24., doi: 10.3389/fpls.2020.600278. [COBISS.SI-ID 47781891]
11. HENNESSEN, Fabienne, MIETHKE, Marcus, ZABURANNYI, Nestor, LOOSE, Maria, LUKEŽIČ, Tadeja, BERNECKER, Steffen, HÜTTEL, Stephan, JANSEN, Rolf, SCHMIEDEL, Judith, FRITZENWANKER, Moritz, IMIRZALIOGLU, Can, VOGEL, Jörg, WESTERMANN, Alexander J., HESTERKAMP, Thomas, STADLER, Marc, WAGENLEHNER, Florian, PETKOVIĆ, Hrvoje, HERRMANN, Jennifer, MÜLLER, Rolf. Amidochelocardin overcomes resistance mechanisms exerted on tetracyclines and natural chelocardin. *Antibiotics*, ISSN 2079-6382, 2020, vol. 9, iss. 9, str. 1-18, ilustr., doi: 10.3390/antibiotics9090619. [COBISS.SI-ID 33973251]
12. HOLCAR, Marija, FERDIN, Jana, SITAR, Simona, TUŠEK-ŽNIDARIČ, Magda, DOLŽAN, Vita, PLEMENITAŠ, Ana, ŽAGAR, Ema, LENASSI, Metka. Enrichment of plasma extracellular vesicles for reliable quantification of their size and concentration for biomarker discovery. *Scientific reports*, ISSN 2045-2322, 020, vol. 10, str. 1-13, ilustr., doi: 10.1038/s41598-020-78422-y. [COBISS.SI-ID 41337603]
13. HOLLMANN, Susanne, KREMER, Andreas, BAEBLER, Špela, TREFOIS, Christophe, GRUDEN, Kristina, RUDNICK, Witold R., TONG, Weida, GRUCA, Aleksandra, BONGCAM-RUDLOFF, Erik, EVELO, Chris T, NECHYPORENKO, Alina, FROHME, Marcus, ŠAFRÁNEK, David, REGIERER, Babette, D'ELIA, Domenica. The need for standardisation in life science research - an approach to excellence and trust. *F1000Research*, ISSN 2046-1402, Dec. 2020, [Vol.] 9, [article no.] 1398, str. 1-14, ilustr., doi: 10.12688/f1000research.27500.2. [COBISS.SI-ID 54804483]
14. JAHIĆ, Alma, TUŠEK-ŽNIDARIČ, Magda, PINTAR, Sara, BERBIĆ, Selma, ŽEROVNIK, Eva. The effect of three polyphenols and some other anti-oxidant substances on amyloid fibril formation by human cystatin C. *Neurochemistry International*, ISSN 0197-0186. [Print ed.], 2020, vol. 140, str. 1-9., doi: 10.1016/j.neuint.2020.104806. [COBISS.SI-ID 26233859]
15. KLANČNIK, Anja, GOBIN, Ivana, JERŠEK, Barbara, SMOLE MOŽINA, Sonja, VUČKOVIĆ, Darinka, TUŠEK-ŽNIDARIČ, Magda, ABRAM, Maja. Adhesion of Campylobacter jejuni is increased in association with foodborne bacteria. *Microorganisms*, ISSN 2076-2607, 2020, vol. 8, iss. 2, str. 1-14, ilustr., doi: 10.3390/microorganisms8020201. [COBISS.SI-ID 5171320]
16. KOGEJ, Zala, DERMASTIA, Marina, MEHLE, Nataša. Development and validation of a new TaqMan real-time PCR for detection of 'Candidatus phytoplasma pruni'. *Pathogens*, ISSN 2076-0817, 7 Aug. 2020, vol. 9, iss. 8, str. 1-13, ilustr., doi: 10.3390/pathogens9080642. [COBISS.SI-ID 24707587]
17. LAVRAČ, Nada, MARTINC, Matej, POLLAK, Senja, POMPE NOVAK, Maruša, CESTNIK, Bojan. Bisociative literature-based discovery: lessons learned and new word embedding approach. *New generation computing*, ISSN 0288-3635, 2020, vol. 38, str. 773-800., doi: 10.1007/s00354-020-00108-w. [COBISS.SI-ID 31844867]
18. LI, Roman, ŽUPANIČ, Anže, TALIKKA, Marja, BELCASTRO, Vincenzo, MADAN, Sumit, DÖRPINGHAUS, Jens, BERG, Colette vom, SZOSTAK, Justyna, MARTIN, Florian, PEITSCH, Manuel C., HOENG, Julia. Systems toxicology approach for testing chemical cardiotoxicity in larval zebrafish. *Chemical research in toxicology*, ISSN 0893-228X. [Print ed.], Jul. 2020, vol. 33, no. 10, str. 2550-2564, ilustr., doi: 10.1021/acs.chemrestox.0c00095. [COBISS.SI-ID 44861955]
19. LUKAN, Tjaša, POMPE NOVAK, Maruša, BAEBLER, Špela, TUŠEK-ŽNIDARIČ, Magda, KLADNIK, Aleš, KRIŽNIK, Maja, BLEJEC, Andrej, ZAGORŠČAK, Maja, STARE, Katja, DUŠAK, Barbara, COLL RIUS, Anna, POLLMANN, Stephan, MORGIEWICZ, Karolina, HENNIG, Jacek, GRUDEN, Kristina. Precision transcriptomics of viral foci reveals the spatial regulation of immune-signaling genes and identifies RBOHD as an important player in the incompatible interaction between potato virus Y and potato. *The Plant journal*, ISSN 0960-7412, 2020, vol. 104, iss. 3, str. 645-661, ilustr., doi: 10.1111/tpj.14953. [COBISS.SI-ID 27546883]
20. LUKEŽIČ, Tadeja, PIKL, Špela, ZABURANNYI, Nestor, REMŠKAR, Maja, PETKOVIĆ, Hrvoje, MÜLLER, Rolf. Heterologous expression of the atypical tetracycline chelocardin reveals the full set of genes required for its biosynthesis. *Microbial cell factories*, ISSN 1475-2859, 2020, vol. 19, št. članka 230, str. 1-13, ilustr., doi: 10.1186/s12934-020-01495-x. [COBISS.SI-ID 44693507]
21. MATJAŠIČ, Tjaša, DREO, Tanja, SAMARDŽIJA, Zoran, BAJT, Oliver, KANDUČ, Tjaša, SIMČIČ, Tatjana, MORI, Nataša. Preliminary experiments into colonization of microorganisms from activated sludge on different types of plastics = Preliminarni poskusi kolonizacije različnih tipov plastike z mikroorganizmi iz aktivnega blata. *Acta biologica slovenica: ABS*, ISSN 1408-3671. [Tiskana izd.], 2020, vol. 63, no. 1, str. 45-61, ilustr. [COBISS.SI-ID 26885379]
22. MEHLE, Nataša, GREGUR, Larisa, BOGOŽALEC KOŠIR, Alexandra, DOBNIK, David. One-step reverse-transcription digital PCR for reliable quantification of different pepino mosaic virus genotypes. *Plants*, ISSN 2223-7747, 2020, vol. 9, no. 3, str. 1-13., doi: 10.3390/plants9030326. [COBISS.SI-ID 5319247]
23. MESTER, Zoltan, CORBISIER, Philippe, ELLISON, Stephen L. R., BEAZ HIDALGO, Maria Roxana, GAO, Yunhua, NIU, Chunyan, TANG, Vincent, LEE, Foo-wing, PÉREZ-URQUIZA, Melina, RAMIREZ SUÁREZ, Angel, BURNS, Malcolm, MILAVEC, Mojca, WIANGNON, Kanjana, GRIFFITHS, Kate R., MCLAUGHLIN, Jacob L.H., SHIBAYAMA, Sachie, TAKATSU, Akiko, AKGÖZ, Müslüm, VONSKY, Maxim, RUNOV, Andrei, LEGUIZAMON GUERRERO, John Emerson. Final report of CCQM-K86.c: relative quantification of genomic DNA fragments extracted from a biological tissue. *Metrologia*, ISSN 0026-1394, 2020, vol. 57, no. 1A, str. 1-38, doi: 10.1088/0026-1394/57/1A/08004. [COBISS.SI-ID 5304655]
24. MORZE, Jakub, SCHWEDHELM, Carolina, BENČIČ, Aleksander, HOFMANN, Georg, BOEING, Heiner, PRZYBYLOWICZ, Katarzyna, SCHWINGSHACKL, Lukas. Chocolate and risk of chronic disease: a systematic review and dose-response meta-analysis. *European journal of nutrition*, ISSN 1436-6215, 2020, 59, 1, str. 389-397, ilustr., doi: 10.1007/s00394-019-01914-9. [COBISS.SI-ID 33538819]
25. NOVAK, Metka, KOPRIVNIKAR KRAJNC, Miha, HRASTAR, Barbara, BREZNIK, Barbara, MAJC, Bernarda, MLINAR, Mateja, ROTTER, Ana, PORČNIK, Andrej, MLAKAR, Jernej, STARE, Katja, PESTELL, Richard G., LAH TURNŠEK, Tamara. CCR5-mediated signaling is involved in invasion of glioblastoma cells in its microenvironment. *International journal of molecular sciences*, ISSN 1422-0067, 12 Jun. 2020, vol. 21, iss. 12, str. 1-20, ilustr. https://www.mdpi.com/1422-0067/21/12/4199. [COBISS.SI-ID 19416067]
26. ÖNDER, Özgün Can, UTROŠA, Petra, CASERMAN, Simon, PODOBNIK, Marjetka, TUŠEK-ŽNIDARIČ, Magda, GRDADOLNIK, Jože, KOVAČIČ, Sebastijan, ŽAGAR, Ema, PAHOVNIK, David. Emulsion-templated synthetic polypeptide scaffolds prepared by ring-opening polymerization of N-carboxyanhydrides. *Polymer chemistry*, ISSN 1759-9962. [Online ed.], 14 Jul. 2020, vol. 11, iss. 26, str. 4260-4270., doi: 10.1039/d0py00387e. [COBISS.SI-ID 20279811]
27. PAPOUTSOGLOU, Evangelia A., FARIA, Daniel, AREND, Daniel, ARNAUD, Elizabeth, ATHANASIADIS, Ioannis N., CHAVES, Inês, COPPENS, Frederik, CORNUT, Guillaume, COSTA, Bruno V., ĆWIEK-KUPCZYŃSKA, Hanna, GRUDEN, Kristina, RAMŠAK, Živa, et al. Enabling reusability of plant phenomic datasets with MIAPPE 1.1. *The new phytologist*, ISSN 1469-8137, 2020, vol. 227, iss. 1, str. 260-273, ilustr., doi: 10.1111/nph.16544. [COBISS.SI-ID 40488453]
28. PETEK, Marko, COLL RIUS, Anna, FERENC, Rok, RAZINGER, Jaka, GRUDEN, Kristina. Validating the potential of double-stranded RNA targeting Colorado potato beetle mesh gene in laboratory and field trials. *Frontiers in plant science*, ISSN 1664-462X, 2020, vol. 11, article no.1250, str. 1-9, doi: 10.3389/fpls.2020.01250. [COBISS.SI-ID 25419523]
29. PETEK, Marko, ZAGORŠČAK, Maja, RAMŠAK, Živa, SANDERS, Sheri, TOMAŽ, Špela, TSENG, Elizabeth, ZOUINE, Mohamed, COLL RIUS, Anna, GRUDEN, Kristina. Cultivar-specific transcriptome and pan-transcriptome reconstruction of tetraploid potato. *Scientific data*, ISSN 2052-4463, 2020, vol. 7, article no. 249, str. 1-15, ilustr., doi: 10.1038/s41597-020-00581-4. [COBISS.SI-ID 27695619]
30. RIVAREZ, Mark Paul Selda, PARAC, Elizabeth, DIMASINGKIL, Shajara Fatima M., FADRIQUELA, Cheek S. Identification of wood Rot fungi in the historic Baker Memorial Hall at the University of the Philippines, Los Baños Campus. *Bioscience research*, ISSN 2218-3973, 2019, iss. 4, vol. 16, str. 1-10, ilustr. http://www.isisn.org/BR16(4)2019/3421-3431-16(4)2019BR19-432.pdf. [COBISS.SI-ID 59943939]
31. SABOTIČ, Jerica, BRZIN, Jože, ERJAVEC, Jana, DREO, Tanja, TUŠEK-ŽNIDARIČ, Magda, RAVNIKAR, Maja, KOS, Janko. L-amino acid oxidases from mushrooms show antibacterial activity against the Phytopathogen Ralstonia solanacearum. *Frontiers in microbiology*, ISSN 1664-302X, 2020, vol. 11, str. 977-1-997-18, doi: 10.3389/fmicb.2020.00977. [COBISS.SI-ID 18527235]
32. SILVA, Washington da, KUTNJAK, Denis, XU, Yi, XU, Yimin, GIOVANNONI, James, ELENA, Santiago F., GRAY, Stewart. Transmission modes affect the population structure of potato virus Y in potato. *PLOS pathogens*, ISSN 1553-7366, 23 Jun. 2020, 16, 6, str. e1008608, 1-23, ilustr., doi: 10.1371/journal.ppat.1008608. [COBISS.SI-ID 21858051]
33. STANKOVIĆ, Ivana, VUČUROVIĆ, Ana, ZEČEVIĆ, Katarina, PETROVIĆ, Branka, RISTIĆ, Danijela, VUČUROVIĆ, Ivan, KRSTIĆ, Branka. Occurrence and molecular characterization of Impatiens necrotic spot tospovirus in ornamentals in Serbia. *Journal of plant pathology*, ISSN 1125-4653, Aug. 2020, vol. 102, iss. 3, str. 787-797, ilustr., doi: 10.1007/s42161-020-00504-7. [COBISS.SI-ID 27424771]
34. STARE, Katja, COLL RIUS, Anna, GUTIÉRREZ-AGUIRRE, Ion, TUŠEK-ŽNIDARIČ, Magda, RAVNIKAR, Maja, KEŽAR, Andreja, KAVČIČ, Luka, PODOBNIK, Marjetka, GRUDEN, Kristina. Generation and in Planta functional analysis of Potato virus Y mutants. *Bio-protocol*, ISSN 2331-8325, 20 Jul. 2020, vol. 10, iss. 14, str. e3692-1-e3692-19, ilustr., doi: 10.21769/BioProtoc.3692. [COBISS.SI-ID 25846531]

