



Poročilo o delu 2013
.....
Annual Report 2013



NACIONALNI INŠTITUT ZA BIOLOGIJO
NATIONAL INSTITUTE OF BIOLOGY

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NAGOVOR DIREKTORICE OB PODELITVI NAGRAD IN PRIZNANJ NACIONALNEGA INŠTITUTA ZA BIOLOGIJO IN PRAZNOVANJU NJEGOVE 53. OBLETNICE

Spoštovani cenjeni gostje, sodelavke in sodelavci, dragi prijatelji!

Najprej iskrena hvala, da ste nas počastili s svojo prisotnostjo in se z nami povrnili za več kot pol stoletja v preteklost, ko se je rojeval Nacionalni inštitut za biologijo, tedaj imenovan Institut za biologijo Univerze v Ljubljani. Vrsta mojih predhodnikov, ki je sledila ustanoviteljem, se tudi v slabih časih, ki so seveda že bili – ni nikoli predajala malodušju in zato sem prepričana, da se bomo z energijo, nepopustljivostjo in vztrajnim delom, ki jo črpamo iz preteklosti v prihodnost, lahko ognili tudi strelam, ki že dve leti švigajo z naših vrhov in ciljajo tudi znanost – prav zdaj – ko jo najbolj potrebujemo za izhod iz krize! A seveda danes ne želim razprav o politiki, ekonomski krizi in krizi vrednot! Mi tu jih imamo in ohranjamo – naša vrednota je radovednost, je znanje, ki ga ustvarjamo in osebno verjamem, da nas vodi po zapletenih poteh evolucije v sonaravni razvoj naše civilizacije.

Zato nekaj več o biologiji, ki jo mnogi poznajo le iz šolskih knjig in zatem še to pozabijo – a se njenega ogromnega pomena za naš današnji obstoj – danes sploh ne zavedajo. Biologija – veda o živem je danes prešla svoje ozke statične okvire in se preliva in zliva v vede kot so n.pr. biofizika, farmacija in medicina, kjer je razumevanje bio-molekul in zakonitosti delovanja celic ključ za njihov razvoj, za uporabo ob bolnikovi postelji! In ko znana zdravila ne delujejo več, ko ne znamo zajeziti že epidemiološko pojavljanje, n.pr rakavih obolenj – se ustavimo prav tu – ob nezadostnem znanju biologije celic in njihovega delovanja!



Prof. dr. **TAMARA LAH TURNŠEK**,
direktorica NIB.

*Prof. Dr. Tamara Lah Turnšek,
Director NIB.*

(Foto | Photo: Žiga Ivanc)

Nacionalni inštitut za biologijo.
National Institute of Biology.

(Foto: arhiv NIB | Photo: Archive NIB)

Biologija sega v druge vsakdanja področja npr .biotehnologije hrane in njeno varnost. o kateri se danes sprašujemo in zanjo skrbimo mnogo bolj kot pred nekaj leti. In se prestrašeno zazremo v njene sestavine in njihove nepoznane učinke. Ko nam razvoj tehnologij prinaša genetsko spremenjene produkte, ki jih brez pridržkov sprejemamo, ko gre za zdravila, a s hudimi predsodki ko gre za hrano in s popolnim neznanjem ko gre za njihovo zlivanje z naravnim okoljem, kjer prav zaradi neznanja preti največja nevarnost uporabe – in se zopet ustavimo – ob neznanju biologije!

In ko danes prestrašeno zremo v silovite ujme, tajfune, ali suše in druge znake globalnega segrevanja in klimatskih sprememb, ki so postale že dela vsakodnevnih novic – se zavemo, da gre za Naravo, kjer se ruši ravnotežje med neživo materijo in hitrim spreminjanjem živega ekosistema. Kar je lahko tako vzrok kot posledica teh sprememb – in se zopet ustavimo – ob neznanju biologije!

Zato naj danes poudarim pomen temeljnih raziskav in se zahvalim SAZU za pokroviteljstvo našemu znanstveno raziskovalnemu delu, to je raziskavam, ki težijo k razumevanju osnovnih zakonitosti v biologiji.

In medtem in ob tem samodejno rastejo in našega znanja nove, še do nedavnega neznane smeri, kot je sintezna biologije, sistemska biologije in bioinformatike, bionike, bisenzorika, ki kar vabijo gospodarstvo, da jih preskusi v praksi. Tako prelivamo znanja v poslovni sektor – ko nas in če ta potrebuje. Da imajo še posebno nekateri naši sodelav-



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DIRECTOR'S ADDRESS AT THE AWARDS CEREMONY OF THE NATIONAL INSTITUTE OF BIOLOGY AND AT THE 53RD ANNIVERSARY

Dear distinguished guests, colleagues, and friends!

First I would like to thank you for honouring us with your presence and for travelling with us to the moment more than half a century ago when the National Institute of Biology, then called the Institute of Biology at the University in Ljubljana, was born. My predecessors as well as the founders of the institute never gave up hope facing difficult times that naturally have also occurred before. Therefore, I'm convinced that employing the energy, resilience and determination drawn from our past and carried into our future we will avoid the lightning that has been launched from the tops of our government and has been also directed to strike science at the precise moment we need it most in order to help us out of the crisis! Today of course I do not wish to discuss the politics, economic crisis, or the crisis of values! Us here at NIB have the values and maintain them – our values are the curiosity and the knowledge we are creating. I personally believe that the two are guiding us through the complex paths of the evolution toward the sustainable development of our civilization.

Therefore, I should dedicate more words to biology, the science that many only remember from school books and soon thereafter forget and certainly do not comprehend its enormous significance for our present existence. Biology is a science of life that has long ago outgrown its narrow frame and has spilled over into as well as fused with other sciences such as biophysical, pharmaceutical, and medicinal sciences where the understanding of biomolecules and the laws that govern the functioning of the living cells are critical for the development of these sciences as much as to be used



Nacionalni inštitut za biologijo.
National Institute of Biology.

(Foto: arhiv NIB | Photo: Archive NIB)

directly in sick patient care! When conventional medications are no longer effective and we cannot prevent epidemiological events such as cancer illness we are stopped right here: at the inadequate knowledge of cell biology and cell function!

Biology is also extending into other areas of our every day existence such as biotechnology of food and food safety that today is more important and more questionable to us than ever before. It is frightening to look into the components of our food and their unknown effects. When the advanced technologies bring us genetically modified products, we accept them without hesitation in case of medications, meet them with harsh bias in case of our food, and display a complete ignorance in case of their release and integration into the natural environment, which in fact is the biggest danger of their use due to our inadequate understanding – we stumble again over the lack of our knowledge of biology!

When nowadays we are frightened observers of powerful storms, typhoons, devastating draughts as well as the other signs of the global warming and the climate change that have become a regular part of our daily news, we become aware that it is the Nature where the balance is broken between the living and non-living matter and where fast changes are taking place within the living ecosystems. The latter may be at the same time a consequence as well as the reason for the changes – which makes us pause again in face of the inadequate knowledge of biology! This is why today I would like to stress the importance of the basic research in biology, and would like to take this opportunity to thank the Slovenian Academy of Sciences and Arts (SAZU) for its patronage in our scientific research work, more specifically the research that is geared toward understanding the basic principles in biology.

In the meanwhile and parallel to the above mentioned events, new and formerly entirely unknown domains of biology are emerging from our knowledge, such as synthetic biology, systemic biology and bioinformatics, bionics, and biology of biosensors that are all available to the present economy and ready to be exploited in practice. This is why we are constantly transferring our knowledge into the business sector – when it's needed and if it's needed. Some of our colleagues are particularly well tuned to these needs which is visible in our ever growing number of business partnerships, especially in frame of several Centres of Excellence (CO),

ci izostren posluh zanj, priča naša rast poslovnih sodelovanj, posebno v okviru nekaterih CO, rast patentov in letošnja okrepitev Pisarne za prenos tehnologij. Ta strokovno podpira naša prizadevanja k izmenjavi znanj s podjetji visokih tehnologij, ki je ključen za hitrejši tehnološki in gospodarski razvoj. Vendar zahtevati, da bi se znanstveniki prelevili v gospodarstvenike, je ravno tako neumno, kot pričakovati od gospodarstvenikov, da bi postali znanstveniki. Tu naj uporabim misel kolega Jadrana Lenarčiča: »če mora gospodarstvenik imeti idejo in vanjo močno verjeti, mora znanstvenik imeti mnogo idej in vanje močno dvomiti!« zato sta torej to dva svetova, med katerimi seveda lahko in mora teči kreativen dialog!

A naše poslanstvo razumemo tudi kot dolžnost, da to znanje prelijemo med mlade in vzgajamo MR tudi v drugih veččinah, ki jih zahteva življenje. Ti novi doktorji znanosti, ki jih bomo danes nagradili in izhajajo iz našega dela, so namreč nujno potrebna gonilna sila inovativnega razvoja Slovenije, kot pravimo – a se zdi, da jih naše okolje vse manj prepoznava in pusti da masovno odhajajo v tujino, brez vračila v vse vloženo. Poskusi zajeziti ta tok so žal prešibki. Naj na tem mestu ponovno apeliram na vrh slovenske politike in ARRS, da s krčenjem javnih sredstev na področju znanosti in razvoja počasi, a zanesljivo režejo vejo, na kateri sedimo – ne le znanstveniki, pač vsi državljani Slovenije! Še več, taka znanstveno raziskovalna politika – če se tako sploh še lahko imenuje – je v popolnem nasprotju s politiko bolj razvitih držav sveta, tudi Evrope, ki v času recesije in finančne krize pospešeno vlagajo v znanost, da čimprej požanje razvojno naravnano gospodarstvo.



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National Institute of Biology.

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Naj tu tudi omenim druge svetove – n.p.r. države BRIC še posebej Brazilijo – v čast našega dragega častnega gosta NE Ambasadorja Gilerta Muora Neta – države Brazilije, in iz katere sem se nedavno vrnila – da je cilj vlaganj brazilske vlade in agencij prav graditi mlade raziskovalce in razvojnike s pomočjo povečane izmenjave s tujino, a obenem ustvarjanjem pogojev za njihovo vrnitev in delo doma! To je edina prava pot, zato vidi tudi NIB, ki tudi sicer deluje globalno – prav v partnerstvu z Brazilijo velik izziv tudi za Slovenijo!

Skoraj polovica našega dela pa je usmerjena v uporaba znanj in razvoj veččin za sodelovanje s strokovnimi službami raznih ministrstev, ki pokrivajo področje našega dela in kjer ohranjamo svojo znanstveno in strokovno nepristranost! V dobršni meri je to prav ministrstvo, ki ga vod minister mag. Dejan Židan, ki bo danes o tem povedal kaj več.

Naj zaključim z besedami našega znanega, žal letos preminulega akademika prof. Roberta Blinca povprašali o tem, kakšen je pomen znanosti za rešitev krize, je odvrnil, da znanost sama ne bo rešila nobene – ne ekološke ne finančne globalne krize. Vendar brez znanosti se iz te krize ni moč rešiti! Vemo namreč, da znanost sama dviguje splošno znanje, njegovo uporabo in omogoča prilagodljivost družbe in posameznika – na spremembe – preživetje – kar seveda biologom ni tuje!

Želim vam torej, da bi v današnjem popoldnevu ujeli kakšno novo misel, srečali stare znance in spoznali nove obraze in se poveselili. saj je navsezadnje Martinovo, ko se mošt spremeni v vino čemur seveda tudi botruje – biologija majhnih organizmov – kvasovk!

Tamara Lah Turnšek
Direktorica NIB

growing number of patents, and in a this year's expansion of the Technology Transfer Office at NIB. The latter is supporting our efforts to exchange the knowledge with the high technology enterprises which is of critical importance to faster development of technology and economy. However, it is important to keep in mind that the scientists cannot be entirely turned into the economists since this would be equally foolish as expecting the economists being turned into scientists. Let me borrow the thought of my colleague Jadran Lenarčič who said »While the economist must possess one idea and needs to believe in it strongly, the scientists must have many ideas and doubt them thoroughly!« This clearly illustrates that there are two separate worlds who despite their differences can and must maintain a creative dialog!*

We understand that our mission is also the obligation to transfer our knowledge to a younger generation, therefore we educate our young researchers in various skills that the life demands. These new doctors of science who are going to receive their awards today and who arise directly from our scientific work, are an important driving force of the innovation and development in Slovenia, as we like to say – although it seems as if our social environment gives them less and less recognition and allows them to move abroad in masses, without a chance of ever returning what we have invested in them. Sadly, any attempts to stop this process remain too weak. Let me use this opportunity to remind those at the very top of the Slovenian politics and the Slovenian Research Agency (ARRS) that by cutting the public financial support for science and development they are surely cutting the branch that we all sit on – not only the scientists but all citizens of Slovenia! Moreover, this kind of scientific research policy – if one can still call it this way – is in stark contrast with the research politics in more developed countries in the world as well as in Europe, which in the present times of recession and financial crisis are still investing in science so they could as soon as possible harvest the fruits of their development-oriented economies.

Let me mention also some other such as the BRIC countries and especially Brazil, not only in honour of our honourable guest his Excellency the Ambassador of Brazil Gilerto Muora Neto but also because it is the country where I have recently returned from and where I have learned that the goal of the Brazilian government and its agencies is to build young researchers and develop

Morska biološka postaja Piran,
Nacionalni inštitut za biologijo.
Marine Biology Station Piran,
National Institute of Biology.

(Foto: arhiv NIB | Photo: Archive NIB)



pers by intensifying the international student exchange and at the same time re-assuring the conditions for their return and work at home! This is the only right way which is well recognized here at NIB who is already acting globally and maintains that the partnership with Brazil is an interesting and great opportunity for Slovenia in general.

Almost half of our effort is directed toward using the knowledge and developing the skills for collaboration with the professional offices at various ministries who are employing our areas of expertise and where we are maintaining our scientific and professional independence! At large this represents the ministry lead by the Minister Mag. Dejan Židan.

Let me conclude with the words of our well known academic Prof. Robert Blinc who sadly passed away this year. He said when asked about the role of science in resolving the crisis that the science itself is not going to resolve neither the ecological or financial global crisis but it is important to know that the crisis cannot be resolved without the science! It is well known that the science alone is increasing general knowledge and its use and that it enables the society as well as the individuals to adapt to changes and survive, which is not at all an estranged thought to the biologists!

I wish that this afternoon each one of you will catch some new thoughts, meet some old acquaintances and some new faces and rejoice. After all it is the Saint Martin's day when cider turns into wine which of course is yet another contribution of biology – coming from the tiny microorganism called yeast!

Tamara Lah Turnšek
Director of NIB

POMEMBNI MEJNIKI V RAZVOJU INŠTITUTA

29. april 1960

Sprejet je bil Akt o ustanovitvi Inštituta za biologijo na Oddelku za biologijo Biotehniške fakultete Univerze v Ljubljani, v prostorih na Aškerčevi 12 v Ljubljani.

1969

Ustanovljena je bila Morska biološka postaja, ki je do leta 1980 delovala v prostorih stare družinske vile v Portorožu.

1975

Inštitut se je preoblikoval v enovito delovno organizacijo.

1980

Morska biološka postaja se je preselila v preurejene prostore tovarne Salvetti na obali pred Piranom.

1988

Ljubljanski del inštituta se je preselil v prostore na Karlovški 19 v Ljubljani.

25. marec 1994

Sprejet je bil Sklep o ustanovitvi javnega raziskovalnega zavoda Inštitut za biologijo, pod katerega sta se kot ustanovitelja podpisala Vlada RS in Univerza v Ljubljani.

1995 - 1998

Ljubljanski del inštituta se je postopoma selil v novo zgradbo Biološkega središča na Večni poti 111 v Ljubljani.

17. januar 1998

Inštitut se je preimenoval v Nacionalni inštitut za biologijo ali skrajšano NIB, ki ga je ustanovila Vlada RS.

2004 - 2006

Morska biološka postaja se je postopoma selila v novo zgradbo, zgrajeno na mestu stare.

DOSEDANJI DIREKTORJI

Prof. dr. Hubert Pehani

(Trebne, 1.11.1900 – 24.2.1995) je bil prvi direktor Inštituta za biologijo in sicer od ustanovitve 29.4.1960 do leta 1966.

Prof. dr. Miran Vardjan (Lož, 1.5.1919 – 15.10.2005) je Inštitut za biologijo vodil od 1966 do 1968.

Prof. dr. Franc Sušnik

(Prevalje, 28.12.1930 – 12.9.1996) je bil na čelu Inštituta za biologijo Univerze v Ljubljani med letoma 1968 in 1976.

Prof. dr. Matija Gogala

(Ljubljana, 11.2.1937) je bil direktor Inštituta za biologijo Univerze v Ljubljani od 1976 do 1979.

Dr. Milan Lovka

(Ljubljana, 12.2.1946) je Inštitut za biologijo vodil od 1979 do 1984.

Mag. Mitja Grosman

(Ljubljana, 5.1.1951) je Inštitut vodil od leta 1984 do 1988.

Prof. dr. Andrej Čokl

(Ljubljana, 16.6.1947) je bil direktor Inštituta za biologijo od leta 1988 do 1996.

Prof. dr. Tamara Lah

Turnšek (Ljubljana, 1.3.1947) vodi inštitut od leta 1996 dalje.

KEY MILESTONES IN THE DEVELOPMENT OF THE INSTITUTE

April 29, 1960

Adoption of the Regulation on Establishment of the Institute of Biology at the Biology Department of the Biotechnical Faculty of University of Ljubljana, located at Aškerčeva 12 in Ljubljana.

1980

The Marine Biological Station was reallocated to refurbished premises of the Salvetti factory on the coast near Piran.

1995 - 1998

The Ljubljana part of the Institute gradually moved to the new building of the Biological Centre on Večna pot 111 in Ljubljana.

1969

Establishment of the Marine Biological Station, which operated in an old family villa in Portorož until 1980.

1988

The Ljubljana part of the Institute moved to premises on Karlovška 19 in Ljubljana.

January 17, 1998

The Institute was renamed the National Institute of Biology, short the NIB, established by the Government of the RS.

1975

The Institute was reorganised to a joint working organisation.

March 25, 1994

Adoption of the Decision on Establishment of the Public Research Institution the Institute of Biology, jointly established by the Government of the RS and the University of Ljubljana.

2004 - 2006

The Institute was renamed the National Institute of Biology, short the NIB, established by the Government of the RS.

PREVIOUS DIRECTORS

Prof. Dr. Hubert Pehani

(Trebne, 1 November 1900 – 24 February 1995) was the first director of the Institute of Biology since its establishment on 29 April 1960 until 1966.

Prof. Dr. Miran Vardjan (Lož, 1 May 1919 – 15 October 2005) was head of the Institute of Biology from 1966 to 1968.

Prof. Dr. Franc Sušnik

(Prevalje, 28 December 1930 – 12 September 1996) was the head of the Institute of Biology of the University of Ljubljana between 1968 and 1976.

Prof. Dr. Matija Gogala

(Ljubljana, 11 February 1937) was head of the Institute of Biology of the University of Ljubljana from 1976 to 1979.

Dr. Milan Lovka (Ljubljana, 12 February 1946) was head of the Institute of Biology from 1979 to 1984.

Mitja Grosman, MSc (Ljubljana, 5 January 1951) was head of the Institute from 1984 to 1988.

Prof. Dr. Andrej Čokl

(Ljubljana, 16 June 1947) was director of the Institute of Biology from 1988 to 1996.

Prof. Dr. Tamara Lah

Turnšek (Ljubljana, 1 March 1947) is the director of the institute since the year 1996.

ORGANIZACIJSKA SHEMA

ORGANIZATIONAL CHART



VODSTVO INŠTITUTA INSTITUTE MANAGEMENT



DIREKTORICA
Director
Prof. dr. Tamara Lah Turnšek

POMOČNIK DIREKTORICE
Deputy Director
Mag. Franc Potočnik



ODDELEK ZA ENTOMOLOGIJO
Department of Entomology
doc. dr. Meta Virant-Doberlet

doc. dr. Meta Virant-Doberlet

VODJE ODDELKOV

HEADS OF DEPARTMENTS



001
MORSKA BIOLOŠKA POSTAJA PIRAN
Marine Biology Station Piran
izr. prof. dr. Vlado Malačič

izr. prof. dr. Vlado Malačič



005
ODDELEK ZA GENSKO TOKSIKOLOGIJO IN BIOLOGIJO RAKA
Department of Genetic Toxicology and Cancer Biology
izr. prof. dr. Metka Filipič

izr. prof. dr. Metka Filipič



002
ODDELEK ZA RAZISKOVANJE SLADKOVODNIH IN KOPENSKIH EKOSISTEMOV
Department of Freshwater and Terrestrial Ecosystems Research
prof. dr. Anton Brancelj

prof. dr. Anton Brancelj



BIOLOŠKA KNJIŽNICA
The Biology Library
Barbara Črnač

Barbara Črnač



003
ODDELEK ZA BIOTEHNOLOGIJO IN SISTEMSKO BIOLOGIJO
Department of Biotechnology and Systems Biology
izr. prof. dr. Maja Ravnikar

izr. prof. dr. Maja Ravnikar



SKUPNE SLUŽBE
Corporate Services
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Znanstveni svet NIB, od 26. 4. 2012 do 25. 4. 2016
NIB Scientific Council, from 26. 4. 2012 to 25. 4. 2016

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- Dr. **Mateja Urlep**, TikhePharma d.o.o.
- Dr. **Peter Venturini**, HELIOS, Tovarna barv, lakov in umetnih smol Količevo, d.o.o.

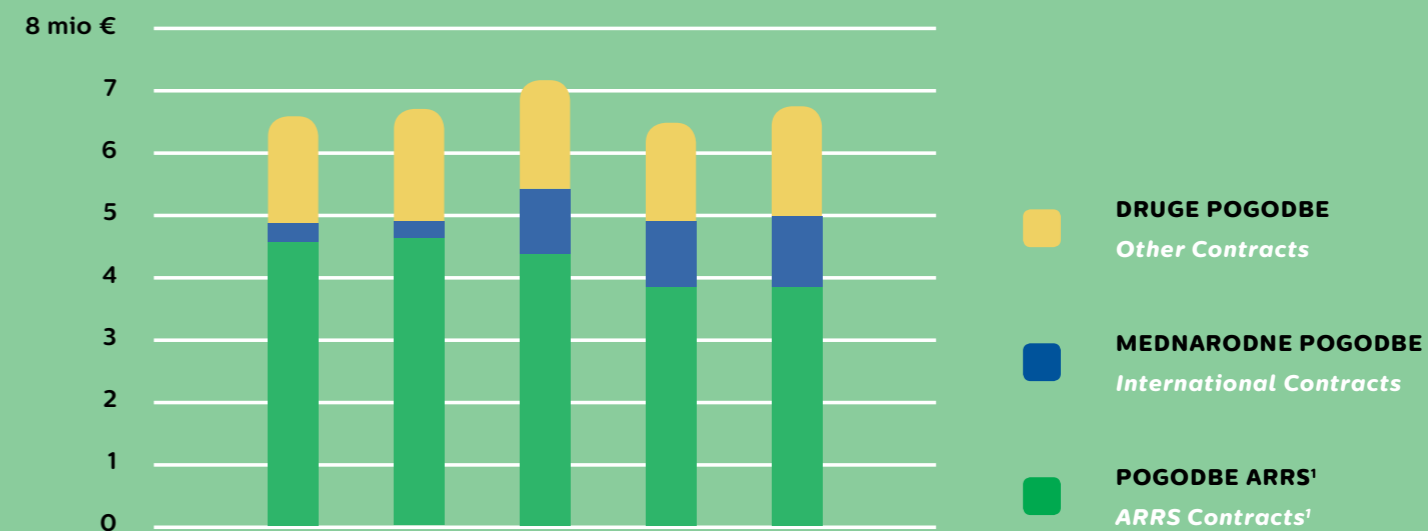
Sestava Upravnega odbora NIB od 9. 7. 2010 dalje.
Board of Governors since 9.7. 2010.

STRUKTURA FINANCIRANJA

FINANCING STRUCTURE

VRSTA FINANCIRANJA <i>Type of Financing</i>	v EUR					INDEKS <i>Index 13/12</i>	STRUKTURA <i>Structure 2013</i>
	2009	2010	2011	2012	2013		
POGODBE ARRS ¹ <i>ARRS Contracts¹</i>	4.654.896	4.705.303	4.449.760	3.906.696	3.905.393	100	57
MEDNARODNE POGODBE <i>International Contracts</i>	298.877	277.285	1.073.662	1.071.189	1.164.369	109	17
DRUGE POGODBE <i>Other Contracts</i>	1.764.208	1.835.134	1.784.468	1.624.100	1.803.595	111	26
SKUPAJ <i>Total</i>	6.717.981	6.817.722	7.307.890	6.601.985	6.873.357	104	100

¹ Javna agencija za raziskovalno dejavnost RS = *Slovenian Research Agency*



OSNOVNA RAZISKOVALNA DEJAVNOST

MAIN RESEARCH ACTIVITIES

Programi ARRS | ARRS Programmes

MBP	P1-0237	Raziskave obalnega morja <i>Coastal Marine Research</i>	Prof. dr. Alenka Malej
EKO	P1-0255	Združbe, odnosi in komunikacije v ekosistemi <i>Communities, Relations and Communications in the Ecosystems</i>	Prof. dr. Anton Brancelj
FITO	P4-0165	Rastlinska fiziologija in biotehnologija <i>Plant Physiology and Biotechnology</i>	Prof. dr. Maja Ravnikar
GEN	P1-0245	Ekotoksikologija, toksikološka genomika in karcinogeneza <i>Ecotoxicology, Toxicogenomics and Carcinogenesis</i>	Prof. dr. Tamara Lah Turnšek
MBP	P1-0143	Kroženje snovi v okolju, snovna bilanca in modeliranje okoljskih procesov in ocena tveganja (skupaj z IJS) <i>Cycling of Substances in the Environment, Mass Balances, Modelling of Environmental Processes and Risk Assessment (joint with IJS)</i>	Prof. dr. Jadran Faganeli

Število projektov | Number of Projects

VRSTA POGODB <i>Type of contract</i>	2012	2013
ARRS	25	24
MEDNARODNE <i>International</i>	30	34
GOSPODARSTVO IN DRUGA JAVNA SLUŽBA <i>Other Contracts</i>	67	53
SKUPAJ <i>Total</i>	122	110



Raziskovalno delo na NIB.
Research work at NIB.

(Foto: arhiv FITO | Photo: Archive FITO)

Mednarodno sodelovanje *International Cooperation*

Število projektov | Number of Projects

MULTILATERALNO MEDNARODNO SODELOVANJE <i>Multilateral International Cooperation</i>	2013	2012
7. OKVIRNI PROGRAM <i>7th Framework Programme</i>	12	10
STRUKTURNI SKLADI <i>Structural and Cohesion EU Funds</i>	7	5
DRUGO (UNEP, IOI, IRMM, ...) <i>Other</i>	15	16
SKUPAJ <i>Total</i>	34	31

Število projektov | Number of Projects

BILATERALNO SODELOVANJE <i>Bilateral Cooperation</i>	2012	2013
Argentina <i>Argentina</i>	1	1
Avstrija <i>Austria Republic</i>	1	0
Bosna in Hercegovina <i>Bosnia and Herzegovina</i>	1	1
Brazilija <i>Brazil</i>	5	3
Črna gora <i>Montenegro</i>	1	1
Finska <i>Finland</i>	1	1
Francija <i>France</i>	1	1
Hrvaška <i>Croatia</i>	2	2
Indija <i>India</i>	1	1
Italija <i>Italy</i>	1	1
Japonska <i>Japan</i>	2	1
Kitajska <i>China</i>	1	1
Koreja <i>Republic of Korea</i>	0	1
Rusija <i>Russia</i>	1	1
Turčija <i>Turkey</i>	1	1
ZDA <i>USA</i>	3	1
SKUPAJ <i>Total</i>	23	18

7. okvirni program EU 7th Framework Programme

1. Quarantine Pest Detection for Use by National Plant Protection Organizations (NPPO) and Inspection Services (**Q-DETECT**); 7.OP; 1.3.2010 – 28.2.2013 (nosilka/PI: M. Ravnikar, A. Čokl)
2. Cost-Effective Hand-Held Device for Rapid In-Field Detection of Flavescence Doree Phytoplasma in Grapevines (**VITISENS**); 7. OP; 1.2.2011 – 31.1.2013 (nosilka/PI: M. Ravnikar)
3. Rationally Designed Aquatic Receptors Integrated in Label-free Biosensor Platforms for Remote Surveillance of Toxins and Pollutants (**RADAR**); 7.OP; 1.1.2011 – 31.12.2014 (nosilka/PI: V. Turk)
4. Fate and Effects of Cytostatic Pharmaceuticals in the Environment and the Identification of Biomarkers For an Improved Risk Assessment on Environmental Exposure (**CytoThreat**); 7.OP; 1.1.2011 – 31.12.2014 (nosilka/PI: M. Filipič)
5. Pan-European Infrastructure for Ocean and Marine Data Management (**Seadatanet II**); 7.OP; 1.10.2011 – 30.9.2015 (nosilka/PI: B. Čermelj)
6. Policy-oriented marine Environmental Research in the Southern European Seas (**PERSEUS**); 7.OP; 1.1.2012 – 31.12.2015 (nosilka/PI: A. Malej)
7. Prototype Operational Continuity for the GMES Ocean Monitoring and Forecasting Service (**MyOcean 2**); 7.OP; 1.4.2012 – 31.10.2014 (nosilec/PI: V. Malačič)
8. Infrastructure for Systems Biology – Europe (**ISBE**); 7.OP; 1.10.2012 – 30.9.2015 (nosilka/PI: K. Gruden)
9. Researchers Night 2013 – Researchers for nature preservation and technology use for the benefit of the society (**ReNATECH**); 7.OP; 1.5.2013 – 30.10.2013 (nosilka/PI: N. Glavaš/M. Oblak)
10. Support for training and career development of researchers (**INTERFACES**); 7.OP; 1.11.2013 – 30.4.2017 (nosilka/PI: V. Turk)
11. Sensing toxicants in Marine waters makes Sense using biosensors (**SMS**); 7.OP; 1.12.2013 – 31.8.2017 (nosilka/PI: N. Kovač)
12. Development of cost efficient advanced dna-based methods for specific traceability issues and high level on-site (**DECATHLON**); 7.OP; 1.12.2013 – 30.11.2016 (nosilka/PI: J.Žel)

Projekti, financirani iz strukturnih skladov Structural and Cohesion EU Funds

1. Določanje novih biomarkerjev možganskih tumorjev – gliomov za diagnozo in kot nove tarče zdravljenja (**GLIOMA**) / Identification of New Glioma Biomarkers as Potential Diagnostic and Therapeutic Targets (**GLIOMA**); Program čezmejnega sodelovanja Slovenija – Italija; 1.11.2011 – 31.10.2014 (nosilka/PI: T. Lah Turnšek)
2. Kraški vodonosnik kot strateški čezmejni vodni vir / Karstic aquifer as strategic trans-boundary water source (**HYDROKARST**); Program čezmejnega sodelovanja Slovenija – Italija; 1.2.2012 – 31.1.2015 (nosilec/PI: A. Brancelj)
3. Grebeni in koraligen severnega Jadrana: ovrednotenje in trajnostno upravljanje v Tržaškem zalivu / Rocky outcrops and coralligenous formations in the North Adriatic: enhancement and sustainable management in the Gulf of Trieste (**TRECOLARA**) – Program čezmejnega sodelovanja Slovenija – Italija; 14.10.2012–14.10.2014 (nosilka/PI: M. Orlando Bonaca)
4. Strengthening common reaction capacity to fight sea pollution of oil, toxic and hazardous substances in Adriatic Sea (**HAZADR**) – IPA projekt; 1.10.2012–31.3.2015 (nosilec/PI: B. Čermelj)
5. Kompetenčni center za biotehnoški razvoj in inovacije – **KC BRIN** / Competency Centre for Biotechnological Development and Innovation – CCBDI; 15.12.2010 – 31.12.2013 (nosilka/PI: K. Gruden)
6. Ballast Water Management System for Adriatic Sea Protection (**BALMAS**); IPA program, 1.11.2013 – 31.3.2016 (nosilka/PI: V. Flander Putrle)
7. Center odličnosti za biosenzoriko, instrumentacijo in procesno kontrolo (**COBIK**); ustanovljen 3.12.2009 / Centre of Excellence for Biosensors, Instrumentation and Process Control, established 3.12.2009

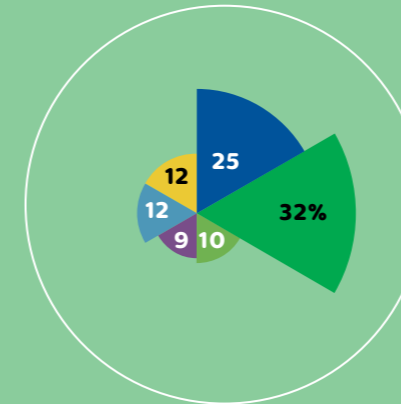
Drugi mednarodni projekti Other International Projects