35. TURK DERMASTIA, Timotej, CERINO, Federica, STANKOVIĆ, David, FRANCÉ, Janja, RAMŠAK, Andreja, TUŠEK-ŽNIDARIČ, Magda, BERAN, Alfred, NATALI, Vanessa, CABRINI, Marina, MOZETIČ, Patricija. Ecological time series and integrative taxonomy unveil seasonality and diversity of the toxic diatom Pseudo-nitzschia H. Peragallo in the northern Adriatic Sea. *Harmful algae*, ISSN 1568-9883, Mar. 2020, vol. 93, 101773, str. 1-20, ilustr., doi: 10.1016/j.hal.2020.101773. [COBISS.SI-ID 40469253]
36. VREEBURG, R. A. M., NAS, M., PAEPE, B. De, DREO, Tanja, GOTTSBERGER, Richard A., FORNEFELD, E., FRASER, K., LEONARD, S., LE ROUX, A. C., MEEKES, Ellis, RIVOAL, Carène, SMITS-MASTEBROEK, L., VAERENBERGH, Johan van. Test performance study for detection of Ralstonia solanacearum and Clavibacter sepedonicus in potato tubers with TaqMan PCR. *Bulletin OEPP*, ISSN 0250-8052, Apr. 2020, vol. 50, iss. 1, str. 177-185, ilustr., doi: 10.1111/epp.12650. [COBISS.SI-ID 31108867]
37. VUČUROVIĆ, Ana, STANKOVIĆ, Ivana, ZEČEVIĆ, Katarina, PETROVIĆ, Branka, DELIBAŠIĆ, Goran, KRSTIĆ, Branka. Occurrence and molecular characterization of wheat streak mosaic virus in wheat in Serbia. *Pesticidi i fitomedicina: naučni časopis Društva za zaštitutu bilja Srbije*, ISSN 1820-3949, 2020, vol. 35, no. 2, str. 117-131, ilustr., doi: 10.2298/PIF2002117V. [COBISS.SI-ID 45361411]
38. ZAJC, Janja, ČERNOŠA, Anja, DI FRANCESCO, Alessandra, CASTORIA, Raffaello, DE CURTIS, Filippo, LIMA, Giuseppe, BADRI, Hanene, JIJAKLI, Haissam, IPPOLITO, Antonio, GOSTINČAR, Cene, ZALAR, Polona, GUNDE-CIMERMAN, Nina, JANISIEWICZ, Wojciech J. Characterization of Aureobasidium pullulans isolates selected as biocontrol agents against fruit decay pathogens. *Fungal genomics & biology*, ISSN 2165-8056, 22 Jan. 2020, vol. 10, iss. 1, str. 1-13, ilustr. https://www.longdom. org/open-access/characterization-of-aureobasidium-pullulans-isolates-selected-as-biocontrol-agents-against-fruit-decay-pathogens.pdf. [COBISS.SI-ID 40467461]

PREGLEDNI ZNANSTVENI ČLANEK
REVIEW ARTICLE

39. BAEBLER, Špela, COLL RIUS, Anna, GRUDEN, Kristina. Plant molecular responses to potato virus Y: a continuum of outcomes from sensitivity and tolerance to resistance. *Viruses*, ISSN 1999-4915, 2020, vol. 12, iss. 2, str. 1-17, ilustr., doi: 10.3390/v12020217. [COBISS.SI-ID 40664837]
40. FILIPIĆ, Arijana, GUTIÉRREZ-AGUIRRE, Ion, PRIMC, Gregor, MOZETIČ, Miran, DOBNIK, David. Cold plasma, a new hope in the field of virus inactivation. *Trends in biotechnology*, ISSN 0167-7799. [Print ed.], 2020, vol. 38, iss. 11, str. 1278-1291, doi: 10.1016/j.tibtech.2020.04.003. [COBISS.SI-ID 33308199]
41. GRUDEN, Kristina, PETEK, Marko, PODPEČAN, Vid, et al. Ménage à trois: unraveling the mechanisms regulating plant-microbe-arthropod interactions. *Trends in Plant Science*, ISSN 1360-1385. [Print ed.], 2020, vol. 25, no. 12, str. 1215-1226, doi: 10.1016/j.tplants.2020.07.008. [COBISS.SI-ID 47574275]
42. HUGGETT, Jim F., WHALE, Alexandra S., SPIEGELAERE, Ward De, ABDEL NOUR, Afif M., BAE, Young-Kyung, BENES, Vladimir, BURKE, Dan, CLEVELAND, Megan, CORBISIER, Philippe, DEVONSHIRE, Alison S., DONG, Lianhua, DRANDI, Daniela, FOY, Carole A., GARSON, Jeremy A., HE, Hua-Jun, HELLEMANS, Jan, KUBISTA, Mikael, LIEVENS, Antoon, MAKRIGIORGOS, Mike G., MILAVEC, Mojca, MUELLER, Reinhold D., NOLAN, Tania, O'SULLIVAN, Denise M., PFAFFL, Michael W., RÖDIGER, Stefan, ROMSOS, Erica L., SHIPLEY, Gregory L., TALY, Valérie, UNTERGASSER, Andreas, WITTWER, Carl T., BUSTIN, Stephen A., VANDESOMPELE, Jo. The digital MIQE guidelines update: minimum information for publication of quantitative digital PCR experiments for 2020. *Clinical chemistry*, ISSN 0009-9147. [Print ed.], Aug. 2020, vol. 66, iss. 8, str. 1012-1029, ilustr., doi: 10.1093/clinchem/hvaa125. [COBISS.SI-ID 24618243]
43. KRIŽNIK, Maja, BAEBLER, Špela, GRUDEN, Kristina. Roles of small RNAs in the establishment of tolerant interaction between plants and viruses. *Current opinion in virology*, ISSN 1879-6257, Jun. 2020, vol. 42, str. 25-31, ilustr., doi: 10.1016/j.coviro.2020.04.006. [COBISS.SI-ID 17660163]

KRATKI ZNANSTVENI PRISPEVEK
SHORT SCIENTIFIC ARTICLE

44. BAČNIK, Katarina, KUTNJAK, Denis, JERIČ KOKELJ, Barbara, TUTA, Nika, LONČAR, Tan, VOGELSANG, Matjaž, RAVNIKAR, Maja. Metagenomic characterization of parental and production CHO cell lines for detection of adventitious viruses. *Biologicals*, ISSN 1045-1056, 2020, vol. [48], str. [1-6]., doi: 10.1016/j.biologicals.2020.11.001. [COBISS.SI-ID 39971587]
45. MEHLE, Nataša, KUTNJAK, Denis, JAKOŠ, Nejc, SELJAK, Gabrijel, PECMAN, Anja, MASSART, Sébastien, RAVNIKAR, Maja. First report of cucurbit aphid-borne yellows virus in Cucurbita pepo and Cucurbita maxima in Slovenia. *Plant disease*, ISSN 0191-2917, 2020, vol. 104, no. 2, str. 599, doi: 10.1094/PDIS-07-19-1524-PDN. [COBISS.SI-ID 5239631]
46. STANKOVIĆ, Ivana, VUČUROVIĆ, Ana, ZEČEVIĆ, Katarina, PETROVIĆ, Branka, RISTIĆ, Danijela, VUČUROVIĆ, Ivan, KRSTIĆ, Branka. Pepino mosaic virus, a new threat for Serbia's tomatoes. *Spanish journal of agricultural research*, ISSN 2171-9292, 2020, vol. 18, no. 3, str. 1-8, e10SC05, ilustr. https://revistas.inia.es/index.php/sjar/article/view/16244. [COBISS.SI-ID 51323651]
47. ŽUPANIČ, Anže, BERNSTEIN, Hans C., HEILAND, Ines. Systems biology: current status and challenges. *Cellular and molecular life sciences*, ISSN 1420-682X, 2020, vol. 77, str. 379-380., doi: 10.1007/s00018-019-03410-z. [COBISS.SI-ID 5288783]