1. Targeted Precision Biocontrol and Pollination Enhancement in Organic Cropping Systems (**BICOPOLL**); ERA-NET, 1.11.2011 – 31.10.2014 (nosilec/PI: A. Čokl)
2. Marine Debris Removal and Preventing Further Litter Entry (**Marine Clean**); ECO-INNOVATION; 1.11.2011–31.10.2014 (nosilka/PI: J. France)
3. Metrology for monitoring infectious diseases, antimicrobial resistance, and harmful microorganisms (**INFECT-MET**); program EURAMET; 1.6.2012–31.5.2015 (nosilka/PI: M. Milavec)
4. Traceability for biologically relevant molecules and entities (**BIO-SITrace**); program EURAMET; 1.7.2013–30.6.2016 (nosilka/PI: T.Dreo)
5. Validation of detection methods for GMOs (**GMO-VAL**); 1.1.2013–31.12.2014 (nosilka/PI: J. Žel)
6. Zlata trsna rumenica / Grapevine flavescence doree (**GRAFDEPI2**); ERA-NET, 10.11.2013 – 9.11.2015 (nosilka/PI: M. Dermastia)
7. Innovative Technology for Cyanobacterial Bloom Control (**LIFE StopCyanobloom**); program LIFE+; 1.7.2013–31.12.2016 (nosilka/PI: B. Sedmak)
8. BIH FARMA, Proficiency test for identification and confirmation methods for potato brown rot and potato ring rot (nosilka/PI: T. Dreo)
9. COST FA 0807, Integrirano upravljanje fitoplazemskih epidemij pri različnih kmetijsko pomembnih rastlinah / Integrated Management of Phytoplasma Epidemics in Different Crop Systems (nosilka/PI: M. Dermastia)
10. COST FA 0804, Molekularno kmetijstvo: rastline kot proizvodna platforma za proteine visoke vrednosti, Molecular farming: plants as a production platform for high value proteins (nosilka/PI: J. Žel)
11. COST FA 0806, Kontrola rastlinskih virusov z uporabo RNA cepiv: novi ne-transgeni pristopi / Plant virus control employing RNA-based vaccines: A novel non-transgenic strategy (nosilka/PI: Š. Baebler)
12. COST FA1103, Endofiti v Biotehnologiji in kmetijstvu / Endophytes in Biotechnology and Agriculture (Nosilka: P. Kogovšek)
13. COST FA 1106, Integriran sistemski pristop za določanje razvojnih mehanizmov, ki nadzorujejo mesnatega sadja kakovost paradiznika in vinske trte / Integrated systems approach to determine the developmental mechanisms controlling fleshy fruit quality in tomato and grapevine (nosilka/PI: K. Gruden)
14. COST BM 1006, Next Generation Sequencing Data Analysis Network (nosilka/PI: K. Gruden)
15. COST TA 1201, Gender STE- Gender, Science, Technology and Environment (nosilka/PI: A. Rotter)
16. EMBOS COST Action ES1003 Development and implementation of pan-European Marine Biodiversity Observatory System, (nosilka/PI: prof. dr. Alenka Malej)

ŠTEVILO IN SESTAVA SODELAVCEV PO ENOTAH NA DAN 31. 12. 2013 NUMBER AND STRUCTURE OF STAFF BY UNITS ON 31. 12. 2013

	Raziskovalci <i>Scientific Staff</i>	Mladi razisko- valci <i>Young Researchers</i>	Tehnični so- delavci <i>Tehncians</i>	Administracija <i>Administration</i>	SKUPAJ <i>Total</i>
MORSKA BIOLOŠKA POSTAJA PIRAN <i>Marine Biology Station</i>	19	8	6	1	34
ODDELEK ZA RAZISKOVANJE SLADKOVODNIH IN KOPENSKIH EKOSISTEMOV <i>Department of Freshwater and Terrestrial Ecosystems Research</i>	7	5	3	0	15
ODDELEK ZA BIOTEHNOLOGIJO IN SISTEMSKO BIOLOGIJO <i>Department of Biotechnology and Systems Biology</i>	21	13	6	2	42
ODDELEK ZA ENTOMOLOGIJO <i>Department of Entomology</i>	6	1	0	0	7
ODDELEK ZA GENSKO TOKSIKOLOGIJO IN BIOLOGIJO RAKA <i>Department of Genetic Toxicology and Cancer Biology</i>	9	4	2	0	15
SKUPNE SLUŽBE <i>Corporate Services</i>	0	0	0	16	16
SKUPAJ <i>Total</i>	62	31	17	19	129

Število in sestava sodelavcev po enotah na dan 31. 12. 2013 Number and Structure of Staff by Units on 31. 12. 2013

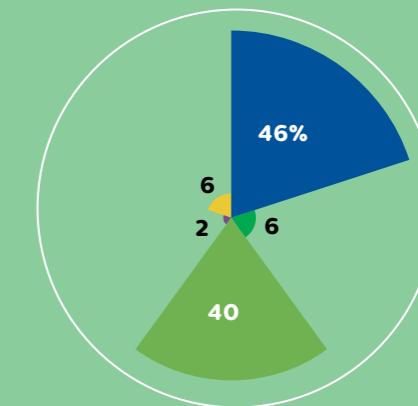


- **MORSKA BIOLOŠKA POSTAJA PIRAN**
Marine Biology Station
- **ODDELEK ZA RAZISKOVANJE SLADKOVODNIH
IN KOPENSKIH EKOSISTEMOV**
*Department of Freshwater and Terrestrial
Ecosystems Research*
- **ODDELEK ZA BIOTEHNOLOGIJO
IN SISTEMSKO BIOLOGIJO**
*Department of Biotechnology
and Systems Biology*
- **ODDELEK ZA ENTOMOLOGIJO**
Department of Entomology
- **ODDELEK ZA GENSKO TOKSIKOLOGIJO
IN BIOLOGIJO RAKA**
*Department of Genetic Toxicology
and Cancer Biology*
- **SKUPNE SLUŽBE**
Corporate Services

IZOBRAZBENA STRUKTURA ZAPOSLENIH EMPLOYEES LEVEL OF EDUCATION

Na dan 31.12.2013 je bilo na Nacionalnem inštitutu za biologijo zaposlenih 129 sodelavcev, od tega 64 doktorjev znanosti, 5 magistrstov, 49 z visoko izobrazbo, 3 z zaključeno višjo šolo ter 8 s srednješolsko izobrazbo. Število zaposlenih se je glede na stanje 31.12.2012 zmanjšalo za 0,77 %.

On 31st of December 2013, we recorded 129 employees with the following degree of education: Ph.D. (64), Master degree (5), Bachelor degree (49), Vocational College (3), secondary school (8). Number of employees was reduced by 0,77 % compared to the previous year.



- **DOKTOR ZNANOSTI | Ph.D.**
- **MAGISTERIJ | M. Sc.**
- **VISOKA IZOBRAZBA | Higher Education**
- **VIŠJA IZOBRAZBA | Vocational College**
- **SREDNJA ŠOLA | Secondary School**

DOKTORATI V LETU 2013 DOCTORAL THESES IN YEAR 2013

- **BORDJAN, Dejan.** Vpliv nadmorske višine na gnezditveno biologijo velike sinice (*Parus major* Linnaeus, 1758) = *Effect of altitude on breeding biology of great tit* (*Parus major* Linnaeus, 1758). Mentor: izr. prof. dr. Davorin Tome
- **GLAVAŠ, Neli.** Sestava in pretvorbe petole in solinskega blata v Sečoveljskih solinah = *Composition and transformations of petola and saline mud from Sečovlje salina*. Mentorica: doc. dr. Nives Kovač
- **KORON, Neža.** Povezave med organsko snovjo in živim srebrom v obalnem morju in lagunah = *Interaction of natural organic matter with mercury in coastal marine and lagoon environments*. Mentor: prof. dr. Jadran Faganeli
- **PETEK, Marko.** Interakcije med krompirjem (*Solanum tuberosum* L.), krompirjevim virusom Y (PVY) in koloradskim hroščem (*Leptinotarsa decemlineata* Say) na molekularnem nivoju = *Interactions between potato (*Solanum tuberosum* L.), potato virus Y (PVY) and Colorado potato beetle (*Leptinotarsa decemlineata* Say) at molecular level*. Mentorica: izr. prof. dr. Kristina Gruden
- **PEZDIRC, Marko.** Mehanizmi toksičnega in genotoksičnega delovanja heterocikličnih aromatskih aminov in ekstraktov pečene mesa v celicah človeškega hepatoma (HepG2) = *Mechanisms of the toxic and genotoxic mode of action of heterocyclic aromatic amines and grilled meat extracts in human hepatoma cell line (HepG2)*. Mentorica: izr. prof. dr. Metka Filipič
- **PODERGAJS, Neža.** Vloga signalnih poti EGFR in FGFR ter novih označevalcev pri glioblastomskih matičnih celicah = *Influence of EGFR and FGFR Signaling Pathways and Novel Markers on Glioblastoma Stem Cells*. Mentorica: prof. dr. Tamara Lah Turnšek
- **ŠTRASER, Alja.** Genotoksično delovanje cianobakterijskih toksinov na humane celice v pogojih in vitro = *Genotoxic activity of cyanobacterial toxins in human cells in vitro*. Mentorica: doc. dr. Bojana Žegura
- **VOJVODA, Jana.** Letna dinamika in raznolikost amonij-oksidirajočih arhej in bakterij v obalnem morju Tržaškega zaliva = *Annual dynamics and diversity of ammonia-oxidizing archaea and bacteria in coastal waters of the Gulf of Trieste*. Mentorica: izr. prof. dr. Valentina Turk

Odstotek objav glede na objave v letu 2004 Percent of Publications (2004 = 100 %)



- **ZNANSTVENI ČLANKI Z IF**
Scientific Papers with IF
- **ZNANSTVENI ČLANKI BREZ IF**
Other Scientific Papers
- **STROKOVNI IN POLJUDNI ČLANKI**
Professional and Popular Articles
- **OBJAVLJENI PRISPEVKI KONGRESOV**
Published Conference Papers

PREGLED OBJAVLJENIH DEL ZA LETA 2004 - 2013 OVERVIEW OF PUBLISHED PAPERS FOR YEARS 2004 - 2013

ZVRST DOKUMENTA TYPE OF DOCUMENT	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	SKUPAJ Total
znanstveni članki z IF <i>scientific papers with IF</i>	32	34	52	46	58	71	58	72	86	83	592
znanstveni članki brez IF <i>other scientific papers</i>	19	16	21	28	24	25	21	9	16	7	186
strokovni in poljudni članki <i>professional and popular articles</i>	45	43	22	64	63	76	56	69	66	62	566
objavljeni prispevki s kongresov <i>published conference papers</i>	41	41	26	25	25	40	40	39	18	24	319
povzetki s kongresov <i>published conference paper abstracts</i>	72	97	108	140	115	161	145	159	101	166	1264
poglavja v knjigah <i>book chapters</i>	13	9	6	3	9	12	13	10	14	28	117
knjige <i>books</i>	2	2	5	5	5	1	3	4	4	3	34
poročila <i>reports</i>	37	35	31	23	31	30	30	27	28	34	306
doktorska dela <i>dissertation theses</i>	6	2	7	6	3	4	7	8	7	9	59
magistrska dela <i>master's theses</i>	1	1		2				1	1		6
patenti <i>patents</i>		2	1				2	4	3	2	14
razno <i>other</i>	42	59	37	53	76	73	93	128	121	207	889
SKUPAJ <i>Total</i>	310	341	316	395	409	493	468	530	465	625	4352

POUČEVANJE NA UNIVERZAH

UNIVERSITY TEACHING

Mednarodna podiplomska šola Jožef Stefan / *Jožef Stefan International Postgraduate School*

- Prof. dr. Anton Brancelj
- Prof. dr. Andrej Čokl
- Izr. prof. dr. Metka Filipič
- Izr. prof. dr. Kristina Gruden
- Prof. dr. Tamara Lah Turnšek
- Prof. dr. Alenka Malej
- Doc. dr. Andreja Ramšak
- Izr. prof. dr. Maja Ravnikar
- Izr. prof. dr. Bojan Sedmak
- Izr. prof. dr. Davorin Tome
- Izr. prof. dr. Valentina Turk
- Doc. dr. Al Vrezec
- Izr. prof. dr. Jana Žel

UNIVERZA V LJUBLJANI

UNIVERSITY OF LJUBLJANA

Biotehniška fakulteta / *Biotechnical Faculty*

- Prof. dr. Andrej Blejec
- Prof. dr. Andrej Čokl
- Prof. dr. Marina Dermastia
- Prof. dr. Jadran Faganeli
- Izr. prof. dr. Kristina Gruden
- Prof. dr. Tamara Lah Turnšek
- Dr. Helena Motaln
- Doc. dr. Maruša Pompe Novak
- Izr. prof. dr. Maja Ravnikar
- Izr. prof. dr. Davorin Tome
- Doc. dr. Al Vrezec
- Izr. prof. dr. Jana Žel

Fakulteta za kemijo in kemijsko tehnologijo

Faculty of Chemistry and Chemical Technology

- Izr. prof. dr. Kristina Gruden
- Prof. dr. Tamara Lah Turnšek
- Dr. Helena Motaln

Fakulteta za matematiko in fiziko

Faculty of Mathematics and Physics

- Prof. dr. Andrej Blejec

Fakulteta za pomorstvo in promet /

Faculty of Maritime Studies and Transport

- Izr. prof. dr. Oliver Bajt
- Prof. dr. Jadran Faganeli
- Doc. dr. Nives Kovač
- Prof. dr. Lovrenc Lipej
- Izr. prof. dr. Vlado Malačič
- Prof. dr. Alenka Malej

Interdisciplinarni doktorski študijski program Biomedicina

Interdisciplinary Doctoral Programme in Biomedicine

- Izr. prof. dr. Metka Filipič
- Izr. prof. dr. Kristina Gruden
- Prof. dr. Tamara Lah Turnšek

Interdisciplinarni doktorski študijski program Statistika /

Interdisciplinary Doctoral Programme in Statistics

- Prof. dr. Andrej Blejec

Interdisciplinarni doktorski študijski program Varstvo okolja

Interdisciplinary Doctoral Programme in Environmental Protection

- Prof. dr. Andrej Blejec
- Prof. dr. Jadran Faganeli
- Prof. dr. Alenka Malej

Magistrski program Uporabna Statistika

Masters programme Applied Statistics

- Prof. dr. Andrej Blejec

UNIVERZA V MARIBORU

UNIVERSITY OF MARIBOR

Fakulteta za naravoslovje in matematiko / *Faculty of Natural Sciences and Mathematics*

- Doc. dr. Damijan Denac
- Prof. dr. Lovrenc Lipej
- Izr. prof. dr. Davorin Tome

UNIVERZA V NOVI GORICI

UNIVERSITY OF NOVA GORICA

Visoka šola za vinogradništvo in vinarstvo

Faculty of Viticulture and Enology

- Doc. dr. Maruša Pompe Novak
- Izr. prof. dr. Maja Ravnikar

Fakulteta za znanosti o okolju

Faculty of Environmental Sciences

- Prof. dr. Anton Brancelj
- Prof. dr. Andrej Čokl
- Izr. prof. dr. Metka Filipič
- Doc. dr. Maruša Pompe Novak
- Izr. prof. dr. Davorin Tome
- Dr. Tatjana Simčič
- Izr. prof. dr. Valentina Turk
- Doc. dr. Al Vrezec

UNIVERZA NA PRIMORSKEM

UNIVERSITY OF PRIMORSKA

Fakulteta za matematiko, naravoslovje in informacijske tehnologije

Faculty of Mathematics, Natural Sciences and Information Technologies

- Prof. dr. Lovrenc Lipej
- Doc. dr. Patricija Mozetič
- Doc. dr. Al Vrezec

Pedagoška fakulteta Koper / *Faculty of Education Koper*

- Doc. dr. Nives Kovač
- Doc. dr. Patricija Mozetič

UNIVERZA V TRSTU

UNIVERSITY OF TRIESTE

UNIVERSITÀ DEGLI STUDI DI TRIESTE

Fakulteta za znanstvene vede / *Faculty of Sciences*

Facoltà delle scienze

- Prof. dr. Lovrenc Lipej

EVRO-SREDOZEMSKA UNIVERZA EMUNI

Euro-Mediterranean University EMUNI

- Prof. dr. Alenka Malej
- Doc. dr. Andreja Ramšak
- Izr. prof. dr. Valentina Turk

OSTALI VISOKOŠOLSKI ZAVODI

OTHER HIGHER EDUCATIONAL INSTITUTIONS

Visoka šola za varstvo okolja, Velenje / *High School for Environmental Protection, Velenje*

- Prof. dr. Bojan Sedmak

PREDAVANJA NA SEDEŽU INŠTITUTA INSTITUTE COLLOQUIA

1. Dr. **Jan Kreuze**, CIP (International Potato Center): »Sekvenciranje in sestavljanje majhnih RNA molekul: rekonstrukcija virusnih genomov iz obrambnih molekul / *Small RNA sequencing and assembly: reconstructing viral genomes from defence molecules*«, 21.2.2013.
2. Prof. dr. Maja Ravnikar in dr. Tanja Dreo, Nacionalni inštitut za biologijo: »Nove raziskave, da bodo rastline zdrave! / *New research for plant health*«, 22. 1.2013.
3. Dr. **Gianfranco Diretto**, Junior Research Scientist, Italian National Agency for New Technologies, Energy and Sustainable Development (ENEA), Casaccia Research Center, Rome (Italy): »Pristopi sistemske biologije pri poljščinah s spremenjeno vsebnostjo β -karotena / *Approaches of Systems Biology of Metabolically Engineered Crops Enriched in β -Carotene Content*«, 25.4.2013.
4. Prof. Dr. **Henning Ulrich**, Department of Biochemistry, Institute of Chemistry, University of São Paulo, Brazil: »Tehnologija aptamer: Učinkovito orodje za bazično raziskovanje, diagnostiko in terapijo / *The Aptamer Technology: Powerful Tools in Basic Science, Diagnostics and Therapy*«, 29.4.2013.
5. Dr. **Raúl Alberto Laumann**, Brazilska raziskovalna organizacija za kmetijstvo, EMBRAPA: »Kemična ekologija v službi varstva rastlin: brazilske izkušnje / *Chemical Ecology applied to pest management: a Brazilian experience*«, 9.5.2013.
6. Dr. **Monika Bright**, University Professor, Department of Limnology and Oceanography, University of Vienna (Austria): »Od mladičev do orjaških črvov cevkarjev – tiotrofična simbioza na globokomorskih hidrotermalnih vrelic / *From tiny babies to giant tubeworms – thiotrophic symbiosis at deep-sea hydrothermal vents*«, 23.5.2013.
7. Dr. **Darja Marolt**, NYSCF-Helmsley Investigator, The New York Stem Cell Foundation Research Institute, New York, USA: »Uporaba humanih pluripotentnih matičnih celic za gojenje nadomestnih tkiv / *Human pluripotent stem cells' use in tissue regeneration*«, 20.6.2013.

8. **Joel L. Vanneste**, New Zealand Institute for Plant & Food Research Ltd: »Pseudomonas syringae pv. actinidiae, tri leta po odkritju v Novi Zelandiji: kaj smo se naučili o patogenu, o bolezni in kako se jo obvladuje? / *Pseudomonas syringae pv. actinidiae, three years after its discovery in New Zealand: what have we learned about the pathogen, the disease and how to control it?*«, 26.9.2013.
9. **Nadia A. Atai**, Department of Neurology and Program in Neuroscience, Massachusetts General Hospital and Harvard Medical School, Boston (USA); Department of Cell Biology and Histology, Academic Medical Center (AMC), University of Amsterdam, Amsterdam (The Netherlands): »Heparin zavira izločanje in horizontalni prenos zunajceličnih veziklov iz glioma celic / *Heparin blocks horizontal transfer of glioma-derived extracellular vesicles*«, 18.11.2013.

Predavanje izr. prof. dr. **MAJE RAVNIKAR**: »Nove raziskave, da bodo rastline zdrave!«

Lecture by Prof. Dr. Maja Ravnikar: »New Research for Plant Health«

(Foto | Photo: Jana Erjavec)



PREDAVANJA NA MBP PIRAN COLLOQUIA AT MBS PIRAN

1. Dr. **Boris Petelin** in Dr. Branko Čermelj, MBP: »SEADATANET 2 in podatkovne baze MBP / *SEADATANET project and the data bases at MBP*«, 20.05.2013.
2. Prof. dr. **Karin Elisabeth Rengefors**, Aquatic Ecology Unit, Department of Biology, Univerza Lund, Švedska: »Vzorci speciacije, disperzije in invazije pri mikroalgah / *Speciation, dispersal, and invasion patterns in microalgae*«, 4.10.2013.
3. Dr. **Lovrenc Lipej**, MBP: »Spremljanje morske biodiverzitete v Naravnem rezervatu Strunjan s posebnim poudarkom na vplivu klimatskih sprememb na izbrane biološke elemente / *Monitoring the biodiversity at the Strunjan Nature Reserve, with special regard to the effect of climate change on selected biological elements*«, 4.11.2013.
4. **Snježana Karinja**, muzejska svetovalka iz Pomorskega muzeja Piran: »Podvodna arheologija / *Underwater archeology*«, 02.12.2013.
5. Dr. **Shin-ichi Uye**, Graduate School of Biosphere Science, Hiroshima University, Japan: »Mehanizmi, napovedi in ukrepi pri masovnem pojavljanju meduz / *Frontier of jellyfish blooms study: Mechanism, forecast and countermeasure of the blooms*«, 4.12.2013.
6. **Simone Cosoli**, Istituto Nazionale di Oceanografia e Geofisica Sperimentale: »Prevladujoče značilnosti tokovanja v Tržaškem zalivu, določene s pomočjo meritev radarja, modela ter ADCP / *Dominant features in the circulation of the Trieste Gulf as revealed by radar, model and ADCP measurements*«, 10.12.2013.



Predavanje prof. dr. **LOVRENCA LIPEJA** na MBP Piran.
Lecture by Prof. Dr. Lovrenc Lipej at MBP Piran.

(Foto | Photo: H. Končar)

POMEMBNI DOGODKI

SVEČANA PODELITEV NAGRAD IN PRIZNANJ MIROSLAVA ZEIA

V Biološkem središču na Večni poti 111 v Ljubljani, je v ponedeljek 11.11.2013, ob 53. letnici obstoja Nacionalnega inštituta za biologijo, potekala že četrta svečana podelitev nagrad in priznanj Nacionalnega inštituta za biologijo, poimenovanih po prof. dr. Miroslavu Zeiu, ki je bil med njegovimi ustanovitelji.

Nagrade Miroslava Zeia so bile podeljene posameznikom za njihove izjemne dosežke na področju osnovnih in uporabnih raziskav ved o življenju ter uresničevanja vizij in poslanstva NIB.

Svečan dogodek je potekal pod častnim pokroviteljstvom Ministrstva za kmetijstvo in okolje ter Slovenske akademije znanosti in umetnosti. Zbrane goste sta slavnostno nagovorila mag. Dejan Židan, minister za kmetijstvo in okolje ter prof. dr. Tamara Lah Turnšek, direktorica NIB. Predsednik SAZU, akad. prof. dr. Jože Trontelj, ki se podelitvi ni mogel udeležiti, je gostom poslal pozdravno pismo.

Minister Židan je v svojem nagovoru izpostavil pomembno vlogo Inštituta pri prenašanju znanja in inovacij na mlade rodove, saj je »prenos znanja ena izmed sedmih prednostnih programskih usmeritev leta 2011 sprejete resolucije 'Zagotovimo si hrano za jutri', ki opredeljuje vizijo razvoja slovenskega kmetijstva in živilstva, in pa tudi ena izmed prednostnih nalog Startegije Evrope 2020.«

Židan se je dotaknil tudi povezave med raziskavami in inovacijami ter novimi, zelenimi delovnimi mesti, ki jih te ustvarjajo.



Nagovor prof. dr. **TAMARE LAH TURNŠEK**, direktorice NIB na svečani podelitvi nagrad in priznanj Miroslava Zeia.

Address of Prof. Dr. TAMARA LAH TURNŠEK, Director NIB at the Solemn Miroslav Zei Award Ceremony.

(Foto | Photo: Žiga Ivanc)

Slavnostni nagovor mag. **DEJANA ŽIDANA**, ministra za kmetijstvo in okolje.

Solemn Speech of Mag. DEJAN ŽIDAN, the Minister of Agriculture and the Environment.

(Foto | Photo: Žiga Ivanc)



NA SVEČANI PODELITVI SO BILE PODELJENE NASLEDNJE NAGRADE NIB:

1. Veliko nagrado Miroslava Zeia za življenjsko delo na področju dejavnosti Nacionalnega inštituta za biologijo za leto 2013 je prejel prof. dr. Andrej Čokl.

Prof. dr. Andrej Čokl je svetovno priznan raziskovalec na področju sporazumevanja žuželk z zvokom, ki se prenaša preko podlage. S svojimi dolgoletnimi raziskavami in vrhunskimi rezultati je dal neprecenljiv prispevek tako k spoznanju, da je vibracijska komunikacija najbolj razširjena oblika sporazumevanja z zvokom, kot tudi k razumevanju njenih temeljnih principov. Njegova bogata bibliografija obsega članke, objavljene v prestižnih znanstvenih revijah, in poglavja v knjigah tujih založniških hiš.

S svojimi nefiziološkimi raziskavami na stenici zeleni smrdljivki in kobilici selki je prof. Čokl že pred tridesetimi leti s pomembnimi objavami začrtal pot kompleksnim raziskavam sporazumevanja in vedenja žuželk. Njegova dela še vedno predstavljajo temelj za raziskave detekcije in procesiranja vibracijskih signalov v centralnem živčnem sistemu.

Poleg pionirskega dela na področju nefizioloških osnov vibracijske komunikacije, je prof. Čokl tudi pomembno prispeval k razumevanju temeljnih principov prenosa vibracijskih signalov po gostiteljskih rastlinah žuželk. Bil je med prvimi raziskovalci v svetu, ki je uporabljal vrhunsko tehnologijo, kot je npr. danes standardni laserski vibrometer, za detekcijo vibracijskih signalov žuželk.

Prof. Andrej Čokl je svoje temeljno raziskovalno delo ves čas združeval s proučevanjem ekonomsko pomembnih žuželk in razvoju potencialnih alternativnih metod na osnovi vibracijskih signalov za nadzor škodljivcev. S poglavjem v knjigi iz leta 2009 je pozornost strokovne javnosti usmeril na velik in popolnoma neizkoriščen potencial uporabe vibracijskih signalov pri zaščiti rastlin.

Prof. dr. Andrej Čokl je bil v obdobju 1988-1996 direktor Nacionalnega inštituta za biologijo in v obdobju 2008-2012 predsednik Znanstvenega sveta NIB. Od leta 1992 do 2013 je vodil Oddelek za entomologijo

IMPORTANT EVENTS

THE SOLEMN MIROSLAV ZEI AWARD CEREMONY AT THE NATIONAL INSTITUTE OF BIOLOGY

On Monday, November 11th 2013, a fourth traditional solemn awards ceremony of the National Institute of Biology was held at the Biological Centre on Večna pot 111 in Ljubljana, at the occasion of the 53rd anniversary of the institute. The award is named after Prof. Dr. Miroslav Zei who was one of the founders of the institute.

The Miroslav Zei awards and recognitions are granted to the individuals for their outstanding achievements in the areas of basic and applied research in life sciences, and for their contribution to realization of the visions and the mission of the National Institute of Biology (NIB).

The solemn award ceremony was held under the honourable patronage of the Ministry of Agriculture and the Environment of the Republic of Slovenia and the Slovenian Academy of Science and Art (SAZU). Mag. Dejan Židan, the Minister of Agriculture and the Environment, and Prof. Dr. Tamara Lah Turnšek, the director of NIB have solemnly addressed the assembled guests. The president of SAZU, Acad. Prof. Dr. Jože Trontelj could not attend the ceremony and have sent his address to the guests in a letter.

In his address minister Židan has pointed out the important role of the institute in transferring the knowledge and innovations to the young generations, saying that »the transfer of knowledge is one of the seven prioritized orientations in the resolution »Assuring food for the future« that was accepted in the year 2011 and is determining the vision for the development of Slovenian agriculture and food industry and at the same time it is also one of the prioritized tasks of the European Strategy 2020«. The minister also touched upon the relationship between the research and innovation and the new green employment opportunities that they are creating.



Prof. dr. **ANDREJ ČOKL**, prejemnik Velike nagrade Miroslava Zeia za življenjsko delo na področju raziskovalne dejavnosti NIB. *The Grand Miroslav Zei Award for his lifelong work in the research domains of NIB was awarded to Prof. Dr. ANDREJ ČOKL.*

(Foto | Photo: Žiga Ivanc)

Predstavitev prof. dr. **ANDREJA ČOKLA** *Speech of Prof. Dr. ANDREJ ČOKL*

(Foto | Photo: Žiga Ivanc)



THE FOLLOWING NIB AWARDS WERE REWARDED AT THE SOLEMN AWARD CEREMONY:

1. **The Grand Miroslav Zei Award for his lifelong work in the research domains of the National Institute of Biology for the year 2013 was awarded to Prof. Dr. Andrej Čokl.**

Prof. Dr. Andrej Čokl is a worldwide renown researcher in the science of insect communication with sound that is transmitted over the surface. With his long year research and top quality results he has invaluablely contributed to the finding that the vibrational communication is the most widespread form of communication with sound, and he was also instrumental in understanding its fundamental principles. His reach bibliography comprises peer-reviewed scientific papers published in prestigious scientific journals, and chapters in books of foreign publishing companies.

Already thirty years ago Prof. Čokl has laid the pathways of complex research of insect communication and behaviour with his neurophysiologic research carried out in southern green stink bug and migratory locust and the influential publications as the proceedings of this research. His work remains fundamental for research of detection and processing of vibrational signals in the central neural system of insects.

Besides the pioneering work in the area of neurophysiologic fundamentals of vibrational communication Prof. Čokl was also important in contributing to understanding of the fundamental principles of transfer of the vibrational signals via the insect's host plants. Prof. Čokl was among the first researchers in the world using the cutting edge technology such as today's commonly used laser vibrometry for the detection of the vibrational signals in insects.

Prof. Andrej Čokl has always carried his basic scientific research using the economically important insects and has geared his research to development of the potential alternative methods based on vibrational signals in pest control. With the chapter in a book published in 2009 he has raised awareness of the professional community of the potentially vast and entirely unexploited potential using the vibrational signals in plant protection.

Prof. Dr. Andrej Čokl served as a director of the National Institute of Biology between 1988-1996, and was a chair of

NIB, ki se ej pod njegovim vodstvom razvil v enega od svetovnih centrov za raziskave vibracijske komunikacije členonožcev. Vodil je številne uspešno zaključene temeljne projekte in vzpostavil sodelovanje s številnimi vrhunskimi raziskovalnimi skupinami v tujini. Izmed njih bi izpostavili sodelovanje z Oddelkom za entomologijo na University of California, Riverside v ZDA in z inštitutom EMBRAPA v Braziliji. Vodil je bilateralne raziskovalne projekte in dele posameznih evropskih projektov. Bil je mentor številnim mladim raziskovalcem, od katerih so mnogi svojo znanstveno kariero uspešno nadaljevali in jo še nadaljujejo doma ter v tujini.

Od leta 2005 je prof. Čokl redni profesor na Univerzi v Ljubljani; predava pa tudi na Univerzah v Mariboru, Novi Gorici in na Visoki šoli za varstvo okolja v Velenju.

2. Nagrado Miroslava Zeia za izjemne dosežke na področju dejavnosti Nacionalnega inštituta za biologijo za leto 2013 je prejela izr. prof. dr. Maja Ravnikar.

Izredna profesorica dr. Maja Ravnikar je svetovno priznana strokovnjakinja na področjih mikrobiologije in biotehnologije, s poudarkom na odkrivanju in proučevanju biologije povzročiteljev bolezni rastlin. S svojim zgledom izredno delavne in inovativne raziskovalke in motivacijske vodje svojih sodelavcev in mlajših raziskovalcev dosega kakovostne rezultate tako pri temeljnem raziskovalnem delu, kot tudi pri neposredni povezavi z industrijskimi partnerji in pri podpori državnim organom. S svojimi sodelavci je razvila številne nove molekularne metode za izolacijo, detekcijo in količinsko ovrednotenje virusov, viroidov in bakterij, ki so objavljene v obliki visoko citiranih raziskovalnih ali preglednih člankov v uglednih revijah z visokimi faktorji vpliva in v knjigah mednarodnih založb. S sodelavci je odkrila več kot 20 novih povzročiteljev bolezni rastlin v Sloveniji, nekatere tudi v Evropi. Pionirsko delo predstavlja izdelava metodologije za sledenje učinkovitega koncentriranja in čiščenja virusov z monolitnimi kromatografskimi nosilci skupaj z biotehnološkim podjetjem BIA Separations. Inovativna povezava koncentriranja virusov z novo generacijo sekvenciranja nukleinskih kislin je letos vodila do odkritja novega ortoreovirusa, ki povzroča gastrointestinalne težave pri ljudeh. Številne razvite metode za identifikacijo in količinsko ovrednotenje



Izr. prof. dr. **MAJA RAVNIKAR**, prejemnica Nagrade Miroslava Zeia za izjemne dosežke na področju raziskovalne dejavnosti NIB.
Miroslav Zei Award for her outstanding achievements in the research domains of NIB was awarded to Assoc. Prof. Dr. MAJA RAVNIKAR.

(Foto | Photo: Žiga Ivanc)

Svečana podelitev nagrad in priznanj Miroslava Zeia - **BIOLOŠKI OKTET**.
Solemn awards ceremony of Miroslav Zei - BIOLOGICAL OCTET.

(Foto | Photo: Žiga Ivanc)



mikroorganizmov uporabljajo raziskovalci pri svojih raziskavah in kot člani referenčnega laboratorija Uprave RS za varno hrano, veterinarstvo in varstvo rastlin za preverjanje zdravstvenega varstva rastlin. Nekatero metode uporabljajo tudi v drugih evropskih laboratorijih.

Dr. Ravnikarjeva že vrsto let zelo uspešno vodi Oddelek za biotehnologijo in sistemsko biologijo in tudi njegov raziskovalni program. Na NIBu je ena od glavnih pobudnic spodbujanja podjetništva, katerega rezultat je že četrto leto delujoče odcepljeno podjetje Biosistemika d.o.o.

Dr. Ravnikarjeva je zelo aktivna v Evropski organizaciji za varstvo rastlin, je članica ameriškega konzorcija za raziskave virusov v okolju, predsednica mednarodne delovne skupine za raziskave virusov in soustanoviteljica evropskega združenja fitobakteriologov.

3. Nagrado Nacionalnega inštituta za biologijo za izjemno doktorsko delo na področju dejavnosti Nacionalnega inštituta za biologijo za leto 2013 je prejela dr. Alja Štraser.

Izsledki izbrane doktorske naloge so bili objavljeni v 7 znanstvenih člankih. Od teh so bili štirje objavljeni v revijah, ki jih Javna agencija za raziskovalno dejavnost RS kategorizira kot A1 in trije v kategoriji A2. Na štirih od teh člankov je kandidatka prva avtorica. Vsi članki so tudi del njene doktorske naloge in so bili skupno že kar 57-krat citirani.