OBJAVLJENI ZNANSTVENI PRISPEVEK NA KONFERENCI
PUBLISHED SCIENTIFIC CONFERENCE CONTRIBUTION

48. BAČNIK, Katarina, KUTNJAK, Denis, MAKSIMOVIĆ, Olivera, KOGEJ, Zala, VUČUROVIĆ, Ana, PECMAN, Anja, MEHLE, Nataša, MILAVEC, Mojca, TUŠEK-ŽNIDARIČ, Magda, GUTIÉRREZ-AGUIRRE, Ion, RAVNIKAR, Maja. Virusi v odpadni vodi: analize odpadne vode za spremljanje epidemije novega koronavirusa. V: CERKVENIK, Stanka (ur.). *Vodni dnevi 2020: simpozij z mednarodno udeležbo: zbornik referatov: 17.-18. september 2020, Rimske Toplice, Kongresni center Rimske terme*. Ljubljana: Slovensko društvo za zaščito voda. 2020, str. 83-90. https://sdzv-drustvo.si/vodni-dnevi/arhiv-vodnih-dnevov/. [COBISS.SI-ID 33689603]
49. OGRINC, Nives, BAŠA ČESNIK, Helena, BUČAR-MIKLAVČIČ, Milena, IVANOŠ, Jerica, KOROUŠIĆ-SELJAK, Barbara, MILAVEC, Mojca, POKLAR ULRIH, Nataša, ZABAVNIK PIANO, Jelka. Infrastruktura za promocijo metrologije v živilstvu in prehrani = Infrastructure for promoting metrology in food and nutrition. V: RASPOR, Peter (ur.). *[Hrana, prehrana, zdravje]: gojimo, hranimo, ohranjajmo. Skupaj: Konferenca Hrana, prehrana, zdravje = Conference Food, Nutrition, Health: [večavtorska monografija]*. Ljubljana: Evropska mreža deklaracije za hrano, tehnologijo, prehrano za zdravje. 2020, str. 311-318, ilustr. [COBISS.SI-ID 38908931]
50. RAVNIKAR, Maja, GRUDEN, Kristina, ŽEL, Jana. Od tkivnih kultur do Oddelka za biotehnologijo in sistemsko biologijo. V: RASPOR, Peter (ur.). *BIA, vztrajanje na biotehnološki poti*, Posvetovanje ob obeležnju "30 letnice podjetja BIA d. o. o.", 16. januar 2020, Ljubljana. Ljubljana: BIA. 2020, str. 97-108, ilustr. [COBISS.SI-ID 5313615]

51. TURK DERMASTIA, Timotej, STANKOVIĆ, David, FRANCÉ, Janja, TUŠEK-ŽNIDARIČ, Magda, RAMŠAK, Andreja, MOZETIČ, Patricija. Diversity of Pseudo-nitzschia H. Pergallo, 1900 along the Slovenian coast, Adriatic Sea, with insights into seasonality, toxicity and potential introductions. V: HESS, Philipp (ur.). *ICHA 2018: harmful algae 2018 - from ecosystems to socio-ecosystems: proceedings of the 18th International Conference on Harmful algae: 21-26 October 2018, Nantes, France*. Nantes: International Society for the Study of Harmful Algae. 2020, str. 72-75, ilustr. https://issha.org/wp-content/uploads/2020/09/ICHA18-Proceedings.pdf. [COBISS.SI-ID 30753539]

SAMOSTOJNI ZNANSTVENI SESTAVEK ALI POGLAVJE V MONOGRAFSKI PUBLIKACIJI
INDEPENDENT SCIENTIFIC COMPONENT PART OR A CHAPTER IN A MONOGRAPH

52. CHRISTIAENS, Olivier, PETEK, Marko, SMAGGHE, Guy, TANING, Clauvis Nji Tizi. The use of nanocarriers to improve the efficiency of RNAi-based pesticides in agriculture. V: FRACETO, Leonardo F. (ur.). *Nanopesticides: from research and development to mechanisms of action and sustainable use in agriculture*. Cham: Springer. cop. 2020, str. 49-68, ilustr. https://link.springer.com/content/pdf/10.1007%2F978-3-030-44873-8.pdf. [COBISS.SI-ID 22635267]
53. KRIŽNIK, Maja, GRUDEN, Kristina, BAEBLER, Špela. Molecular responses of plants to viruses with emphasis on small RNAs. V: AWASTHI, L. P. (ur.). *Applied plant virology: advances, detection, and antiviral strategies*. London [etc.]: Academic Press, an imprint of Elsevier. cop. 2020, str. 141-157, ilustr. [COBISS.SI-ID 17004291]
54. MILAVEC, Mojca, DOBNIK, David, BOGOŽALEC KOŠIR, Alexandra, ŽEL, Jana. Metrology of DNA approaches. V: BURNS, Malcolm (ur.), FOSTER, Lucy (ur.), WALKER, Michael (ur.). *DNA techniques to verify food authenticity: applications in food fraud*, (Food Chemistry, Function and Analysis, 16). Cambridge: Royal Society of Chemistry. 2020, str. 147-153. http://dx.doi.org/10.1039/9781788016025. [COBISS.SI-ID 5204559]

PATENTNA PRIJAVA
PATENT APPLICATION

55. PRIMC, Gregor, ZAPLOTNIK, Rok, MOZETIČ, Miran, FILIPIĆ, Arijana, GUTIÉRREZ-AGUIRRE, Ion, DOBNIK, David, DULAR, Matevž, PETKOVŠEK, Martin. *Method and device for disinfection of liquid: patentna prijava EP20200482.6*. Munchen: European Patent office, 2020. [COBISS.SI-ID 45799939]

PATENT
PATENT

56. PRIMC, Gregor, MOZETIČ, Miran, ZAPLOTNIK, Rok, VESEL, Alenka, RAVNIKAR, Maja, ŽEL, Jana, MEHLE, Nataša, GUTIÉRREZ-AGUIRRE, Ion, FILIPIĆ, Arijana, DOBNIK, David. *Postopek za deaktivacijo virusa v vodi: patent SI 25811 A, 2020-09-30*. Ljubljana: Urad RS za intelektualno lastnino, 2020. [25] str., ilustr. [COBISS.SI-ID 4955215] patentna družina: P-201900255, 2019-12-20; GB 1821107.8, 2018-12-21

UREDNIK
EDITOR

57. *Biomolecular detection and quantification*. Milavec, Mojca (področni urednik 2014-). Amsterdam: Elsevier, 2014-. http://www.journals.elsevier.com/biomolecular-detection-and-quantification. [COBISS.SI-ID 3411023]
58. *BMC plant biology*. Gruden, Kristina (član uredniškega odbora 2011-). London: BioMed Central, 2001-. ISSN 1471-2229. http://www.biomedcentral.com/bmcplantbiol/. [COBISS.SI-ID 2594324]
59. *Food analytical methods*. Žel, Jana (član uredniškega odbora 2008-). New York: Springer Science and Business Media, 2008-. ISSN 1936-9751. [COBISS.SI-ID 1857359]
60. *Frontiers in physiology*. Gruden, Kristina (področni urednik 2012-). Lausanne: Frontiers Research Foundation, 2010-. ISSN 1664-042X. http://frontiersin.org/physiology. [COBISS.SI-ID 1218939]
61. *Molecular genetics and genomics: MGG*. Gruden, Kristina (član uredniškega odbora 2014-). Berlin; New York: Springer-Verlag, cop. 2001-. ISSN 1617-4615. [COBISS.SI-ID 14355673]
62. *National geographic, Slovenija*. Dermastia, Marina (član uredniškega odbora 2006-). Ljubljana: Rokus, 2006-. Ljubljana: Rokus, 2006-2008. Ljubljana: Rokus Klett, 2009-. ISSN 1854-4851. http://www.dlib.si/details/URN:NBN:SI:spr-ICOOAPNE. [COBISS.SI-ID 225874688]
63. *Pathogens*. Mehle, Nataša (gostujoči urednik 2020-2021). Basel: MDPI AG, 2012-. ISSN 2076-0817. [COBISS.SI-ID 523338009]
64. *Phytopathogenic mollicutes*. Mehle, Nataša (član uredniškega odbora 2011-). New Delhi: Divan Enterprises, 2011-. ISSN 2249-4669. [COBISS.SI-ID 2431055]
65. *Plants*. Dermastia, Marina (gostujoči urednik 2020). Basel: MDPI AG, 2012-. ISSN 2223-7747. [COBISS.SI-ID 523345433]
66. JOVIČEVIĆ KLUG, Patricia (urednik), DEŽMAN, Miha (urednik), BAČNIK, Katarina (urednik), NOVAK, Rok (urednik), TURK DERMASTIA, Timotej (urednik), MARINKO, Živa (urednik), KIKAJ, Adem (urednik), JUROV, Andrea (urednik), TOPOLE, Martin (urednik), 12. študentska konferenca Mednarodne podiplomske šole Jožefa Stefana in 14. dan mladih raziskovalcev (Konferenca KMBO) = 12th Jožef Stefan International Postgraduate School Students' Conference and 14th Young Researchers' Day, 15th May 2020. *Knjiga povzetkov = Book of abstracts*. Ljubljana: Mednarodna podiplomska šola Jožefa Stefana: = Jožef Stefan International Postgraduate School: Inštitut Jožef Stefan: = Jožef Stefan Institute, 2020. http://ipssc.mps.si/BookOfAbstracts.pdf. [COBISS.SI-ID 15815939]
67. KREFT, Marko, STOJAN DOLAR, Mojca, FON, Doroteja, PANGERC ŽNIDARŠIČ, Tanja, DERMASTIA, Marina (urednik). *Človeško telo, Samostojni delovni zvezek za biologijo v 8. razredu osnovne šole*. 1. izd. Ljubljana: Rokus Klett, 2020. 177 str., ilustr. ISBN 978-961-271-918-0. [COBISS.SI-ID 304925440]
68. STARČIČ ERJAVEC, Marjanca, PANGERC ŽNIDARŠIČ, Tanja, DERMASTIA, Marina (urednik). *Dotik življenja 9, Samostojni delovni zvezek za biologijo v 9. razredu osnovne šole*. 1. izd. Ljubljana: Rokus Klett, 2020. 147 str., ilustr. ISBN 978-961-292-017-3. [COBISS.SI-ID 304924672]
69. ŽIBERNA, Marjan, DERMASTIA, Marina (urednik), TOME, Davorin (urednik). *Rastvejitev: prvih 1,89341556 x 10 [zgoraj] 9 sekund: Nacionalni inštitut za biologijo 1960-2020*. Ljubljana: Nacionalni inštitut za biologijo, 2020. 191, [3] str., [1] zganj. pril., ilustr. ISBN 978-961-94802-0-5. [COBISS.SI-ID 28756739]