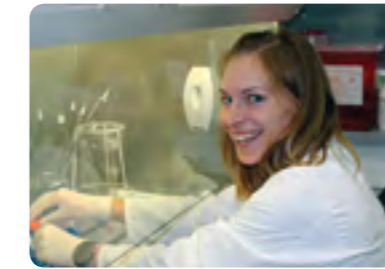
4. Na prireditvi so prejeli priznanja Nacionalnega inštituta za biologijo tudi vsi mladi sodelavci NIB, ki so v obdobju od 1. oktobra 2012 do 30. septembra 2013 pridobili doktorske nazive: dr. Neža Koron, dr. Ana Torkar in dr. Alja Štraser.

the Scientific Committee at NIB between 2008-2012. From 1992 and until 2013 he was a head of the Department of Entomology at NIB which has flourished under his leadership in one of the world's centres for research of vibrational communication of insects. He has directed a number of successfully completed basic research projects and has established collaboration with numerous top research groups abroad. Among them it is worthwhile mentioning the collaboration with the Department of Entomology at the University of California Riverside in the United States, and with the Institute EMBRAPA in Brazil. He has directed a number of bilateral research projects and specific parts of the individual European projects. He was a mentor to a number of young researchers among whom many have continued or are still continuing their scientific careers here in Slovenia or abroad.

Since 2005 Prof. Čokl is a Professor at the University of Ljubljana, and is also teaching at the University of Maribor, University of Nova Gorica, and at the Environmental protection College in Velenje.

2. Miroslav Zei award for her outstanding achievements in the research domains of the National Institute of Biology for the year 2013 was awarded to Associate Professor Dr. Maja Ravnikar.

The Associate Professor Dr. Maja Ravnikar is a world known expert in the areas of microbiology and biotechnology and more specifically in research and discovery of biology of plant disease agents. As an exemplary very hard worker, an innovative researcher, and a motivational leader to her co-workers and young researchers she is achieving top quality results in basic as well as applied research by connecting and collaborating with the partners from industry and by providing services to the state agencies. Together with her co-workers she has developed a number of new molecular methods for extraction, detection and quantitative determination of viruses, viroids and bacteria which were published in highly cited original research and review papers published in prestigious scientific journals with high impact factors and in books published by foreign publishing companies. Together with her co-workers she has discovered more than 20 new plant disease agents, mainly in Slovenia but also in Europe. Her pioneering work represents building a technology for tracing the effectiveness of concentration and purification of viruses using monolithic chromatographic supports together with the biotechnology company BIA Separations.



Dr. **ALJA ŠTRASER**, prejemnica Nagrade za izjemno doktorsko delo na področju dejavnosti NIB za leto 2013.
The award for an extraordinary doctoral thesis in the research domains of the NIB for the year 2013 was awarded to Dr. ALJA ŠTRASER.

(Foto: arhiv GEN | Photo: Archive GEN)

Promocija novih doktorjev znanosti.
Promotion of the new Doctors of science.

(Foto | Photo: Žiga Ivanc)



This year the innovative coupling of virus concentration with the new generation of nucleic acid sequencing lead to the discovery of a new Orthoreovirus that is a causal agent of gastrointestinal problems in humans. Many of developed methods for identification and quantitative evaluation of microorganisms are being used by the researchers in their research work as well as for their work for evaluating the phytosanitary status of plants within the reference laboratory at the Administration of the Republic of Slovenia for Food safety, Veterinary and Plant Protection. Some of the methods are being used also in other European laboratories.

Dr. Ravnikar is a head of the Department of Biotechnology and Systems Biology and also directs its research program extremely successfully through a number of years. At NIB she is one of the main protagonists of encouraging enterprise which resulted in a now four years old spin off company Biosistemika L.C.C.

Dr. Ravnikar is very active in the European Organisation for Plant Protection, she is a member of the United States consortium for research of viruses in the environment, a president of the international working group for virus research, and a cofounder of the European Association of Phytobacteriology.

3. The award of the National Institute of Biology for an extraordinary doctoral thesis in the research domains of the National Institute of Biology for the year 2013 was awarded to Dr. Alja Štraser.

The research proceedings were published in seven peer reviewed scientific papers. Among them four were published in journals that are categorized by the Research Agency of the Republic of Slovenia as A1, and three as category A2. The candidate appears as the first author in four of the seven papers. All papers are also part of her doctoral thesis and were altogether already cited 57 times.

4. At the solemn award ceremony, the National Institute of Biology recognition awards were granted to all young researchers at NIB who have had obtained their doctoral degrees between the October 1st 2012 and September 30th 2013 – these young researchers are Dr. Neža Koron, Dr. Ana Torkar in Dr. Alja Štraser.

POZDRAVNO PISMO AKAD. PROF. DR. JOŽETA TROTLJA OB PODELITVI NAGRAD IN PRIZNANJ NACIONALNEGA INŠTITUTA ZA BIOLOGIJO

Spoštovana direktorica Nacionalnega inštituta za biologijo, gospa profesorica Tamara Lah Turnšek, cenjeni profesor Andrej Čokl in drugi nagrajenci, spoštovani gospod minister Dejan Židan, gospe in gospodje.

Gospo direktorici prisrčna hvala za prijazno povabilo, da nocojšnji slavnostni večer preživim z vami. Obžalujem, da sem se moral opravičiti. Gospa profesorica ve, kako visoko cenim biologijo in ostale vede o življenju. Med njimi je seveda tudi moja ožja stroka. Te vede bodo bolj zaznamovale naše stoletje kot katerakoli druga. Tako napovedujejo ljudje, ki znanost poznajo in razumejo.

A ne gre samo za vede. Osebnostno sem zavzet občudovalec življenja kot pojava. Kljub napredku astronomije še danes ne vemo, ali je življenje v vesolju izjema ali pravilo. Za zdaj velja, da smo vsaj v našem delu vesolja po vsej verjetnosti sami – kolikor daleč pač segajo naše oči in tipala naših instrumentov. Vse, kar je živega, pa je v komaj nekaj kilometrov debeli plasti okrog površine našega malega planeta. Za vesoljske dimenzije neznamen, miniaturni drobci snovi. A to je snov, ki je urejena na edinstven način. Ta snov ureja samo sebe. In je uredila svoj življenjski prostor: kisik v planetarni atmosferi, plodna tla za rast, kroženje snovi, podnebje. In se obnaša, kot da ima nepremagljivo voljo do samoohranitve, razvoja, razmnoževanja. In uporablja komaj verjetne zvijače, s katerimi trenutek za trenutek goljufa zakone, ki vladajo neživi naravi in težijo k izravnavanju in umirjanju razlik. Življenje jih pogosto uporablja tako, da se zdi, kot da delujejo v nasprotju s samimi seboj.

To znajo že silno majhni koščki snovi, za katere niti ne veljajo vsa klasična merila za status živih bitij. Tak je virus HIV, ki je iznašel načine, da izklopi sicer uničujoča orožja imunskega sistema človeka. In potem so



Akademik prof. dr. **JOŽE TRONTELJ**
(1939–2013).

*Acad. Prof. Dr. **JOŽE TRONTELJ**
(1939–2013).*

(Foto | Photo: Barbara Jakše Jeršič)

Častni gost mag. **DEJAN ŽIDAN**,
minister za kmetijstvo in okolje in
prof. dr. **TAMARA LAH TURNŠEK**,
direktorica NIB.

*Guest of Honor Mag. **DEJAN ŽIDAN**,
the Minister of Agriculture and the
Environment.*

(Foto | Photo: Žiga Ivanc)



tu bakterije, prva prava bitja, v katerih so že milijarde let skoraj vsi izumi, potrebni za razvoj mnogoceličnih bitij. Niso le prva, bodo tudi zadnja bitja še dolgo potem, ko se bo planet že bližal svoji astronomski smrti in bo ostalemu življenju gosotljubje odpovedano. Na vrhu današnjega cvetočega življenja pa so človeški možgani, najzapletenejša znana stvar v vesolju, sposobna učenja, čustvovanja, odločanja, pogleda v prihodnost. Zavest je vrhunska funkcija delujočih možganov, ki je ne zmoremo niti definirati, kaj šele pojasniti, čeprav je vsakdanja subjektivna izkušnja vsakogar med nami.

Znanje o življenju se hitro nabira in čudovito je biti zraven. Biti zraven – to človeka zaznamuje na poseben način. Vpliva na način mišljenja, vpliva na odnos do narave, vcepja spoštovanje do bitij, ki so nam hrana, ki so bila že od davnine odločilna za preživetje človeške vrste. Ta preživetvena odvisnost iz davnine seveda ni nikoli minila, le današnji način življenja se je ljudem spremenil tako, da se ne sprašujejo več, odkod imamo kruh, odkod mleko, odkod tistih deset ali dvajset prehranskih 'surovin', iz katerih sestavljajo vsakdanje zajtrke, kosila in večerje. A zavest o odvisnosti iz davnine se vrača. In dobro je, da se. Pomagala nam bo spremeniti vedenje. Upajmo, da pravočasno, še preden bomo naš planet preveč zavozili.

Spoštovani prejemniki nagrade Miroslava Zeia, v imenu Slovenske akademije znanosti in umetnosti in v svojem lastnem imenu vam iskreno čestitam. Tudi vi ste med tistimi, ki radovedno odstirate zaveso, za katero so še vedno skriti številni genialni mehanizmi živega sveta. Vaše delo je privilegij, ki mu je vredno posvetiti poklicno življenje. Je privilegij, za katerega je vredno žrtvovati neštete ure časa zunaj okvirov poklicnih dolžnosti. Tudi tistega časa, ki je sicer namenjen zasebnosti, počitku, sprostitvi. Ta čas ni plačan z denarjem, niti ni z denarjem plačljiv. Valuta je druga, vsota pa ga odtehta.

Srečno še naprej!

Vaš Jože Trontelj

ADDRESS OF THE ACAD. PROF. DR. JOŽE TRONTELJ AT THE AWARDS CEREMONY OF THE NATIONAL INSTITUTE OF BIOLOGY

Dear Madam, distinguished professor Tamara Lah Turnšek, director of the National Institute of Biology, distinguished professor Andrej Čokl and other distinguished awarded guests, distinguished minister Dejan Židan, ladies and gentlemen,

My best thanks to the madam director for her friendly invitation for spending today's solemn evening with you. I regret that I had to excuse myself. Madam director knows very well how highly I value biology and other life sciences. Among them is also my narrow professional expertise. These sciences will increasingly mark our century more than any other. This is predicted by people who know and understand science.

It is not only about the sciences. Personally I am an enthusiastic admirer of life as a phenomenon. Despite the progress in astronomy we still not know today if life in space is an exception or rule. For now we believe that at least in our part of space we are most likely alone, as far as we can say based on our senses and reach of our instruments. Everything alive lies in only a few kilometres thin layer around the surface of our small planet. In space dimensions insignificant, miniature speck of matter. But the matter is arranged in a unique way. This matter arranges itself. It has arranged its living space: oxygen in the planetary atmosphere, fertile soil for growth, cycling of matter, a climate. And it behaves as if it possesses an unconquerable will for self-preservation, development, and reproduction. It is using unbelievable tricks to cheat moment after moment the laws that govern the non-living nature and tend to even out and tame the differences. The life is often using them in a way that seems to be acting contradictory to itself.

This is something that even incredibly small specks seem to know, those for which the conventional standards for status of living not even count. The HIV virus is one of them, and it has invented the ways to switch off the normally destroying weapons of the immune system in



Svečana podelitev nagrad in priznanj
Miroslava Zeia, 11.11.2013.

*Solemn awards ceremony
of Miroslav Zei, 11.11.2013.*

(Foto | Photo: Žiga Ivanc)



Svečana podelitev nagrad in priznanj
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humans. And then there are the bacteria, the first real beings in which almost all inventions necessary for development of multi-cellular beings already existed for billions of years. They are not only the first but will also be the last beings long after when the planet will be approaching its astronomical death and will deny his hospitality to other forms of life. At the top of today's blossoming life is the human brain, the most complicated known object in space capable of learning, emotions, decision making, and looking to the future. Consciousness is the top function of the working brain that we cannot define nor explain although it is an every day subjective experience of every one among us.

Knowledge of life is accumulating fast and it is fascinating to be here. To be here – that marks a human in a special way. It influences the way of thinking, the relationship toward the nature, conveys respect toward living beings that are our food and were since long time ago critical to the survival of the human species. The dependence for survival from the far past of course never ended, it is only the modern way of living that changed people in a way where they are not asking anymore where the bread and milk come from, and where do some ten or twenty food components that build every day breakfast, lunch and dinner come from. But the awareness from the long past is coming back. And this is good. It will help us change our behaviour. Let's hope that it will happen on time, before we wreck our planet too much.

Dear Miroslav Zei award winners, in the name of the Slovenian Academy of Science and Art and in my own name I am sincerely congratulating you. You also are among those who curiously pull the curtain that is still hiding numerous ingenious mechanisms of the living world. Your work is a privilege that is worth dedicating your professional life to. It is a privilege worth scarifying numerous hours of time beyond the frames of professional duties. Also the time that is normally dedicated to personal life, rest, relaxation. This time is not paid by money and cannot be. The currency is different but the amount is worthy. Good luck for your future!

Yours, Jože Trontelj

SREČANJE MLADIH RAZISKOVALK IN RAZISKOVALCEV TER NJIHOVIH MENTORJEV

V Biološkem središču v Ljubljani, je ob dnevu žena, 8. marca potekalo že tretje skupno srečanje mladih raziskovalk in raziskovalcev ter njihovih mentoric in mentorjev iz Nacionalnega inštituta za biologijo in Oddelka za biologijo Biotehniške fakultete Univerze v Ljubljani.

Nacionalni inštitut za biologijo in Oddelek za biologijo Biotehniške fakultete Univerze v Ljubljani imata že v svojem poslanstvu navedeno, da je ustvarjanje novega temeljnega znanja na področju biologije in sorodnih naravoslovnih ter okoljskih ved in prenašanje tega znanja v uporabo za izboljšanje kvalitete življenja, za podporo okoljskim politikam in za razvoj znanosti, eden izmed temeljev njenega delovanja. Raziskovanje in izobraževanje na področju ved o življenju in naravi nalaga obema institucijama veliko odgovornost, da ustvarjata strokovne in znanstvene podlage in krepita družbeno klimo za trajno harmonično sožitje med človekom in naravo.

Tako sta obe instituciji ponosni, da lahko med svojimi vrstami pozdravita vsako leto več mladih raziskovalk in raziskovalcev. Na Nacionalnem inštitutu za biologijo se usposablja že 36 mladih raziskovalk in raziskovalcev, od katerih se jih 29 usposablja v skladu s pogodbo z Javno agencijo za raziskovalno dejavnost, 7 pa jih prihaja iz gospodarstva. Na Oddelku za biologijo se podiplomsko usposablja 27 mladih raziskovalk in raziskovalcev.

Z namenom, da bi se mladi raziskovalci obeh institucij, ki delujeta pod skupno streho Biološkega središča, med seboj bolje spoznali, predstavili svoje raziskovalno delo ter navezali stike za bodoča projektna in pedagoška sodelovanja, je 8. marca potekalo že tretje srečanje mladih raziskovalk in raziskovalcev ter njihovih mentorjev.

Dogodek sta s slavnostnim nagovorom otvorila prof. dr. Tom Turk, prodekan Oddelka za biologijo BF in



Pozdravni nagovor direktorice NIB, prof. dr. TAMARE LAH Turnšek na srečanju mladih raziskovalcev in njihovih mentorjev Nacionalnega inštituta za biologijo in Oddelka za biologijo Biotehniške Fakultete UL, 8.3.2013.

Speech of Prof. Dr. TAMARA LAH Turnšek, Director NIB at the meeting of young researchers and their mentors from the National Institute of Biology and the Department of Biology, Biotechnical Faculty UL, 8.3.2013.

(Foto | Photo: J. Polajnar)

Ženski pevski zbor ANDROMEDA. Women's Choir ANDROMEDA.

(Foto | Photo: J. Polajnar)



prof. dr. Tamara Lah Turnšek, direktorica NIB. Mlade raziskovalce, mentorje in slušatelje pa je pozdravil tudi veleposlanik Nizozemske, njegova ekselencija gospod Johannes Douma.

Direktorica NIB, prof. dr. Tamara Lah Turnšek je v začetku pozdravila veleposlanika Nizozemske, njegovo ekselencijo gospoda Johannes Douma, se mu zahvalila, da je s svojim obiskom počastil »Dan žena«, ki je v Biološkem središču postala kar »Dan mladih raziskovalcev«. Ta instrument znanstvene politike Agencije za raziskovalno dejavnost v Sloveniji uspešno poteka že od leta 1985 in je izdatno prispeval k dvigu raziskav, kadrovskega pomlajevanju raziskovalnih skupin na inštitutih, pedagoškemu delu na univerzah in povečanju kadrovskega potenciala za potrebe drugih uporabnikov iz javnega in zasebnega sektorja. Ob tem je prof. Lahova poudarila pomen mednarodne izmenjave študentov in spodbudila mlade raziskovalce, da bi si pridobili mednarodno štipendijo za študij v tujini, s čimer bi si nabrali dragocene mednarodne izkušnje in se po zaključenem izobraževanju vrnili v domovino. Tudi prof. Lahova je izpostavila problem »bega možganov«, ko se mladi zaradi pomanjkanja služb odločajo za delo v tujini, kar za dolgoročni razvoj Slovenije ni dobro. Zahvalila se je mladim raziskovalcem za njihovo delo in njihovim mentorjem, brez katerih tolikega uspeha ne bi bilo.