ODDELEK ZA GENETSKO TOKSIKOLOGIJO IN BIOLOGIJA RAKA

DEPARTMENT OF GENETIC TOXICOLOGY AND CANCER BIOLOGY

IZVIRNI ZNANSTVENI ČLANEK
ORIGINAL SCIENTIFIC ARTICLE

1. BERGANT LOBODA, Kaja, JANEŽIČ, Matej, ŠTAMPAR, Martina, ŽEGURA, Bojana, FILIPIČ, Metka, PERDIH, Andrej. Substituted 4,5'-bithiazoles as catalytic inhibitors of human DNA topoisomerase II / alpha/alpha. *Journal of chemical information and modeling*, ISSN 1549-9596. [Print ed.], 27 Jul. 2020, vol. 60, iss. 7, str. 3662-3678, ilustr., doi: 10.1021/acs.jcim.0c00202. [COBISS.SI-ID 18365443]
2. BERGANT LOBODA, Kaja, VALJAVEC, Katja, ŠTAMPAR, Martina, WOLBER, Gerhard, ŽEGURA, Bojana, FILIPIČ, Metka, SOLLNER DOLENC, Marija, PERDIH, Andrej. Design and synthesis of 3,5-substituted 1,2,4-oxadiazoles as catalytic inhibitors of human DNA topoisomerase IIalfa. *Bioorganic chemistry*, ISSN 0045-2068, 2020, vol. 99, str. 103828-1 - 103828-19, ilustr., doi: 10.1016/j.bioorg.2020.103828. [COBISS.SI-ID 4900977]
3. DÍEZ-QUIJADA, Leticia, HERCOG, Klara, ŠTAMPAR, Martina, FILIPIČ, Metka, CAMEÁN, Ana M., JOS, Angeles, ŽEGURA, Bojana. Genotoxic effects of cylindrospermopsin, microcystin-LR and their binary mixture in human hepatocellular carcinoma (HepG2) cell line. *Toxins : Elektronski vir*, ISSN 2072-6651, 2020, vol. 12, iss. 12, str. 1-16, ilustr., doi: 10.3390/toxins12120778. [COBISS.SI-ID 41761027]
4. ELERŠEK, Tina, FLISAR, Karel, LIKOZAR, Blaž, KLEMENČIČ, Marina, GOLOB, Janvit, KOTNIK, Tadej, MIKLAVČIČ, Damijan. Electroporation as a solvent-free green technique for non-destructive extraction of proteins and lipids from Chlorella vulgaris. *Frontiers in bioengineering and biotechnology*, ISSN 2296-4185, May 2020, vol. 8, art. 443, str. 1-9, ilustr., doi: 10.3389/fbioe.2020.00443. [COBISS.SI-ID 15115267]
5. GAJSKI, Goran, GERIĆ, Marko, DOMIJAN, Ana-Marija, GOLUBOVIĆ, Ivana, ŽEGURA, Bojana. Marine toxin domoic acid induces in vitro genomic alterations in human peripheral blood cells. *Toxicon*, ISSN 0041-0101. [Print ed.], Nov. 2020, vol. 187, str. 93-100, ilustr., doi: 10.1016/j.toxicon.2020.08.024. [COBISS.SI-ID 28129283]
6. HERCOG, Klara, ŠTAMPAR, Martina, ŠTERN, Alja, FILIPIČ, Metka, ŽEGURA, Bojana. Application of advanced HepG2 3D cell model for studying genotoxic activity of cyanobacterial toxin cylindrospermopsin. *Environmental pollution*, ISSN 0269-7491. [Print ed.], Oct. 2020, vol. 265, pt. B, str. 1-11, ilustr., doi: 10.1016/j.envpol.2020.114965. [COBISS.SI-ID 19219971]
7. HERCOG, Klara, ŠTERN, Alja, MAISANABA HERNÁNDEZ, Sara, FILIPIČ, Metka, ŽEGURA, Bojana. Plastics in cyanobacterial blooms - genotoxic effects of binary mixtures of cylindrospermopsin and bisphenols in HepG2 cells. *Toxins : Elektronski vir*, ISSN 2072-6651, 2020, vol. 12, iss. 4, str. 1-19, ilustr. https://www.mdpi.com/2072-6651/12/4/219. [COBISS.SI-ID 40541189]
8. HIRA, Vashendriya V. V., BREZNIK, Barbara, NOORDEN, Cornelis J. F. van, LAH TURNŠEK, Tamara, MOLENAAR, Remco J. 2D and 3D in vitro assays to quantify the invasive behavior of glioblastoma stem cells in response to SDF-1[alpha]. *Biotechniques*, ISSN 0736-6205. [Print ed.], 2020, vol. 69, no. 5, str. 339-346., doi: 10.2144/btn-2020-0046. [COBISS.SI-ID 26930691]
9. HIRA, Vashendriya V. V., BREZNIK, Barbara, VITTORI, Miloš, JONG, Annique Loncq de, MLAKAR, Jernej, OOSTRA, Roelof-Jan, KHURSHED, Mohammed, MOLENAAR, Remco J., LAH TURNŠEK, Tamara, NOORDEN, Cornelis J. F. van. Similarities between stem cell niches in glioblastoma and bone marrow : rays of hope for novel treatment strategies. *The Journal of histochemistry and cytochemistry*, ISSN 0022-1554, 2020, vol. 68, no. 1, str. 33-57, doi: 10.1369/0022155419878416. [COBISS.SI-ID 5208655]
10. JEWETT, Anahid, KOS, Janko, KAUR, Kawaljit, LAH TURNŠEK, Tamara, BREZNIK, Barbara, SENJOR, Emanuela, WONG, Paul, NGUYEN, Kristin Y., KO, Meng-Wei. Multiple defects of natural killer cells in cancer patients : anarchy, dysregulated systemic immunity, and immunosuppression in metastatic cancer. *Critical reviews in immunology*, ISSN 1040-8401, 2020, vol. 40, iss. 2, str. 93-133, ilustr., doi: 10.1615/CritRevImmunol.2020033391. [COBISS.SI-ID 14129923]
11. MØLLER, Peter, AZQUETA, Amaya, BOUTET-ROBINET, Elisa, KOPPEN, Gudrun, BONASSI, Stefano, MILIĆ, Mirta, GAJSKI, Goran, COSTA, Solange, ŽEGURA, Bojana, NOVAK, Matjaž, et al. Minimum Information for Reporting on the Comet Assay (MIRCA) : recommendations for describing comet assay procedures and results. *Nature protocols*, ISSN 1750-2799. [Online ed.], 2020, vol. 15, issue 12, str. 3817-3826, ilustr., doi: 10.1038/s41596-020-0398-1. [COBISS.SI-ID 34443523]
12. NOVAK, Metka, KOPRIVNIKAR KRAJNC, Miha, HRASTAR, Barbara, BREZNIK, Barbara, MAJC, Bernarda, MLINAR, Mateja, ROTTER, Ana, PORČNIK, Andrej, MLAKAR, Jernej, STARE, Katja, PESTELL, Richard G., LAH TURNŠEK, Tamara. CCR5-mediated signaling is involved in invasion of glioblastoma cells in its microenvironment. *International journal of molecular sciences*, ISSN 1422-0067, 12 Jun. 2020, vol. 21, iss. 12, str. 1-20, ilustr. https://www.mdpi.com/1422-0067/21/12/4199. [COBISS.SI-ID 19416067]
13. ŠTAMPAR, Martina, BREZNIK, Barbara, FILIPIČ, Metka, ŽEGURA, Bojana. Characterization of In vitro 3D cell model developed from human hepatocellular carcinoma (HepG2) cell line. *Cells*, ISSN 2073-4409, Nov. 2020, vol. 9, iss. 12, str. 1-19, ilustr., doi: 10.3390/cells9122557. [COBISS.SI-ID 40005123]
14. UJVÁROS, Andrea Zsuzsanna, HERCOG, Klara, RIBA, Milán, GONDA, Sándor, FILIPIČ, Metka, VASAS, Gábor, ŽEGURA, Bojana. The cyanobacterial oligopeptides microginins induce DNA damage in the human hepatocellular carcinoma (HepG2) cell line. *Chemosphere*, ISSN 0045-6535. [Print ed.], 2020, vol. 240, str. 1-11. , doi: 10.1016/j.chemosphere.2019.124880. [COBISS.SI-ID 5164111]

PREGLEDNI ZNANSTVENI ČLANEK
REVIEW ARTICLE

15. LAH TURNŠEK, Tamara, NOVAK, Metka, BREZNIK, Barbara. Brain malignancies : glioblastoma and brain metastases. *Seminars in cancer biology*, ISSN 1044-579X. [Print ed.], 2020, vol. 60, str. 262-273, doi: 10.1016/j.semcancer.2019.10.010. [COBISS.SI-ID 5208399]
16. MAJC, Bernarda, SEVER, Tilen, ZARIĆ, Miki, BREZNIK, Barbara, TURK, Boris, LAH TURNŠEK, Tamara. Epithelial-to-mesenchymal transition as the driver of changing carcinoma and glioblastoma microenvironment. *Biochimica et biophysica acta. BBA, Molecular cell research*, ISSN 0167-4889. [Print ed.], Oct. 2020, vol. 1867, iss. 10, str. 118782, 1-14, ilustr., doi: 10.1016/j.bbamcr.2020.118782. [COBISS.SI-ID 21291011]

SAMOSTOJNI ZNANSTVENI SESTAVEK ALI POGLAVJE V MONOGRAFSKI PUBLIKACIJI
INDEPENDENT SCIENTIFIC COMPONENT PART OR A CHAPTER IN A MONOGRAPH

17. FILIPIČ, Metka, NOVAK, Matjaž, ŽEGURA, Bojana. Genotoxicity of the residues of anticancer drugs : a hazard for aquatic environment. V: HEATH, Ester (ur.), et al. *Fate and effects of anticancerdrugs in the environment*. Cham: Springer. 2020, str. 403-420. https://link.springer.com/content/pdf/10.1007%2F978-3-030-21048-9.pdf. [COBISS.SI-ID 5308495]