Ob zaključku uvodnega dela je zbrane pozdravil tudi častni gost veleposlanik Nizozemske, njegova ekselencija gospod Johannes Douma. V zanimivem nagovoru je spregovoril o svoji študijski izkušnji, ko se je diplomsko dela in doktorska disertacije tipkalo še na pisalne stroje. Spregovoril je o financiranju raziskav s strani Evropske unije, poudaril pomen »ekonomske miselnosti« v znanosti, da znamo bodoče investitorje prepričati, da smo najboljši, da imamo najboljše znanje in nudimo to, kar potrebujejo. Mladim raziskovalcem je zaželel veliko uspeha, da bi vztrajali na svoji poti, stali na svojih stališčih in bili neodvisni v svojem razmišljanju.

Na dogodku so nam svoje raziskovalno delo s kratkim predavanjem predstavili mladi raziskovalci, ki so bili v zadnjem letu svojega podoktorskega študija.

MEETING OF YOUNG RESEARCHERS AND THEIR MENTORS

On 8 March 2013, on the day dedicated to women, the third joint meeting of young researchers and their mentors from the National Institute of Biology and the Department of Biology at the Biotechnical Faculty of the University of Ljubljana took place at the Biology Centre in Ljubljana.

The creation of new fundamental knowledge in the field of biology and similar nature- and environment-related sciences and facilitating this knowledge in order to improve the quality of life, to support environmental policies and to provide the development of science present the core mission of the National Institute of Biology and the Department of Biology at the Biotechnical Faculty of the University of Ljubljana. Research and education in the field of sciences related to life and nature put great responsibility on both institutions in order to create professional and scientific foundations and strengthen the social climate for permanent harmonic symbiosis between the man and nature.

Both institutions are proud of the fact to be able to welcome an increasing number of young researchers every year. 36 young researchers study at the National Institute of Biology; 29 of them study in accordance with the contract concluded with the Slovenian Research Agency, 7 of them work in the economy sector. 27 young researchers at the Department of Biology are post-graduate students.

With the main aim to enable young researchers from both institutions, which operate within the scope of the Biology Centre, to get to know each other better, present their research work and make contacts for future project and pedagogical cooperation, the meeting of young researchers and their mentors took place on 8 March 2013.

The event was solemnly opened by Prof. Dr. Tamara Lah Turnšek, director of NIB, and Prof. Dr. Tom Turk, vice dean of the Department of Biology at the Biotechnical Faculty. Young researchers, mentors and students has also welcomed the guest of honor, Ambassador of the Netherlands, His Excellency Mr. Johannes Douma.



Srečanje mladih raziskovalcev in njihovih mentorjev Nacionalnega inštituta za biologijo in Oddelka za biologijo Biotehniške Fakultete UL.

Meeting of Young Researchers and their Mentors of the National Institute of Biology and the Department of Biology, Biotechnical Faculty UL.

(Foto | Photo: J. Polajnar)



Pozdravni nagovor veleposlanika Nizozemske, njegove ekselencije gospoda JOHANNESA DOUMA.

Speech of Ambassador of the Netherlands, His Excellency Mr. JOHANNES DOUMA.

(Foto | Photo: J. Polajnar)

Mladi raziskovalci Nacionalnega inštituta za biologijo in Oddelka za biologijo Biotehniške Fakultete UL.

Young researchers of the National Institute of Biology and the Department of Biology, Biotechnical Faculty UL.

(Foto | Photo: J. Polajnar)

At the beginning, Director of National Institute of Biology Prof. Dr. Tamara Lah Turnšek, welcomed His Excellency Mr Johannes Douma, Ambassador of the Netherlands, and thanked him for honouring "International Women's Day", which has become a "Day of Young Researchers" in the Biology Centre. This instrument of science policy of Slovenian Research Agency has been running successfully since 1985 and has extensively contributed to the rise of research, staff rejuvenation of research teams at institutes, pedagogical work at universities and increasing human resources for the needs of other users from the public and private sectors. Moreover, Prof. Lah Turnšek stressed the importance of international student exchanges and encouraged young researchers to obtain an international scholarship to study abroad and gain valuable international experience, but after completing their studies to return to their homeland. Prof. Lah Turnšek raised the issue of "brain drain", when young professionals choose to work abroad due to lack of jobs in Slovenia, which is not good for Slovenia's long-term development. She thanked young researchers for their work and their mentors for encouraging them to be successful to such an extent.

At the end of the introductory part, the guest of honour His Excellency Mr Johannes Douma, Ambassador of the Netherlands, welcomed all participants. In an interesting speech he spoke about his study experience, when thesis and doctoral dissertations were still being typed on typewriters. He talked about the European Union research funding, stressed the importance of "economic mentality" in science, where we know how to convince prospective investors that we are the best, that we have the best knowledge and are able to provide them with what they need. He wished young researchers a lot of success and to persevere, to stay true to their beliefs and to remain independent in their thinking.

At the meeting, young researchers who are in their final year of postdoctoral study, presented their research work by giving short lectures.



OBISK MINISTRA ZA KMETIJSTVO IN OKOLJE MAG. DEJANA ŽIDANA

Minister za kmetijstvo in okolje mag. Dejan Židan je 9.9.2013 s sodelavci obiskal Nacionalni inštitut za biologijo, s ciljem izmenjave informacij in izkušenj v zvezi s strokovnimi nalogami, ki jih NIB že več kot desetletje uspešno izvaja za potrebe ministrstva. Minister mag. Dejan Židan je predstavil usmeritve in ključne prioritete ministrstva ter izpostavil področje voda in prehrane. Posebej je opozoril na pomen voda, ki v nepredvidljivih podnebnih spremembah vsako leto dobivajo večji pomen, saj se zadnja leta vedno pogosteje srečujemo s sušami in se bomo še pogosteje, kar bo vplivalo tako na ukrepe države kot na druge potrebne tehnološke prilagoditve.

OBISK MINISTRA ZA IZOBRAŽEVANJE, ZNANOST IN ŠPORT DR. JERNEJA PIKALA

Minister za izobraževanje, znanost in šport dr. Jernej Pikalo je 28.10.2013, v okviru svojega obiska slovenske Istre, obiskal tudi Morsko biološko postajo Piran, ki deluje v okviru Nacionalnega inštituta za biologijo. Ministru so bile predstavljene glavne raziskovalne vsebine, ki jih izvaja ta enota ter infrastrukturni načrti. Med drugim izgradnja novega Centra NIB v Ljubljani ter posodobitev opreme (raziskovalnega plovila) v okviru MBP. Minister dr. Pikalo je ob tem dejal, da si ministrstvo, ob razumevanju celotne vlade, prizadeva za izdatnejše financiranje visokega šolstva in znanosti, vprašanje stabilnega financiranja pa načrtuje urediti v noveli Zakona o raziskovalni dejavnosti, ki je v pripravi.

Obisk delegacije iz Egipta.
Visit of the Egyptian Delegation.

(Foto | Photo: Arhiv NIB | Archive NIB)



OBISK DELEGACIJE IZ EGIPTA

Nacionalni inštitut za biologijo v Ljubljani je 11.10.2013 obiskala delegacija iz Egipta in sicer visoki predstavniki Ministrstva za kmetijstvo, Ministrstva za trgovino in industrijo ter Ministrstva za promet skupaj s predstavnicami slovenskega Ministrstva za kmetijstvo in okolje Vlasto Knapič, predstavnicami Luke Koper Mileno Jerman in predstavnikoma združenja špediterjev Igorjem Kuzelj in Robertom Skokom. Delegacija si je ogledala karantenske laboratorije in se seznanila s problematiko diagnosticiranja karantenskih rastlinskih bolezni. Izvedena je bila tudi demonstracija novih metod za molekularno identifikacijo mikroorganizmov, ki se lahko izvajajo izven laboratorija in so bile razvite na Oddelku za biotehnologijo in sistemsko biologijo NIB. Razpravljalo se je o postopkih kontrole uvoza egiptovskih rastlinskih proizvodov v Evropo preko Luke Koper in o možnostih tesnejšega sodelovanja.

NACIONALNI INŠTITUT ZA BIOLOGIJO JE POSTAL REDNI ČLAN DRUŠTVA »SLOVENSKI ZNANSTVENI INŠTITUT NA DUNAJU«

Upravni odbor Društva »Slovenski znanstveni inštitut na Dunaju« (SZI) je na svoji 49. seji 10.1.2013 sprejel Nacionalni inštitut za biologijo med redne člane Društva »Slovenski znanstveni inštitut na Dunaju / Slowenisches Wissenschaftsinstitut in Wien«. Kot član SZI bo NIB spodbujal, izvajal in razvijal znanstveno, kulturno, tehnološko in gospodarsko sodelovanje z Avstrijo. Vodstvo NIB se je 16.5.2013 udeležilo predstavitve NIB avstrijskim partnerjem, ki je potekalo na sedežu SZI na Dunaju.



Obisk dr. JERNEJA PIKALA, ministra za izobraževanje, znanost in šport na Morski biološki postaji v Piranu.

Visit of Minister of Education, Science and Sports JERNEJ PIKALO, PhD at Marine Biology Station in Piran.

(Foto | Photo: Arhiv NIB | Archive NIB)

VISIT OF MINISTER OF AGRICULTURE AND THE ENVIRONMENT DEJAN ŽIDAN

9 Sept 2013 Minister of Agriculture and the Environment Dejan Židan and his colleagues visited the National Institute of Biology with the aim of exchanging information and experience with regard to expertise tasks which have been successfully implemented by NIB for the needs of the Ministry for over a decade. Minister Dejan Židan presented the policies and key priorities of the Ministry and highlighted the areas of nutrition and water supplies. He specifically pointed to the importance of waters, which due to unpredictable climate changes receive greater significance every year because we are increasingly faced with droughts in recent years and will increasingly be more so in the future, which will affect both the state policies and lead to other necessary technological adjustments.

VISIT OF MINISTER OF EDUCATION, SCIENCE AND SPORTS JERNEJ PIKALO

28 Oct 2013 Minister of Education, Science and Sports Jernej Pikalo visited the Piran Marine Biology Station, which operates within the National Institute of Biology, in the framework of his visit to the Slovenian Istria. Minister was presented with all the main research contents carried out by this unit as well as its infrastructure plans which, among other things, include the construction of the new NIB Centre in Ljubljana and the modernization of equipment (research vessel) in the context of MBP. Mr Pikalo said that despite current economic situation of the state, the Ministry seeks to increase funding for higher education and science and plans to arrange the question of stable funding in the now preparing Act amending research activity.



Obisk mag. DEJANA ŽIDANA, ministra za kmetijstvo in okolje.

Visit of Mag. DEJAN ŽIDAN, the Minister of Agriculture and the Environment.

(Foto | Photo: H. Končar)

Obisk dr. JERNEJA PIKALA, ministra za izobraževanje, znanost in šport na Morski biološki postaji v Piranu.

Visit of Minister of Education, Science and Sports JERNEJ PIKALO, PhD at Marine Biology Station in Piran.

(Foto | Photo: Arhiv NIB | Archive NIB)



VISIT OF THE EGYPTIAN DELEGATION

11 Oct 2013 National Institute of Biology in Ljubljana was visited by a delegation from Egypt consisting of senior representatives of their Ministry of Agriculture, Ministry of Trade and Industry and Ministry of Transport, together with the representative of the Slovenian Ministry for Agriculture and the Environment Vlasta Knapič, the representative of Luka Koper Milena Jerman and the representatives of Association of Freight Forwarders Igor Kuzelj and Robert Skok. The delegation visited quarantine laboratories and were there acquainted with the problems of diagnosing quarantine plant diseases. New methods for molecular identification of microorganisms that can be performed outside the laboratory and were developed at the Department of Biotechnology and Systems Biology at NIB were also demonstrated. Further on, the participants discussed procedures for checks on imports of Egyptian plant products to Europe through the Port of Koper and the possibilities of closer cooperation.

NATIONAL INSTITUTE OF BIOLOGY HAS BECOME A REGULAR MEMBER OF THE "SLOVENIAN SCIENTIFIC INSTITUTE IN VIENNA" SOCIETY

1 Oct 2013 Board of Managers of the "Slovenian Scientific Institute in Vienna" adopted National Institute of Biology among its regular members at its 49th session. As a member of the Institute, NIB will promote, implement and develop scientific, cultural, technological and economic cooperation with Austria. NIB managing staff participated in the presentation of NIB to Austrian partners, which took place at the Institute in Vienna on 16 May 2013.

15. OBLETNICA SODELOVANJA NIB S SLUŽBO ZA VARSTVO RASTLIN FURS IN RAZŠIRITEV AKREDITACIJE SIST EN ISO/IEC 17025 NA PODROČJE DOLOČANJA MIKROORGANIZMOV

Ob 15. obletnici sodelovanja NIB s Službo za varstvo rastlin FURS in razširitvi akreditacije SIST EN ISO/IEC 17025 na področje določanja mikroorganizmov, je v Biološkem središču 22.1.2013 potekalo predavanje z naslovom "Nove raziskave, da bodo rastline zdrave!" Predavanje sta pripravili prof.dr. Maja Ravnika in dr. Tanja Dreo z Oddelka za biotehnologijo in sistemsko biologijo (NIB). Namen predavanja je bil, da ob tem jubileju predstavimo najnovejše raziskave in diagnostične metode, ki zagotavljajo nadzor nad boleznimi rastlin in izboljšujejo kakovost pridelkov. To je izredno dinamično področje, ki zahteva hitrost, prilagodljivost, interdisciplinarnost in integracijo različnih znanj. Predavanja so se udeležili predstavniki Urada RS za varno hrano, inšpekcijskih služb in ministrstev, raziskovalci, študenti in novinarji.

MEDNARODNI DAN OČARLJIVIH RASTLIN

17. 5. 2013 je potekal že drugi Mednarodni Dan očarljivih rastlin v Botaničnem vrtu v Ljubljani in tudi drugod po Sloveniji pod okriljem evropske organizacije za raziskave rastlin (European Plant Science Organisation). V Sloveniji je bil glavni organizator Dneva očarljivih rastlin Slovensko društvo za biologijo rastlin, sodeloval pa je tudi NIB, ki je na dveh stojnicah (»Gensko spremenjene rastline za proizvodnjo koristnih snovi« in »Ko bakterije napadejo očarljive rastline«) pripravil praktične prikaze, namenjene predvsem šolarjem in družinam. Cilj te pobude je rastline in znanosti, ki jih preučujejo, približati čim širši javnosti, da se bo čim več ljudi po vsem svetu zavedalo pomena znanosti o rastlinah za kmetijstvo, trajnostno proizvodnjo hrane, vrtnarstvo, gozdarstvo in za proizvodnjo neživilskih izdelkov, kot so papir, les, kemikalije, energija in farmacevtski izdelki ter vloge rastlin pri ohranjanju okolja.

Noč raziskovalcev, 27.9.2013.
Researchers Night, 27.9.2013.

(Foto | Photo: V. Bernetič)



NOČ RAZISKOVALCEV

Nacionalni inštitut za biologijo je v okviru dogodka Noč raziskovalcev, 27.9.2013 odprl svoja vrata v Ljubljani in Piranu. Obiskovalci na sedežu NIB v Ljubljani so se udeležili zanimivih in poučnih predavanj o žuželkah, pticah, gobah in okoljskih dejavnikih za nastanek in razvoj raka, v drugi uri pa so lahko slišano tudi preverili in si ogledali laboratorije ter delo oddelkov. Tudi Morsko biološko postajo v Piranu je obiskalo veliko število učencev in dijakov, ki so v okviru različnih dejavnosti spoznavali zakonitosti morja in njegove prebivalce. Opazovali so morje pod mikroskopom, spoznavali kemijo morja, raznovrstnost morskih organizmov, delo na ladji in si ogledali priprave na potop. Noč raziskovalcev je evropski projekt – dogodek, ki se je na ta dan odvijal na več kot 600 lokacijah in v več kot 300 evropskih mestih hkrati. Namen dogodka je predstaviti poklic in življenje znanstvenika. »Raziskovalci in znanstveniki v središču vsakdanjega življenja« je bil fokus vseh aktivnosti v okviru letošnje Noči raziskovalcev.



Noč raziskovalcev, 27.9.2013.
Researchers Night, 27.9.2013.

(Foto | Photo: H. Končar)

15th ANNIVERSARY OF COOPERATION OF NIB WITH PLANT PROTECTION SERVICE AND THE EXTENSION OF SIST EN ISO / IEC 17025 ACCREDITATION TO THE FIELD OF IDENTIFYING MICROORGANISMS

22 Jan 2014 At the 15th anniversary of cooperation of NIB with the Department of Plant Protection, and the extension of SIST EN ISO / IEC 17025 accreditation to the field of identifying microorganisms, a lecture entitled "New Research to Help the Health of Plants" was held at the Biology Centre. The lecture was prepared by Prof. Dr. Maja Ravnika and Dr. Tanja Dreo from the Department of Biotechnology and Systems Biology at NIB. The purpose of the lecture was to present the latest research and diagnostic methods that provide control of plant diseases and improve the quality of crops. This is an extremely dynamic field that requires speed, flexibility, interdisciplinarity and integration of different skills. The lecture was attended by representatives of the Office for Food Safety, inspection services and ministries, researchers, students and journalists.

Noč raziskovalcev, 27.9.2013.
Researchers Night, 27.9.2013.