UREDNIK
EDITOR

18. *Food and chemical toxicology*. Filipič, Metka (član uredniškega odbora 2015-). Amsterdam [etc.]: Elsevier. ISSN 0278-6915. [COBISS.SI-ID 1218325]
19. *ISRN Toxicology (Print)*. Filipič, Metka (član uredniškega odbora 2011-). Cairo: Hindawi Publishing Corporation. ISSN 2090-6188. [COBISS.SI-ID 2398543]
20. *Mutation research, Genetic toxicology and environmental mutagenesis*. Žegura, Bojana (član uredniškega odbora 2016-). Amsterdam; Lausanne; New York; Oxford; Shannon; Tokyo: Elsevier. ISSN 1383-5718. [COBISS.SI-ID 1239829]
21. *Mutation research, Reviews in mutation research*. Filipič, Metka (član uredniškega odbora 2014-). Amsterdam; Lausanne; New York; Oxford; Shannon; Tokyo: Elsevier. ISSN 1383-5742. [COBISS.SI-ID 1240341]
22. *Pathology oncology research*. Lah Turnšek, Tamara (član uredniškega odbora 1997-). Budapest: Tud. Kiadó. ISSN 1219-4956. [COBISS.SI-ID 21115]
23. *Poročilo o delu v letu ...*. Lah Turnšek, Tamara (član uredniškega odbora 1995-). (Tiskana izd.). Ljubljana: Nacionalni inštitut za biologijo, (199-)-. ISSN 1408-3299. [COBISS.SI-ID 68115968]
24. *Radiology and oncology*. Filipič, Metka (član uredniškega odbora 2007-), Lah Turnšek, Tamara (član uredniškega odbora 2007-). [Print ed.]. Ljubljana: Slovenian Medical Society - Section of Radiology; (Zagreb): Croatian Medical Association - Croatian Society of Radiology, 1992-. ISSN 1318-2099. http://www.degruyter.com/view/j/raon [COBISS.SI-ID 32649472]
25. *Spatula : glasilo Študentske sekcije Slovenskega farmacevtskega društva*. Breznik, Barbara (član uredniškega odbora 2010-). Ljubljana: Študentska sekcija Slovenskega farmacevtskega društva, 1997-. ISSN 1408-7650. [COBISS.SI-ID 79482624]
26. *Toxins : Elektronski vir*. Žegura, Bojana (gostujoči urednik 2020-2021), Štern, Alja (gostujoči urednik 2020-2021). Basel: MDPI, 2009-. ISSN 2072-6651. [COBISS.SI-ID 517594649]
27. HEATH, Ester (urednik), ISIDORI, Marina (urednik), KOSJEK, Tina (urednik), FILIPIČ, Metka (urednik). *Fate and effects of anticancer drugs in the environment*. Cham: Springer, 2020. XVI, 469 str., ilustr. ISBN 978-3-030-21047-2. ISBN 978-3-030-21048-9. https://link.springer.com/content/pdf/10.1007%2F978-3-030-21048-9.pdf. [COBISS.SI-ID 33111847]

ODDELEK ZA RAZISKAVE ORGANIZMOV IN EKOSISTEMOV

DEPARTMENT OF ORGANISMS AND ECOSYSTEMS RESEARCH

IZVIRNI ZNANSTVENI ČLANEK
ORIGINAL SCIENTIFIC ARTICLE

1. ABEL, Christopher, SCHNEIDER, Jutta M., KUNTNER, Matjaž, HARMS, Danilo. Phylogeography of the cosmopolitan orb-weaver Argiope trifasciata (Araneae: Araneidae). *Biological journal of the Linnean Society*, ISSN 0024-4066. [Print ed.], 2020, vol. 131, iss. 1, str. 61-75, ilustr., doi: 10.1093/biolinnean/blaa078. [COBISS.SI-ID 61909763]
2. BEDJANIČ, Matjaž, KALKMAN, Vincent J., SUBRAMANIAN, K. A. A new species of Orthetrum Newman, 1833 (Odonata: Libellulidae) from the Andaman Islands, India. *Zootaxa*, ISSN 1175-5326, 2020, vol. 4779, no. 1, str. 91-100, ilustr. [COBISS.SI-ID 15748355]
3. BEDJANIČ, Matjaž, ŽUNIČ, Alenka. Kobilica selka Locusta migratoria Linnaeus, 1758 - stara in nova vrsta v favni kobilic Slovenske Istre (Orthoptera: Acrididae). *Natura Sloveniae: revija za terensko biologijo*, ISSN 1580-0814. [Tiskana izd.], 2020, letn. 22, št. 2, str. 29-41. http://web.bf.uni-lj.si/bi/NATURA-SLOVENIAE/pdf/NatSlo_22_2_2.pdf,. [COBISS.SI-ID 46889219]
4. BRAMBILLA, Mattia, SCRIDEL, Davide, BAZZI, Gaia, ILAHIANE, Luca, IEMMA, Aaron, PEDRINI, Paolo, BASSI, Enrico, BIONDA, Radames, MARCHESI, Luigi, GENERO, Fulvio, TEUFELBAUER, Norbert, PROBST, Remo, VREZEC, Al, KMECL, Primož, MIHELIČ, Tomaž, BOGLIANI, Giuseppe, SCHMID, Hans, ASSANDRI, Giacomo, PONTARINI, Renato, BRAUNISCH, Veronika, ARLETTAZ, Raphaël, CHAMBERLAIN, Dan. Species interactions and climate change: how the disruption of species co-occurrence will impact on an avian forest guild. *Global change biology*, ISSN 1354-1013. Print ed., 2020, vol. 26, iss. 3, str. 1212-1224., doi: 10.1111/gcb.14953. [COBISS.SI-ID 5282383]
5. BRANCELJ, Anton, MORI, Nataša, TREU, Francesco, STOCH, Fabio. The groundwater fauna of the Classical Karst: hydrogeological indicators and descriptors. *Aquatic ecology*, ISSN 1386-2588, 2020, vol. 54, str. 205-224, doi: 10.1007/s10452-019-09737-w. [COBISS.SI-ID 5247567]
6. COLE, Lorna J., KLEIJN, David, DICKS, Lynn, STOUT, Jane C., POTTS, Simon G., ALBRECHT, Matthias, BALZAN, Mario V., BARTOMEUS, Ignasi, BEBELI, Penelope J., BEVK, Danilo, BIESMEIJER, Jacobus C., CHLEBO, Robert, DAUTARTE, Anželika, EMMANOUIL, Nikolaos, HARTFIELD, Chris, HOLLAND, John M., HOLZSCHUH, Andrea, KNOBEN, Nieke T. J., KOVÁCS-HOSTYÁNSZKI, Anikó, MANDELIK, Yael, PANOU, Heleni, PAXTON, Robert J., PETANIDOU, Theodora, PINHEIRO DE CARVALHO, Miguel A.A., RUNDLÖF, Maj, SARTHOU, Jean-Pierre, STAVRINIDES, Menelaos C., JOSE SUSO, Maria, SZENTGYÖRGYI, Hajnalka, VAISSIÈRE, Bernard E., VARNAVA, Androulla, MONTSERRAT, Vilà, ZEMECKIS, Romualdas, SCHEPER, Jeroen. A critical analysis of the potential for EU Common Agricultural Policy measures to support wild pollinators on farmland. *Journal of Applied Ecology*, ISSN 0021-8901. Print ed., 2020, vol. 57, iss. 4, str. 681-694, ilustr., doi: 10.1111/1365-2664.13572. [COBISS.SI-ID 40464133]
7. ČANDEK, Klemen, AGNARSSON, Ingi, BINFORD, Greta, KUNTNER, Matjaž. Caribbean golden orbweaving spiders maintain gene flow with North America. *Zoologica scripta*, ISSN 0300-3256, 2020, vol. 49, iss. 2, str. 210-221, doi: 10.1111/zsc.12405. [COBISS.SI-ID 5294927]
8. ČANDEK, Klemen, PRISTOVŠEK, Urška, KUNTNER, Matjaž. Machine learning approaches identify male body size as the most accurate predictor of species richness. *BMC biology*, ISSN 1741-7007, 2020, 18, article no. 105, str. 1-16, ilustr., doi: 10.1186/s12915-020-00835-y. [COBISS.SI-ID 27512067]
9. ČOKL, Andrej, ŽUNIČ, Alenka, LAUMANN, Raúl Alberto, VIRANT-DOBERLET, Meta. Female competition for availability of males in insects: the Nezara viridula (Linnaeus, 1758) model. *Insect science*, ISSN 1672-9609, 2020, vol. 27, iss. 4, str. 804-814, doi: 10.1111/1744-7917.12692. [COBISS.SI-ID 5072975]
10. FAY, Rémi, SCHAUB, Michael, BORDER, Jennifer A., HENDERSON, Ian G., FAHL, Georg, FEULNER, Jürgen, HORCH, Petra, MÜLLER, Mathis, REBSTOCK, Helmut, SHITIKOV, Dmitry, TOME, Davorin, VÖGELI, Matthias, GRÜEBLER, Martin U. Evidence for senescence in survival but not in reproduction in a short-lived passerine. *Ecology and evolution*, ISSN 2045-7758, 2020, vol. 10, str. 5383-5390, ilustr., doi: 10.1002/ece3.6281. [COBISS.SI-ID 22306563]
11. GÜNTER, Franziska, BEAULIEU, Michaël, FREIBERG, Kasimir F., WELZEL, Ines, TOSHKOVA, Nia, ŽAGAR, Anamarija, SIMČIČ, Tatjana, FISCHER, Klaus. Genotype-environment interactions rule the response of a widespread butterfly to temperature variation. *Journal of evolutionary biology*, ISSN 1010-061X, 2020, vol. 33, iss. 7, str. 920-929, ilustr., doi: 10.1111/jeb.13623. [COBISS.SI-ID 40591109]
12. KALKMAN, Vincent J., BABU, Raman, BEDJANIČ, Matjaž, CONNIFF, Karen, GYELTSHEN, T., KHAN, M. K., SUBRAMANIAN, K. A., ZIA, A., ORR, A. G. Checklist of the dragonflies and damselflies (Insecta: Odonata) of Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. *Zootaxa*, ISSN 1175-5334. [Online ed.], 2020, vol. 4849, no. 1, str. 1-84, ilustr. https://www.biotaxa.org/Zootaxa/article/view/zootaxa.4849.1.1. [COBISS.SI-ID 28131331]
13. KUNTNER, Matjaž, CODDINGTON, Jonathan A. Sexual size dimorphism: evolution and perils of extreme phenotypes in spiders. *Annual review of entomology*, ISSN 0066-4170. [Print ed.], 2020, vol.65, str. 57-80, doi: 10.1146/annurev-ento-011019-025032. [COBISS.SI-ID 5289551]
14. LUKAN, Tjaša, POMPE NOVAK, Maruša, BAEBLER, Špela, TUŠEK-ŽNIDARIČ, Magda, KLADNIK, Aleš, KRIŽNIK, Maja, BLEJEC, Andrej, ZAGORŠČAK, Maja, STARE, Katja, DUŠAK, Barbara, COLL RIUS, Anna, POLLMANN, Stephan, MORGIEWICZ, Karolina, HENNIG, Jacek, GRUDEN, Kristina. Precision transcriptomics of viral foci reveals the spatial regulation of immune-signaling genes and identifies RBOHD as an important player in the incompatible interaction between potato virus Y and potato. *The Plant journal*, ISSN 0960-7412, 2020, vol. 104, iss. 3, str. 645-661, ilustr., doi: 10.1111/tpj.14953. [COBISS.SI-ID 27546883]
15. LUO, Yufa, GOH, Seok Ping, LI, Daiqin, GONZAGA, Marcelo O, SANTOS, Adalberto J, TANIKAWA, Akio, YOSHIDA, Hajime, HADDAD, Charles R., MAY-COLLADO, Laura, GREGORIČ, Matjaž, TURK, Eva, KUNTNER, Matjaž, AGNARSSON, Ingi. Global diversification of Anelosimus spiders driven by long distance overwater dispersal and Neogene climate oscillations. *Systematic biology: a journal of the Society of Systematic Biologists*, ISSN 1063-5157. [Print ed.], 2020, vol. 69, iss. 6, str. 1122-1136, ilustr., doi: 10.1093/sysbio/syaa017. [COBISS.SI-ID 13831939]
16. MATJAŠIČ, Tjaša, DREO, Tanja, SAMARDŽIJA, Zoran, BAJT, Oliver, KANDUČ, Tjaša, SIMČIČ, Tatjana, MORI, Nataša. Preliminary experiments into colonization of microorganisms from activated sludge on different types of plastics = Preliminarni poskusi kolonizacije različnih tipov plastike z mikroorganizmi iz aktivnega blata. *Acta biologica slovenica: ABS*, ISSN 1408-3671. [Tiskana izd.], 2020, vol. 63, no. 1, str. 45-61, ilustr. [COBISS.SI-ID 26885379]
17. MEGÍA-PALMA, Rodrigo, ARREGUI, Lucía, POZO, Isaac, ŽAGAR, Anamarija, SEREN, Nina, CARRETERO, Miguel A., MERINO, Santiago. Geographic patterns of stress in insular lizards reveal anthropogenic and climatic signatures. *Science of the total environment*, ISSN 0048-9697, 20 Dec. 2020, vol. 749, [article] 141655, str. 1-10, ilustr., doi: 10.1016/j.scitotenv.2020.141655. [COBISS.SI-ID 27479299]
18. OPPEDISANO, Tiziana, POLAJNAR, Jernej, KOSTANJŠEK, Rok, DE CRISTOFARO, Antonio, IORIATTI, Claudio, VIRANT-DOBERLET, Meta, MAZZONI, Valerio. Substrate-borne vibrational communication in the vector of apple proliferation disease Cacopsylla picta (Hemiptera: Psyllidae). *Journal of economic entomology*, ISSN 0022-0493. [Print ed.], 2020, vol. 113, iss. 2, str. 596-603, doi: 10.1093/jee/toz328. [COBISS.SI-ID 5244751]
19. ORŁOWSKI, Grzegorz, MRÓZ, Lucyna, KADEJ, Marcin, SMOLIS, Adrian, TARNAWSKI, Dariusz, KARG, Jerzy, CAMPANARO, Alessandro, BARDIANI, Marco, HARVEY, Deborah J., MÉNDEZ, Marcos, THOMAES, Arno, VREZEC, Al, ZIOMEK, Krzysztof, RUDECKI, Andrzej L., MADER, Detlef. Breaking down insect stoichiometry into chitin-based and internal elemental traits: patterns and correlates of continent-wide intraspecific variation in the largest European saproxylic beetle. *Environmental pollution*, ISSN 0269-7491. [Print ed.], Jul. 2020, vol. 262, article 114064, str. 1-13, ilustr., doi: 10.1016/j.envpol.2020.114064. [COBISS.SI-ID 40641029]
20. ORŁOWSKI, Grzegorz, MRÓZ, Lucyna, KADEJ, Marcin, SMOLIS, Adrian, TARNAWSKI, Dariusz, KARG, Jerzy, CAMPANARO, Alessandro, BARDIANI, Marco, HARVEY, Deborah J., MÉNDEZ, Marcos, THOMAES, Arno, VREZEC, Al, ZIOMEK, Krzysztof, RUDECKI, Andrzej L., MADER, Detlef. Supporting dataset and methods for body sizes and concentrations of chemical elements measured in elytra and abdomens of Stag Beetles Lucanus cervus. *Data in brief*, ISSN 2352-3409, Aug. 2020, vol. 31, [article] 105935, str. 1-31, ilustr., doi: 10.1016/j.dib.2020.105935. [COBISS.SI-ID 22631427]
21. 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*, ISSN 1617-1381, Apr. 2020, vol. 54, [article] 125781, str. 1-8, ilustr., doi: 10.1016/j.jnc.2019.125781. [COBISS.SI-ID 40703749]
22. TOPLAK, Ivan, ŠIMENC, Laura, PISLAK, Metka, BEVK, Danilo. Determination of genetically identical strains of four honeybee viruses in bumblebee positive samples. *Viruses*, ISSN 1999-4915, 2020, vol. 12, no. 11, art. 1310, str. 1-16, ilustr., doi: 10.3390/v12111310. [COBISS.SI-ID 37519875]
23. TURK, Eva, ČANDEK, Klemen, KRALJ-FIŠER, Simona, KUNTNER, Matjaž. Biogeographical history of golden orbweavers: chronology of a global conquest. *Journal of biogeography*, ISSN 0305-0270, 2020, vol. 47, iss. 6, str. 1333-1344, ilustr., doi: 10.1111/jbi.13838. [COBISS.SI-ID 13834243]
23. VELILLA, Estefania, POLAJNAR, Jernej, VIRANT-DOBERLET, Meta, COMMANDEUR, Daniel, SIMON, Ralph, CORNELISSEN, Johannes H. C., ELLERS, Jacintha, HALFWERK, Wouter. Variation in plant leaf traits affects transmission and detectability of herbivore vibrational cues. *Ecology and evolution*, ISSN 2045-7758, 2020, vol. 10, iss. 21, str. 12277-12289, ilustr., doi: 10.1002/ece3.6857. [COBISS.SI-ID 30902531]
24. VINKO, Damjan, ŠALAMUN, Ali, TRATNIK, Ana, ERBIDA, Nina, PIRNAT, Aljoša, VRHOVNIK, Maja, KABLAR, Danijel, KOGOVŠEK, Peter, ŠRAMEL, Nina, HOSTNIK, Maja, ZALETELJ, Nika, ŠABEDER, Nik, TIVADAR, Nika, SNOJ, Jaka, BEDJANIČ, Matjaž. Favna kačjih pastirjev (Odonata) naravnega rezervata Ribniki v dolini Drage pri Igu (Ljubljansko barje, osrednja Slovenija). *Natura Sloveniae: revija za terensko biologijo*, ISSN 1580-0814. [Tiskana izd.], 2020, letn. 22, št. 2, str. 5-28. http://web.bf.uni-lj.si/bi/NATURA-SLOVENIAE/pdf/NatSlo_22_2_1.pdf,. [COBISS.SI-ID 46898947]
25. VITTORI, Miloš, VODNIK, Katarina, BLEJEC, Andrej. Changes in cuticle structure during growth in two terrestrial isopods (Crustacea: Isopoda: Oniscidea). *Nauplius*, ISSN 2358-2936, 28 Oct. 2020, vol. 28, e2020041, str. 1-11, ilustr., doi: 10.1590/2358-2936e2020041. [COBISS.SI-ID 35849475]
26. VREZEC, Al, AMBROŽIČ, Špela, KAPLA, Andrej (avtor, fotograf), RATAJC, Urška. Gradivo za favno hroščev (Coleoptera) Slovenije. 5. prispevek, Polyphaga: Staphyliniformia: Staphylinoidea: Silphidae = Material for the Beetle Fauna (Coleoptera) of Slovenia. 5th contribution, Polyphaga: Staphyliniformia: Staphylinoidea: Silphidae. *Scopolia: glasilo Prirodoslovnega muzeja Slovenije*, ISSN 0351-0077. [Tiskana izd.], 2020, no. 99, str. 1-153, ilustr., zvd. https://www.pms-lj.si/si/files/default/Publikacije/Strokovna-glasila/Scopolia_99.pdf. [COBISS.SI-ID 39666691]
27. XU, Xin, KUNTNER, Matjaž, BOND, Jason E., ONO, Hirotsugu, HO, Simon Y. W., LIU, Fengxiang, YU, Long, LI, Daiqin. Molecular species delimitation in the primitively segmented spider genus Heptathela endemic to Japanese islands. *Molecular phylogenetics and evolution*, ISSN 1055-7903, Oct. 2020, vol. 151, 106900, str. 1-8, ilustr., doi: 10.1016/j.ympev.2020.106900. [COBISS.SI-ID 22080003]

KRATKI ZNANSTVENI PRISPEVEK
SHORT SCIENTIFIC ARTICLE

28. RIPPLE, William J., WOLF, Christopher, NEWSOME, Thomas M., BARNARD, Phoebe, MOOMAW, William, BORDJAN, Dejan (podpisnik, sodelavec pri raziskavi), HOMŠAK, Marko (podpisnik, sodelavec pri raziskavi), JERAN, Matevž (sodelavec pri raziskavi), KROFL, Miha (podpisnik, sodelavec pri raziskavi), KURALT, Žan (podpisnik, sodelavec pri raziskavi), MALEJ, Milan (podpisnik, sodelavec pri raziskavi), MALEJ, Alenka (podpisnik, sodelavec pri raziskavi), MIKOŠ, Matjaž (podpisnik, sodelavec pri raziskavi), NAGEL, Thomas Andrew (podpisnik, sodelavec pri raziskavi), STRONEN, Astrid Vik (podpisnik, sodelavec pri raziskavi), ZAGMAJSTER, Maja (podpisnik, sodelavec pri raziskavi), ŽAGAR, Anamarija (podpisnik, sodelavec pri raziskavi), et al. World scientists' warning of a climate emergency: 11.258 scientist signatories from 153 countries. *Bioscience*, ISSN 0006-3568, jan. 2020, letn. 70, št. 1, str. 8-12, 100, 319, [15] str. pril., ilustr., doi: 10.1093/biosci/biz088. [COBISS.SI-ID 8982625]