(Foto | Photo: H. Končar)



INTERNATIONAL FASCINATION OF PLANTS DAY

17 May 2013 The second International Fascination of Plants Day was held at the Ljubljana Botanical Garden and elsewhere in Slovenia under the auspices of the European Organization for Plant Research (European Plant Science Organisation). In Slovenia, the main organizer of the Fascination of Plants Day was the Slovenian Society for Biology of Plants. NIB also participated in the event with two stalls (entitled "Genetically Modified Plants for the Production of Useful Substances" and "When Bacteria Invade Fascinating Plants") presenting practical demonstrations aimed mainly at schoolchildren and families. The aim of this initiative is to present plants and science to a wider audience, in order for more people around the world to be aware of the importance of the science of plants for agriculture, sustainable food production, horticulture, forestry, of the production of non-food products such as paper, timber, chemicals, energy, pharmaceuticals and of the role of plants in the environment.

THE RESEARCHER'S NIGHT

27 Sept 2013 In the framework of the event Researcher's Night, the National Institute of Biology opened its doors in Ljubljana and Piran. Visitors to NIB's headquarters in Ljubljana were able to attend interesting and instructive lectures on insects, birds, fungi and environmental factors for the emergence and development of cancer. After lectures, they could also check what they heard and see the work of departments and laboratories. The Marine Biology Station in Piran was visited by a large number of pupils, who learned about the characteristics of the sea and its inhabitants through different activities. They watched the sea under a microscope, learned about the chemistry of the sea, about the diversity of marine organisms and about work on the boat. They could also observe preparations for the dive. Researcher's Night is a European project – an event that is held on this day at more than 600 locations in more than 300 European cities at the same time. The purpose of the event is to present the profession and the life of a scientist. "Researchers and scientists at the heart of everyday life" was the focus of all activities within the framework of this year's Researcher's Night.



(Foto / Photo: Davorin Tome)

1.0

SKUPNE SLUŽBE Corporate Services

Vodja / Head

• Mag. **Franc Potočnik**, pomočnik direktorice / Deputy Director

Naslov / Address

Nacionalni inštitut za biologijo / National Institute of Biology

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Uprava / Administration

1. Prof. dr. **Tamara Lah Turnšek**, direktorica / Director
2. **Dunja Goršič**, samostojna strokovna sodelavka za kadre / Independent Specialist Assistant for Human Resources
3. **Helena Končar**, samostojni strokovni sodelavec za organizacijo in poslovanje / Independent Specialist Assistant for Organisation and Business Operations
4. **Maja Malec**, strokovna sodelavka za upravno pravne zadeve / Independent Specialist Assistant for Administrative-Legal Affairs
5. Mag. **Mirjana Oblak**, strokovna sodelavka za mednarodne projekte in vodja pisarne za prenos tehnologij / Independent Specialist Assistant for International Projects and Head of the Technology Transfer Office
6. **Darja Penšek**, samostojna strokovna sodelavka za kadre / Independent Specialist Assistant for Human Resources
7. **Gašper Polajnar**, samostojni strokovni sodelavec za organizacijo in poslovanje / Independent Specialist Assistant for Organisation and Business Operations



8. **Alenka Tomšič**, samostojni strokovni sodelavec za javna naročila / Independent Specialist Assistant for Public Procurement

Računovodstvo / Accounting

1. **Olga Brišar**, glavna računovodkinja / Head Accountant
2. Mag. **Mojca Rak**, glavna računovodkinja / Head Accountant
3. **Karolina Rigler**, pooblaščenca računovodkinja / Authorized Accountant
4. **Irena Verderber**, računovodkinja / Accountant
5. **Jelka Svenšek**, računovodkinja / Accountant

Knjižnica / Library

1. **Barbara Černač**, dokumentalistka raziskovalka / Documentalist Researcher
2. **Lučka Glavač**, dokumentalistka arhivarka / Documentalist Registrar

DEJAVNOST

Skupne službe so organizacijska enota, ki je zadolžena za izvajanje naslednjih funkcij in aktivnosti: finančne in računovodstvo, kadrovske zadeve, nabave in javna naročila, administrativna podpora projektne- mu vodenju, splošne zadeve, urejanje informacijskih in računalniških sistemov, administrativne zadeve za organe upravljanja in podobno.

V okviru Skupnih služb deluje tudi Biološka knjižnica, ki je v upravljanju tako Nacionalnega inštituta za biologijo kot tudi Oddelka za biologijo Biotehniške fakultete Univerze v Ljubljani.

Poleg poslovnih in promocijskih aktivnosti, navedenih v Uvodu tega Poročila o delu, smo v okviru Skupnih služb v letu 2013 sodelovali pri organizaciji posebnih dogodkov za javnost: svečana podelitev nagrad in priznanj Miroslava Zeia odličnim znanstvenikom na področju biologije, svečan sprejem mladih raziskovalcev Nacionalnega inštituta za biologijo in Oddelka za biologijo Biotehniške fakultete Univerze v Ljubljani, dan odprtih vrat NIB v Ljubljani, predstavitev NIB avstrijskim partnerjem na sedežu Društva »Slovenski znanstveni inštitut na Dunaju« (SZI), mednarodni Dan očarljivih rastlin, srečanje raziskovalcev NIB in Univerze v Novi gorici UNG v dvorcu Lanthieri v Vipavi, Noč raziskovalcev in drugih. NIB-ovo zbirko knjig Vse živo smo predstavili na sejmu akademske knjige Liber.ac.

V soizdajateljstvu z Biotehniško fakulteto Univerze v Ljubljani dvakrat letno izdajamo znanstveno revijo »Natura Sloveniae – revija za terensko biologijo«. S predavanji smo sodelovali v okviru projekta »Znanost na cesti, znanje in ideje na prepihu«, koordinirali smo tudi redna strokovna predavanja na sedežu NIB v Ljubljani. V soorganizaciji Inštituta LUTRA smo pripravili razstavo »AQUAVIVA – razstava diatomej Ljubljani«, na Krakovskem nasipu ob Ljubljani. Na sedežu Društva »Slovenski znanstveni inštitut na Dunaju« smo pripravili razstavo podvodne fotografije Tihomirja Makovca: »Življenje na stebrih«. Razstava naravoslovne fotografije Janija Turka: »Skrivnosti Mediterana«, pa je bila na ogled v avli Biološkega središča, ob podelitvi nagrad in priznanj Miroslava Zeia.

Obisk veleposlanika Braziliije, 9.5.2013. Z leve: prof. dr. **ANDREJ ČOKL**, dr. **RAÚL ALBERTO LAUMANN** (Embrapa), prof. dr. **TAMARA LAH TURNŠEK** (direktorica NIB), nj. eksc. g. **GILBERTO FONSECA GUIMARÃES DE MOURA** (veleposlanik Braziliije) in g. **ANDRE MAKARENKO** (sekretar na brazilski ambasadi).

*Visit of the Ambassador of Brazil, 9. 5. 2013. From the left: Prof. Dr. **ANDREJ ČOKL**, Dr. **RAÚL ALBERTO LAUMANN** (Embrapa), Prof. Dr. prof. dr. **TAMARA LAH TURNŠEK** (Director NIB), His Excellency Mr. **GILBERTO FONSECA GUIMARÃES DE MOURA** (Ambassador of Brazil) and Mr. **ANDRE MAKARENKO** (Secretary at the Brazilian Embassy).*

(Foto | Photo: H. Končar)



Obisk francoske delegacije, 19.11.2013. Z leve: **THOMAS WELLE BROUCK** (Ataše za znanost in visoko šolstvo, Francosko Veleposlaništvo), prof. dr. **TAMARA LAH TURNŠEK** (direktorica NIB), dr. **LUIS M. MIR** (CNRS), dr. **FLORENCE NOBLE** (CNRS), dr. **FRANCESCA GRASSIA** (CNRS).

*Visit of the French delegation, 19.11.2013. From the left: Mr. **THOMAS WELLE BROUCK** (Attaché for science and higher education, French Embassy), Prof. Dr. **TAMARA LAH TURNŠEK** (Director NIB), Dr. **LUIS M. MIR** (Director of the laboratory of Vectorology and anti-cancerous therapeutics (joint research unit of the CNRS, Gustave Roussy Institute and the Paris-XI University)), Dr. **FLORENCE NOBLE** (Deputy scientific director of the Institute of Biological Sciences of the CNRS), Dr. **FRANCESCA GRASSIA** (Deputy director of the European research and international cooperation office (DERCI) of the CNRS).*

(Foto | Photo: H. Končar)



Dan odprtih vrat NIB v Ljubljani – obisk Oddelka za gensko toksikologijo in biologijo raka, 9. 10. 2013.

Open day on NIB – Visit of the Department of Genetic Toxicology and Cancer Biology, 9. 10. 2013.

(Foto | Photo: H. Končar)

ACTIVITIES

The Corporate Services are the organisational unit in charge of providing support to research organisational units. Their main activities are finance and accounting, human resources, procurement, administration support for project management, general affairs, management of IT and computer systems, administrative affairs for management bodies and similar duties.

The Biology Library is also part of the Corporate Services and is managed jointly by the National Institute of Biology and the Biology Department of the Biotechnical Faculty University of Ljubljana.

In addition to business and promotional activities mentioned in the introduction to this report, we have, in the framework of Joint Staff, participated in the organization of special events for the public in 2013: the Miroslav Zei Awards ceremony to award excellent scientists in the field of biology; the reception for young researchers of the National Institute for Biology and the Department of Biology at Biotechnical Faculty, University of Ljubljana; the Open Day at NIB Ljubljana; the presentation of NIB to Austrian partners at the headquarters of the Society »Slovenian Scientific Institute in Vienna«; the International Fascination of Plants Day; the meeting of NIB researchers and the University of Nova Gorica at the Lantieri mansion in Vipava; Researcher's Night and other events. NIB's collection of books "Everything live" was presented at the exhibition of academic books Liber.ac.

Together with Biotechnical Faculty at the University of Ljubljana we publish a scientific journal »Nature Sloveniae – Magazine for Field Biology« twice a year. We participated in the project »Science on the Road, Knowledge and Ideas in the Draught« with lectures and we also co-ordinated regular lectures at NIB headquarters in Ljubljana. In co-operation with the LUTRA Institute we prepared an exhibition »AQUAVIVA – Exhibition of Diatoms of Ljubljana« at Krakovski nasip by the Ljubljana river. At the headquarters of the Society »Slovenian Scientific Institute in Vienna« we prepared an exhibition of underwater photography by Tihomir Makovec: »Life on the Pillars.« Exhibition of nature photography by Jani Turk, entitled »Secrets of the Mediterranean«, was on display in the lobby of the Biological Centre, at the Miroslav Zei Awards Ceremony.



NIB se je s svojo zbirko knjig Vse živo in ostalimi publikacijami udeležil sejma akademske knjige "Liber.ac", 21. – 23. 5. 2013.

With collection of books »All live« and other publications NIB participated on the Academic Book Fair "Liber.ac", 21. – 23. 5. 2013.

(Foto | Photo: Arhiv NIB | Archive NIB)



Predavanje v okviru projekta »Znanost na cesti, znanje in ideje na prepihu«, dr. **DANILO BEVK** (NIB): »Tudi čebele imajo krizo«, Kavarna Union, 23.10.2013.

*Lecture within the framework of the project »Science on the road, knowledge and ideas on the draft«, Dr. **DANILO BEVK** (NIB): »The bees have crisis, too«, Café Union, 23. 10. 2013.*

(Foto | Photo: Arhiv NIB | Archive NIB)



Razstava podvodne fotografije **TIHOMIRJA MAKOVCA**: »Življenje na stebrih«.

*Underwater Photography Exhibition, **TIHOMIR MAKOVEC**: »Life on the pillars«.*

(Foto | Photo: T. Makovec)

Leščur / *Pinna nobilis*
Noble pen shell

(Foto | Photo: T. Makovec)



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ODDELEK MORSKA BIOLOŠKA POSTAJA PIRAN – MBP

Department Marine Biology Station Piran – MBP

Vodja / Head:

- izr. prof. dr. **Vlado Malačič**, univ. dipl. fiz., znanstveni svetnik

Pomočnica vodje / Head deputy

- doc. dr. **Patricija Mozetič**, univ. dipl. biol., vodja DE III, višja znanstvena sodelavka

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- dr. **Branko Čermelj**, univ. dipl. ing. geol., višji strokovno – raziskovalni sodelavec
- prof. dr. **Jadran Faganeli**, univ. dipl. kem., znanstveni svetnik
- dr. **Vesna Flander Putrle**, univ. dipl. biol., znanstvena sodelavka
- dr. **Janja Francé**, univ. dipl. biol., asistentka z doktoratom
- dr. **Neli Glavaš**, univ. dipl. kem., asistentka z doktoratom
- dr. **Mateja Grego**, univ. dipl. biol., znanstvena sodelavka
- dr. **Tjaša Kogovšek**, univ. dipl. ing. geol., asistentka z doktoratom
- dr. **Neža Koron**, univ. dipl. mikrobiol., asistentka z doktoratom
- doc. dr. **Nives Kovač**, univ. prof. bi-ke., višja znanstvena sodelavka
- dr. **Matjaž Ličer**, univ. dipl. fiz., asistent z doktoratom
- prof. dr. **Lovrenc Lipej**, univ. dipl. biol., znanstveni svetnik
- prof. dr. **Alenka Malej**, univ. dipl. biol., znanstvena svetnica



14. dr. **Borut Mavrič**, univ. dipl. biol., asistent z doktoratom
15. dr. **Martina Orlando Bonaca**, univ. dipl. biol., znanstvena sodelavka
16. dr. **Boris Petelin**, univ. dipl. ing. gradb., strokovno – raziskovalni sodelavec
17. doc. dr. **Andreja Ramšak**, univ. dipl. biol., višja strokovno – raziskovalna sodelavka
18. dr. **Tinkara Tinta**, univ. dipl. biokem., asistentka z doktoratom
19. izr. prof. dr. **Valentina Turk**, univ. dipl. biol., znanstvena svetnica

Mladi raziskovalci / Young Scientists

1. **Katja Klun**, univ. dipl. kem.
2. **Maja Kos Kramar**, univ. dipl. mikrobiol.
3. **Valentina Pitacco**, mag. morske biol.
4. **Lucija Raspor Dall'Olio**, univ. dipl. mikrobiol.
5. **Iva Talaber**, univ. dipl. biol.
6. **Martin Vodopivec**, univ. dipl. fiz.

Strokovno tehnični sodelavci / Technicians

1. **Vladimir Bernetič**, projektni sodelavec in knjižničar
2. **Anja Fettich**, strokovna sodelavka
3. **Janez Forte**, vodilni strokovni sodelavec
4. **Jana Gregorič**, poslovna sekretarka
5. **Tihomir Makovec**, strokovni sodelavec – vodja potapljaške baze
6. **Gašper Polajnar**, samostojni strokovni sodelavec za organizacijo in poslovanje
7. **Milijan Šiško**, vodilni strokovni sodelavec
8. **Marko Tadejevič**, vodilni tehnično–strokovni sodelavec

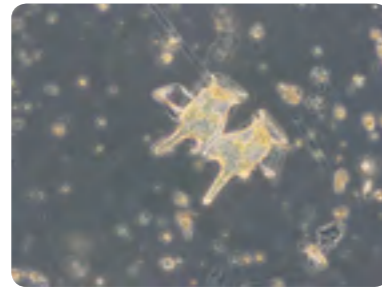
RAZISKOVALNA DEJAVNOST

Kot vodilna enota za raziskave morskih ekosistemov v Sloveniji je v letu 2013 Morska biološka postaja (MBP) nadaljevala multidisciplinarno, temeljne in uporabne raziskave v okviru dveh raziskovalnih programov ter več mednarodnih in nacionalnih aplikativnih projektov. Raziskave v okviru programov zagotavljajo temeljna znanja o obalnih morskih ekosistemih za katere je značilno, da so izpostavljeni kombinaciji številnih dejavnikov, ki delujejo v različnih prostorskih in časovnih skalah.

Na naravne procese v obalnih območjih pomembno vplivajo tudi antropogeni pritiski, ki predstavljajo dodaten ključen dejavnik. Raziskave, ki tečejo na MBP zagotavljajo raziskovalno in strokovno podporo za trajnostni razvoj ter potrebna znanja za izpolnjevanje okoljskih zahtev mednarodne, evropske in nacionalne zakonodaje. Ključno je tudi razvijanje novih metodologij in zagotavljanje tako tranzientnih opazovanj antropogenih vplivov na okolje (npr. pomorski promet), kot neprekinjenih opazovanj meteoroloških, oceanografskih in bioloških parametrov z opazovalnim sistemom VIDA na morju. Raziskovalno delo je osnova pedagoškim dejavnostim sodelavcev MBP, ki so vključeni v izobraževalne procese dodiplomskega in podiplomskega študija slovenskih in tujih univerz.

Raziskovalni program P1-0237 »Raziskave obalnega morja«

Interdisciplinarni program, ki temelji na eksperimentalnih terenskih in laboratorijskih raziskavah ter modeliranju, zagotavlja znanje o kompleksnih obalnih in polzaprtih morskih ekosistemih in omogoča izvajanje trajnostne rabe teh ekosistemov. Raziskovalni program poteka v okviru šestih med seboj povezanih sklopov s poudarkom na študiju oceanografskih in antropogenih gonilnih sil ter njihovih vplivov na sestavo in delovanje ekosistema. V l. 2013 smo ovrednotili numerični prognostični model za severni Jadran s primerjavo radarskih in ADCP tokov. Pokazalo se je, da je model reproduciral najpomembnejše cirkulacijske strukture, a se v podrobnostih kar znatno



Celici dinoflagelata *Dinophysis tripos*
Two cells of the dinoflagellate
Dinophysis tripos

(Foto | Photo: P. Mozetič)

Terminalna celica kolonijske diatomeje
iz rodu *Bacteriastrium*
Terminal cell of the colony of diatom
Bacteriastrium sp.