OBJAVLJENI ZNANSTVENI PRISPEVEK NA KONFERENCI
PUBLISHED SCIENTIFIC CONFERENCE CONTRIBUTION

29. MATJAŠIČ, Tjaša, SIMČIČ, Tatjana, BAJT, Oliver, MORI, Nataša. Plastika kot onesnaževalo v rečnih sedimentih in njen vpliv na mikrobni metabolizem. V: CERKVENIK, Stanka (ur.). *Vodni dnevi 2020: simpozij z mednarodno udeležbo: zbornik referatov: 17.-18. september 2020, Rimske Toplice, Kongresni center Rimske terme*. Ljubljana: Slovensko društvo za zaščito voda. 2020, str. 229-238, ilustr. https://sdzv-drustvo.si/vodni-dnevi/arhiv-vodnih-dnevov/. [COBISS.SI-ID 29036035]
30. MORI, Nataša, DEBELJAK, Barbara, ZAGMAJSTER, Maja, FIŠER, Cene, BRANCELJ, Anton. Pogled pod površje - živi svet v podzemnih vodah rečnih nanosov. V: CERKVENIK, Stanka (ur.). *Vodni dnevi 2020: simpozij z mednarodno udeležbo: zbornik referatov: 17.-18. september 2020, Rimske Toplice, Kongresni center Rimske terme*. Ljubljana: Slovensko društvo za zaščito voda. 2020, str. 103-115, ilustr. https://sdzv-drustvo.si/vodni-dnevi/arhiv-vodnih-dnevov/. [COBISS.SI-ID 29031939]

SAMOSTOJNI ZNANSTVENI SESTAVEK ALI POGLAVJE V MONOGRAFSKI PUBLIKACIJI
INDEPENDENT SCIENTIFIC COMPONENT PART OR A CHAPTER IN A MONOGRAPH

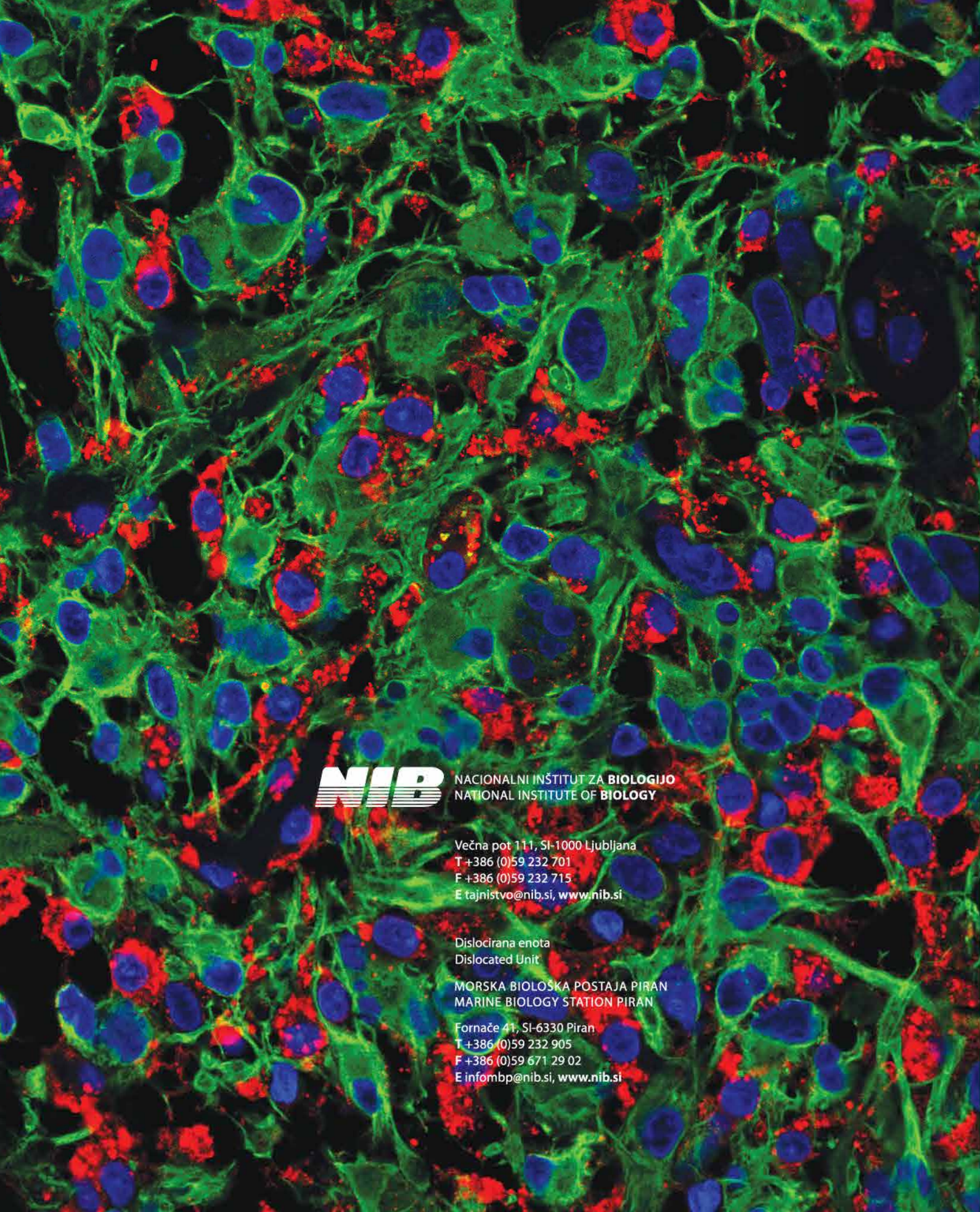
31. FRANGINI, Lorenzo, TOME, Davorin, FANIN, Yannick, PESARO, Stefano, FILACORDA, Stefano. Fedeltà del re di quaglie (Crex crex) all'area di canto durante una stagione riproduttiva = Zvestoba koscev (Crex crex) lokaciji oglašanja v času gnezdenja = Fidelity of corncrakes (Crex crex) to a singing position during one breeding season. V: ŽUNIČ, Alenka (ur.). *Approccio transfrontaliero alla conservazione e gestione dei siti Natura 2000 = Čezmejni pristop k ohranjanju in upravljanju z območji Natura 2000 = Transboundary approach to conservation and management of Natura 2000 sites*, (Knjižna zbirka Vse živo, zv. 6). 1a ed. Ljubljana: Nacionalni inštitut za biologijo: = National institute of biology. 2020, str. 139-162, ilustr. https://www.ita-slo.eu/sites/default/files/progetti/NAT2CARE%201-1.pdf. [COBISS.SI-ID 24941059]
32. VREZEC, Al, GENERO, Fulvio, AMBROŽIČ, Špela, BENUSSI, Enrico, KOCIJANČIČ, Stiven, MULEJ, Aljaž. Andamento della popolazione e variazioni della distribuzione dell'Allocco degli Urali (Strix uralensis) al margine del suo areale di distribuzione in Slovenia e Italia = Spremembe v razširjenosti in velikosti populacije kozače (Strix uralensis) na robu razširjenosti vrste v Sloveniji in Italiji = Population trends and distribution changes of the ural owl (Strix uralensis) at the edge of its distribution range in Slovenia and Italy. V: ŽUNIČ, Alenka (ur.). *Approccio transfrontaliero alla conservazione e gestione dei siti Natura 2000 = Čezmejni pristop k ohranjanju in upravljanju z območji Natura 2000 = Transboundary approach to conservation and management of Natura 2000 sites*, (Knjižna zbirka Vse živo, zv. 6). 1a ed. Ljubljana: Nacionalni inštitut za biologijo: = National institute of biology. 2020, str. 163-192, ilustr. https://www.ita-slo.eu/sites/default/files/progetti/NAT2CARE%201-1.pdf. [COBISS.SI-ID 24215043]
33. ŽUNIČ, Alenka, STRAZZABOSCHI, Luca, DE LUCA, Matteo, AMBROŽIČ, Špela, KAPLA, Andrej, KOCIJANČIČ, Stiven, STRITIH PELJHAN, Nataša, VREZEC, Al. Distribuzione del Rosalia alpina nell›area transfrontaliera Italia-Slovenia = Razširjenost alpskega kozlička (Rosalia alpina) na čezmejnem območju Italija-Slovenija = Distribution of the alpine longicorn (Rosalia alpina) in Italy-Slovenia transboundary area. V: ŽUNIČ, Alenka (ur.). *Approccio transfrontaliero alla conservazione e gestione dei siti Natura 2000 = Čezmejni pristop k ohranjanju in upravljanju z območji Natura 2000 = Transboundary approach to conservation and management of Natura 2000 sites*, (Knjižna zbirka Vse živo, zv. 6). 1a ed. Ljubljana: Nacionalni inštitut za biologijo: = National institute of biology. 2020, str. 217-246, ilustr. https://www.ita-slo.eu/sites/default/files/progetti/NAT2CARE%201-1.pdf. [COBISS.SI-ID 24212739]

ZNANSTVENI SESTAVEK V SLOVARJU, ENCIKLOPEDIJI, LEKSIKONU
SCIENTIFIC ENTRY IN DICTIONARY, ENCYCLOPAEDIA OR LEXICON

34. AGNARSSON, Ingi, KUNTNER, Matjaž. Araneae C. Linnaeus 1758, converted clade name. V: DE QUEIROZ, Kevin (ur.), CANTINO, Philip (ur.), GAUTHIER, Jacques A. (ur.). Phylonyms: a companion to the PhyloCode. Boca Raton: CRC Press. 2020, str. 613-616. [COBISS.SI-ID 22108163]
35. AGNARSSON, Ingi, KUNTNER, Matjaž. Araneomorphae F. P. Smith 1902, converted clade name. V: DE QUEIROZ, Kevin (ur.), CANTINO, Philip (ur.), GAUTHIER, Jacques A. (ur.). *Phylonyms: a companion to the PhyloCode*. Boca Raton: CRC Press. 2020, str. 623-624. [COBISS.SI-ID 22114819]
36. AGNARSSON, Ingi, KUNTNER, Matjaž. Mesothelae R. I. Pocock 1892, converted clade name. V: DE QUEIROZ, Kevin (ur.), CANTINO, Philip (ur.), GAUTHIER, Jacques A. (ur.). *Phylonyms: a companion to the PhyloCode*. Boca Raton: CRC Press. 2020, str. 617-618. [COBISS.SI-ID 22108931]
37. KUNTNER, Matjaž, AGNARSSON, Ingi. Mygalomorphae R. I. Pocock 1892, converted clade name. V: DE QUEIROZ, Kevin (ur.), CANTINO, Philip (ur.), GAUTHIER, Jacques A. (ur.). *Phylonyms: a companion to the PhyloCode*. Boca Raton: CRC Press. 2020, str. 621-622. [COBISS.SI-ID 22112515]
38. KUNTNER, Matjaž, AGNARSSON, Ingi. Opisthothelae R. I. Pocock 1892, converted clade name. V: DE QUEIROZ, Kevin (ur.), CANTINO, Philip (ur.), GAUTHIER, Jacques A. (ur.). *Phylonyms: a companion to the PhyloCode*. Boca Raton: CRC Press. 2020, str. 619-620. [COBISS.SI-ID 22109443]
39. VIRANT-DOBERLET, Meta. Čokl, Andrej: (1947-). *Slovenska biografija*, ISSN 2350-5370, 2020. https://www.slovenska-biografija.si/oseba/sbi1023230/. [COBISS.SI-ID 30142979]

UREDNIK
EDITOR

40. *Acta entomologica slovenica*. Vrezec, Al (član uredniškega odbora 2020-). Ljubljana: Slovensko entomološko društvo Štefana Michielija, 1993-. Ljubljana: Slovensko entomološko društvo Štefana Michielija, 1993-1994. Ljubljana: Slovensko entomološko društvo Štefana Michielija: Prirodoslovni muzej Slovenije, 1995-. ISSN 1318-1998. http://www.pms-lj.si/si/o-nas/arhiv-publikacij/acta-entomologica-slovenica. [COBISS.SI-ID 36553984]
41. *Annales: analiza istrske in mediteranske študije, Series historia naturalis*. Tome, Davorin (član uredniškega odbora 1994-). [Tiskana izd.]. Koper: Zgodovinsko društvo za južno Primorsko: Znanstveno raziskovalno središče Republike Slovenije = Capodistria: Società storica del Litorale: Centro di ricerche scientifiche della Repubblica di Slovenia = Koper: Science and Research Centre of the Republic of Slovenia, 1994-. ISSN 1408-533X. http://zdjp.si/p/annalesshn/. [COBISS.SI-ID 71951360]
42. *Biologia Macedonica*. Bedjanič, Matjaž (član uredniškega odbora 2006-). Skopje: Institut za biologija, Prirodno-matematički fakultet: = Institute for Biology, Faculty of Natural Sciences and Mathematics, 2006-. ISSN 1857-5277. [COBISS.SI-ID 27373613]
43. *Biota: revija za biologijo in ekologijo*. Bedjanič, Matjaž (član uredniškega odbora 1999-). Žalec: Društvo varuhov okolja Radoživ; Rače: Društvo za proučevanje ptic in varstvo narave, 2000-2008. ISSN 1580-4208. [COBISS.SI-ID 108263168]
44. *Bulletin of entomological research*. Virant-Doberlet, Meta (urednik 2005-). London: Commonwealth Bureau of Entomology. ISSN 0007-4853. [COBISS.SI-ID 3144463]
45. *Erjavecia: bilten*. Bedjanič, Matjaž (glavni urednik 1996-). Ljubljana: Slovensko odonatološko društvo, 1995-. ISSN 1408-8185. [COBISS.SI-ID 42700545] kategorija: SU (S) točke: 10
46. *Hacquetia*. Kuntner, Matjaž (član uredniškega odbora 2006-). [Tiskana izd.]. Ljubljana: ZRC SAZU, Biološki inštitut Jovana Hadžija, 2002-. ISSN 1581-4661. http://hacquetia.zrc-sazu.si. [COBISS.SI-ID 120166144]
47. *Herpetology notes: publication of the Societas Europaea Herpetologica*. Žagar, Anamarija (član uredniškega odbora 2016-). Bonn: Societas Europaea Herpetologica. ISSN 2071-5773. [COBISS.SI-ID 1056245]
48. *Image analysis & stereology: official journal of the International Society for Stereology*. Blejec, Andrej (član uredniškega odbora 2014-). [Tiskana izd.]. Ljubljana: Društvo za stereologijo in kvantitativno analizo slike, Medicinska fakulteta, 2000-. ISSN 1580-3139. [COBISS.SI-ID 106479104]
49. *Larus: godišnjak Zavoda za ornitologiju Hrvatske akademije znanosti i umjetnosti*. Vrezec, Al (član uredniškega odbora 2018-). Zagreb: Razred za prirodne znanosti Hrvatske akademije znanosti i umjetnosti, 1991-. [COBISS.SI-ID 36355584]
50. *Metodološki zvezki*. Blejec, Andrej (član uredniškega odbora 2005-). [Tiskana izd.]. Ljubljana: Fakulteta za družbene vede, 2004-. ISSN 1854-0023. https://www.stat-d.si/mz/. [COBISS.SI-ID 215795712]
51. *National geographic, Slovenija*. Vrezec, Al (član uredniškega odbora 2009-). Ljubljana: Rokus, 2006-. Ljubljana: Rokus, 2006-2008. Ljubljana: Rokus Klett, 2009-. ISSN 1854-4851. http://www.dlib.si/details/URN:NBN:SI:spr-ICOOAPNE. [COBISS.SI-ID 225874688]
52. *Natura Sloveniae: revija za terensko biologijo*. Bedjanič, Matjaž (član uredniškega odbora 1999-), Mori, Nataša (član uredniškega odbora 2013-), Polajnar, Jernej (tehnični urednik 2007-). [Tiskana izd.]. Ljubljana: Zveza za tehnično kulturo Slovenije, 1999-. Ljubljana: Zveza za tehnično kulturo Slovenije, 1999-2011. Ljubljana: Biotehniška fakulteta Univerze: Nacionalni inštitut za biologijo, 2012-. ISSN 1580-0814. http://web.bf.uni-lj.si/bi/NATURA-SLOVENIAE/] [COBISS.SI-ID 102784768]
53. *Periodicum biologorum: an interdisciplinary international journal of the Societas Scientiarum Naturalium Croatica established 1885*. Vrezec, Al (področni urednik 2015-). Zagreb: Hrvatsko prirodoslovno društvo, 1970-. ISSN 0031-5362. https://hrcak.srce.hr/ojs/index.php/periodicum_biologorum/issue/archive. [COBISS.SI-ID 5560834]
54. *PloS one*. Kuntner, Matjaž (član uredniškega odbora 2014-). San Francisco (CA): Public Library of Science, 2006-. ISSN 1932-6203. [COBISS.SI-ID 2005896]
55. *Poročilo o delu v letu ...*. Blejec, Andrej (član uredniškega odbora 1995-), Virant-Doberlet, Meta (član uredniškega odbora 1995-). [Tiskana izd.]. Ljubljana: Nacionalni inštitut za biologijo, [199-]-. ISSN 1408-3299. [COBISS.SI-ID 68115968]
56. *Scopolia: glasilo Prirodoslovnega muzeja Slovenije*. Vrezec, Al (član uredniškega odbora 2009-). [Tiskana izd.]. Ljubljana: Prirodoslovni muzej Slovenije, 1978-. ISSN 0351-0077. [COBISS.SI-ID 15960578]
57. *Svet ptic: revija Društva za opazovanje in proučevanje ptic v Sloveniji*. Vrezec, Al (član uredniškega sveta 2000-). [Tiskana izd.]. Ljubljana: Društvo za opazovanje in proučevanje ptic Slovenije DOPPS, 2000-. ISSN 1580-3600. [COBISS.SI-ID 107164672]
58. *Trdoživ: bilten slovenskih terenskih biologov in ljubiteljev narave*. Bedjanič, Matjaž (član uredniškega odbora 2012-). [Tiskana izd.]. Ljubljana: Slovensko odonatološko društvo [etc.], 2012-. ISSN 2232-5999. https://botanicno-drustvo.si/publikacije/trdoziv/ [COBISS.SI-ID 261923840]
59. *Varstvo narave: revija za teorijo in prakso varstva naravne dediščine*. Vrezec, Al (član uredniškega odbora 2019-). [Tiskana izd.]. Ljubljana: Zavod Republike Slovenije za varstvo naravne in kulturne dediščine, 1962-. ISSN 0506-4252. http://www.dlib.si/details/URN:NBN:SI:spr-KTOLY9PX. [COBISS.SI-ID 6433794]
60. *ZooKeys*. Kuntner, Matjaž (področni urednik 2012-). Sofia: Pensoft Publishers, 2008-. ISSN 1313-2989. [COBISS.SI-ID 517960729]
61. AMBROŽIČ, Špela (avtor, fotograf), TOME, Davorin (urednik), MORI, Nataša (urednik), VREZEC, Al (urednik). *60 obrazov biodiverzitete = [60] views of biodiversity. avtorji fotografij in risb Špela Ambrožič Ergaver ... et al.]*. 1. izd. Ljubljana: Nacionalni inštitut za biologijo, 2020. 142 str., fotogr. ISBN 978-961-94802-1-2. [COBISS.SI-ID 304300032]
62. *Čmrljica*. BEVK, Danilo, BEVK, Danilo (urednik). Ljubljana: [samozal.] D. Bevk, 2014-. [COBISS.SI-ID 3057999]
63. DE QUEIROZ, Kevin (urednik), CANTINO, Philip (urednik), GAUTHIER, Jacques A. (urednik). *Phylonyms: a companion to the PhyloCode*. Boca Raton: CRC Press, 2020. XXVII, 1324 str., ilustr. ISBN 978-1-138-33293-5. ISBN 1-138-33293-3. [COBISS.SI-ID 22096131] (KUNTNER, Matjaž – član uredniškega odbora)
64. PODOBNIK, Anica (urednik), DOLINAR, Vinko (urednik), RUDOLF, Vinko (urednik), JEZERŠEK, Ivan (urednik), PETERNELJ, Franci (urednik), ŠEGA, Janez (urednik), BEVK, Danilo (urednik, fotograf). *60 let s čebelami: zbornik ob obletnici delovanja Čebelarskega društva Sovodenj (1960-2020)*. 1. natis. Sovodenj: Čebelarsko društvo, 2020. 132 str., ilustr. ISBN 978-961-07-0066-1. [COBISS.SI-ID 24671491]
65. ŽIBERNA, Marjan, DERMASTIA, Marina (urednik), TOME, Davorin (urednik). *Rastvejitev: prvih 1,89341556 x 10 [zgoraj] 9 sekund: Nacionalni inštitut za biologijo 1960-2020*. Ljubljana: Nacionalni inštitut za biologijo, 2020. 191, [3] str., [1] zganj. pril., ilustr. ISBN 978-961-94802-0-5. [COBISS.SI-ID 28756739]
66. ŽUNIČ, Alenka (urednik). *Approccio transfrontaliero alla conservazione e gestione dei siti Natura 2000 = Čezmejni pristop k ohranjanju in upravljanju z območji Natura 2000 = Transboundary approach to conservation and management of Natura 2000 sites*, (Knjižna zbirka Vse živo, zv. 6). 1a ed. Ljubljana: Nacionalni inštitut za biologijo: = National institute of biology, 2020. 280 str., ilustr. ISBN 978-961-94802-2-9. https://www.ita-slo.eu/sites/default/files/progetti/NAT2CARE%201-1.pdf. [COBISS.SI-ID 19919363]



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