(Foto | Photo: P. Mozetič)



razlikuje od eksperimentalnih meritev. Izvedli smo Lagrangejevo sledenje površinskih delcev s pomočjo plovcev in meritve hitrosti posedanja pridnenih lebdečih delcev. Z metodami podatkovnega rudarjenja, prostorsko-časovnih povezovalnih pravil in večnivojskih usmerjenih grafov smo pridobili nova spoznanja o izmenjavi vodnih mas med posameznimi sredozemskimi območji. Zaključen je bil eksperimentalni del sklopa raziskav fizikalno-bioloških povezav fitoplanktona s specifičnimi dejavniki okolja. Pokazalo se je, da že majhne spremembe stabilnosti vodnega stolpa v plitvih obalnih območjih izzovejo fiziološki odziv fitoplanktona, ki se odraža v vertikalnih razlikah fotosintetskih parametrov. Z analizo velikostnih frakcij fitoplanktona smo nadaljevali z raziskavami trofičnih povezav pelaškega prehranjevalnega spleta, raziskave sezonskih in medletnih razlik fitoplanktona pa smo dopolnili z analizami barvil z uporabo HPLC.

V l. 2013 smo zaključili primerjalno študijo populacijske dinamike morske iskrnice v severnem Jadranu in severnem Črnem morju. V obeh sistemih iskrnica povzroča občasne rdeče plime; razpoložljivost hrane in pogostost vetrovnih dni pa so se izkazali kot pomembni dejavniki za populacijsko dinamiko in množično pojavljanje. Zaključena je bila tudi študija sestave in razširjenosti združbe oksidatorjev amonija. Dinamiko amonij-oksidirajočih arhej in bakterij smo spremljali s kvantifikacijo genov *amoA* z metodo qPCR in najvišje koncentracije teh organizmov zaznali v pridnenem sloju v obdobju nižjih temperatur. Na osnovi DDGE in genskih knjižnic gena *amoA* pa smo ugotovili tudi sezonske spremembe v sestavi združb. Nadaljevale so se tudi raziskave mikrobov asociiranih z meduzami. Vrstna sestava bakterij na površini meduz je bila podobna sestavi v okolni vodi, razlikovali pa so se deleži posameznih vrst. Meduze predstavljajo za bakterije primeren organski substrat in ugotovili smo, da masovni pojav meduz pomembno vpliva na sestavo mikrobne združbe. Raziskovali smo odzive meiofavne na pomanjkanje kisika z *in situ* poskusi, pomemben pa je bil tudi razvoj metodologij, še zlasti izboljšava metode za razločevanje živih in odmrlih organizmov. Tovrstna metodologija je pomembna za ugotavljanje časovnih okvirov preživetja različnih vrst meiofavne v hipoksičnih oz. anoksičnih razmerah v sedimentu. Raziskave morske biodiverzitete so se v l. 2013 osredotočile na tematike, povezane z implementacijo EU Okvirne direk-

RESEARCH ACTIVITY

As the leading unit for marine ecosystem research in Slovenia, the Marine Biology Station (MBS) continued its multidisciplinary, basic and applied research in 2013 within the scope of two research programmes and several international and national applied projects. Research under these programmes provides basic knowledge of coastal marine ecosystems, which are characteristically exposed to a combination of many drivers that are active at different spatial and temporal scales.

The natural processes in coastal areas are also significantly influenced by anthropogenic pressures, which present an additional key driver. The research underway at MBS provides scientific and professional support for sustainable development and knowledge for meeting the environmental requirements of international, European and national legislation. Likewise of key importance is the development of new methodologies and the provision of transient observations of anthropogenic impact on the environment (e.g. maritime transport) and continuous observations of meteorological, oceanographic and biological parameters with the VIDA observation system at sea. The research work presents a basis for the pedagogical activities of associates of MBS, who are involved in the educational processes of undergraduate and postgraduate studies at Slovenian and foreign universities.

Research Programme P1-0237 “Coastal Ocean Research”

This interdisciplinary programme, based on experimental field and laboratory research and modelling, provides knowledge of complex coastal and semi-enclosed marine ecosystems, which in turn enables the sustainable use of these ecosystems. The research programme is being carried out within the framework of six interconnected sets with emphasis on the study of oceanographic and anthropogenic driving forces and their impacts on the composition and functioning of the ecosystem. In 2013 we assessed the numerical



Vzorčevanje sedimentnega dna
Sediment sampling

(Foto | Photo: T. Ozod-Seradij)

Vzorčevanje sedimentnega dna
Sediment sampling

(Foto | Photo: T. Ozod-Seradij)



prognostic model for the northern Adriatic by comparing radar and ADCP currents. It was discovered that this model reproduced the most important circulation structures; however, the details differed rather substantially from the experimental measurements. We carried out Lagrangian particle tracking using floats and we also measured the velocity of the sinking of suspended particles near the sea floor. Using methods of data mining, spatio-temporal association rules and multi-level directed graphs, we have obtained new findings on water mass exchange among individual Mediterranean areas. The experimental part of the set of research into the physical biological coupling between phytoplankton and specific environmental factors was concluded. It was discovered that even slight changes in the stability of the water column in shallow coastal zones trigger a physiological response of the phytoplankton, which is reflected in the vertical differences of photosynthetic parameters. By analysing the size fractions of phytoplankton we continued our research into trophic relations of the pelagic food web; we upgraded the existing knowledge of the seasonal and interannual variations in phytoplankton with analyses of pigments using HPLC.

In 2013 we concluded a comparative study of the population dynamics of the heterotrophic dinoflagellate *Noctiluca scintillans* in the northern Adriatic and the northern Black Sea. In the case of both systems, *N. scintillans* causes occasional red tides; the availability of food and the frequency of windy days have shown to be important factors for the population dynamics and mass occurrence. The study of the composition and distribution of the community of ammonia-oxidisers was also concluded. The dynamics of ammonia-oxidising archaea and bacteria were monitored with a quantification of *amoA* genes using the qPCR method; the highest concentrations of these organisms were detected in the demersal zone during lower temperatures. Based on DDGE and genomic libraries of the *amoA* gene, we also determined seasonal changes in the composition of communities. Research into microbes associated with jellyfish was likewise continued. The species composition of the bacteria on the surface of the jellyfish was similar to the composition in the surrounding water; however, the shares of individual species differed. Jellyfish present a suitable organic substrate for bacteria; it has been ascertained that the mass occurrence of jellyfish has an important impact on the composition of the microbial commu-

tive o morski strategiji. Razvijali smo metodologije za vrednotenje okoljskega stanja na osnovi bentoških habitatnih tipov in travnikov kolenčaste cimdodoceje. Med ostalimi biološkimi elementi smo se posvetili raziskavam prehranjevalne ekologije morskih psov in skatov ter bioakumulacije živega srebra in pa študiju biogenih formacij, zlasti kamenih koral. Nadaljevali smo z analizami trendov prisotnosti termofilnih in tujerodnih organizmov v slovenskem morju. V okviru raziskav onesnaženja smo nadaljevali s študijem vloge mikrobov v procesih razgradnje bioplastike in študijem dinamike naravnih populacij mikroorganizmov ob prisotnosti različnih onesnaževal (posamezni pesticidi oz. njih mešanica, težke kovine, PAH).

V okviru CRP projekta smo v sodelovanju z Zavodom za ribištvo analizirali značilnosti in sezonsko pojavljanje nekaterih gospodarsko pomembnih vrst rib ter pregledali vsebino želodcev izbranih vrst rib. V nekaterih želodcih smo odkrili precejšen delež mikroplastike, kar je bilo potrjeno z analizo delcev na Kemijskem inštitutu. Analizirali smo fotokemijsko razgradnjo bisfenola A kot modelnega organskega onesnaževala v sistemu železovih ionov in karboksilnih kislin ter spremljali vplive različnih parametrov (pH, vrsta in koncentracija karboksilne kisline, getita, NaCl, prisotnost/odsotnost kisika). Nadaljeval se je tudi študij vsebnosti in razširjenosti različnih onesnaževal (organskih in kovin) v sedimentu in organizmih našega morja. Študirali smo sezonsko aktivnost acetilholinesteraze, glutation-S-transferaze in katalaze v različnih tkivih klapavic ter poškodbe DNA s kometnim testom in mikronukleusnim testom. Zaključili smo specifične interdisciplinarne raziskave sestave in pretvorbe petole, slanice in solinskega blata v Sečoveljskih solinah.

Raziskovalni program P1-0143 »Kroženje snovi v okolju, snovna bilanca in modeliranje okoljskih procesov in ocena tveganja«

V okviru raziskovalnega programa, ki ga vodi prof. dr. Milena Horvat z IJS, smo raziskovalci MBP študirali interakcije med kovinami in morskimi organskimi koloidi, pretežno fitoplanktonskega izvora, s posebnim

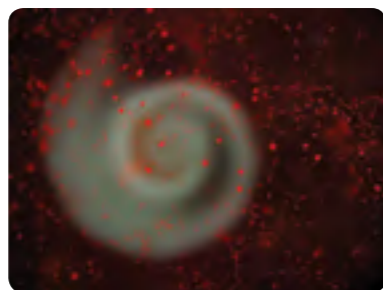


Vzorčevanje s planktonsko mrežo
Sampling with plankton net

(Foto | Photo: V. Flander Putrle)

Obrast na bioplastiki
Biofilm on bioplastic

(Foto | Photo: V. Turk)



poudarkom na makroagregatih (makrogelih). Organski koloidi, ki so sestavljeni pretežno iz heteropolisaharidov in lipidov, aglomerirajo v makrogele in vežejo anorganske delce s kovinami z izvorom v preperevanju okoliških kamnin in resuspenziji sedimenta. V koloidni frakciji je večina kovin vezanih v večje makromolekule, pretežno odporne N-vsebujoče makromolekule, in tako imobilizirane kovine se ohranjajo. Delež makromolekularno vezanih kovin v Tržaškem zalivu, glede na celotne raztropljene, je razmeroma majhen. Izstopata Cu in predvsem Hg. Porazdelitveni koeficienti so pokazali razmeroma šibko sposobnost vezave kovin na koloide in makroagregate v primerjavi s suspendirano snovjo.

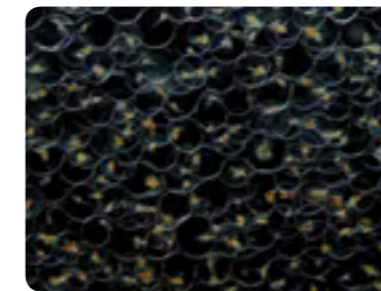
GLAVNI DOSEŽKI V LETU 2013

V letu 2013 smo izvedli zelo zahtevno obnovo oceanografsko-ekološke opazovalne postaje Vida. Projekt obnove boje Vide (mase 3,5 tone), ki je bila prvič po petih letih ponovno izвлечena na kopno, je bil tehnično in finančno zahteven. Enota MBP je uspela zaključiti finančno konstrukcijo obnove s tretjinskim sofinanciranjem Agencije R Slovenije za raziskovalno dejavnost, Agencije R Slovenije za okolje, kot tudi z lastno udeležbo s sredstvi za obnovo merilnih naprav. Obnova je vsebovala osnovna obnovitvena dela na trupu iz nerjaveče pločevine, kot tudi zamenjavo električnih instalacij in merilne elektronike. Na bojo Vido je bila poskusno nameščena tudi kamera, ki je bila položena na morskno dno v globino 22 m, pa tudi merilnik za meritev koncentracije kisika, ki je opremljen z ustreznim mehničnim brisalcem optično občutljivega predela. Z merilnikom spremljamo morebitne pojave hipoksije na morskem dnu.

V letu 2013 je potekalo izvajanje IPA Adriatic projekta »Krepitev zmogljivosti v skupnem boju proti onesnaženju morja z nafto, toksičnimi in nevarnimi snovmi v Jadranskem morju« HAZADR. Izvedli smo prve strokovne študije za postavitev radijskega sistema (WERA) za spremljanje površinskih tokov in valov in usmerili aktivnosti za pridobivanje ustreznih soglasij za postavitev sprejemno-oddajnih anten na grebenu pri piranski stolni cerkvi, kar omogoča spremljanje to-

nity. We studied the responses of meiofauna to lack of oxygen with in situ tests; also important was the development of methodologies, particularly the improvement of the method for distinguishing between living and dead organisms. Such methodology is important for establishing the time frames of the survival of various species of meiofauna under hypoxic or anoxic conditions in the sediment. In 2013, research into marine biodiversity focused on topics connected with the implementation of the EU Marine Strategy Framework Directive. We developed methodologies for assessing environmental status based on benthic habitat types and Cymodocea nodosa meadows. As regards other biological elements, we focused on research into the trophic ecology of sharks and rays, the bioaccumulation of mercury, and the study of biogenic formations, especially of stony corals. We continued analysing the trends of the presence of thermophilic and non-native organisms in the Slovenian sea. Within the scope of pollution research we continued the study of the role of microbes in the processes of the decomposition of bioplastics and the study of the dynamics of natural populations of microorganisms in the presence of various contaminants (individual pesticides or a mix of them, heavy metals and PAH).

Under the CRP project, in cooperation with the Fisheries Research Institute of Slovenia, we analysed the characteristics and seasonal occurrence of certain economically important species of fish, and examined the contents of the stomachs of select species of fish. Some of the stomachs contained a substantial amount of microplastics, which was confirmed with a particle analysis at the National Institute of Chemistry. We analysed the photochemical decomposition of bisphenol A as the model organic contaminant in a system of iron ions and carboxylic acids, and monitored the impact of various parameters (pH, type and concentration of carboxylic acid, goethite, NaCl, and presence/absence of oxygen). The study of the content and distribution of various contaminants (organic and metals) in the sediment and organisms in the sea was likewise continued. We studied the seasonal activity of acetylcholinesterase, glutathione S-transferase and catalase in different tissues of mussels and DNA damage with a comet assay and micronucleus test. We concluded specific interdisciplinary research into the composition and transformation of the petola microbial mat, brine and salt-pan mud at the Sečovlje salterns.

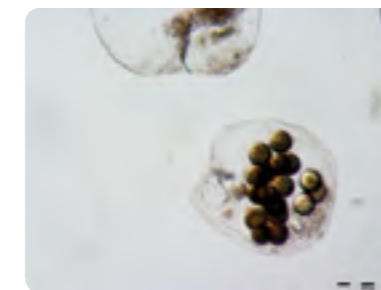


Morska iskrnica / Noctiluca scintillans
Sea sparkle

(Foto | Photo: T. Kogovšek)

Morska iskrnica / Noctiluca scintillans
Sea sparkle

(Foto | Photo: V. Turk)



Research programme P1-0143 »Cycling of substances in the environment, mass balances, modelling of environmental processes and risk assessment«

In the frame of this research programme, led by prof. Milena Horvat from JSI Ljubljana, the MBS researchers were mainly involved in the study of interaction between metals and marine organic colloids including macroaggregates (macrogels) mostly of phytoplankton origin. They contain entrapped particles with high metal concentrations originating from continental wathering and resuspension. In the organic colloids, prevalently composed of heteropolysaccharides and in lesser extent of lipids, most metals are bonded onto large N-containing macromolecules, less prone to degradation, constituting a possible path of metal immobilization and preservation. The proportion of macromolecular-bound metals in the pool of total dissolved metals in coastal waters appears, except Cu and especially Hg, to be rather low. According to the distribution coefficients, the northern Adriatic organic colloids, including macroaggregates, exhibit rather weak metal-binding capacity compared to particulate matter.

MAIN ACHIEVEMENTS IN 2013

In 2013 we carried out very demanding restoration of the Vida oceanographic and ecological observation station. The project of restoring the Vida buoy (mass 3.5 tons, which was pulled ashore for the first time after five years, was technically and financially demanding. The MBS unit succeeded in completing the financial construction of the restoration with one-third shares financed by the Slovenian Research Agency (ARRS), with the Slovenian Environment Agency and by using its own resources for restoring the measuring devices. The restoration encompassed basic restoration works on the body made of stainless steel metal, as well as the replacement of electrical wiring and electronic measuring instruments. A test camera was installed on the Vida buoy and placed on the seabed at a depth of 22 m, as well as an oxygen measurement probe,

kov in valov v območju tako Tržaškega, kot tudi Piranskega zaliva. Kot partner na projektu smo sodelovali tudi pri popisovanju/klasifikaciji opreme strokovnih služb za ukrepanje v primeru razlitij oljnih madežev. V letu 2013 smo izvedli nove strokovne podlage za implementacijo EU direktiv, to je Vodne direktive in Okvirne direktive o morski strategiji, katerih rezultat so smernice za izvajanje nacionalnega monitoringa v prihodnjih letih.

Širjenje znanja in popularizacija rezultatov raziskovalnega dela je v letu 2013 potekala izjemno intenzivno, organizirali smo nekaj tovrstnih javnih prireditev (Dan odprtih vrat, Noč raziskovalcev, predavanja na MBP) in sodelovali pri številnih drugih (Festival znanosti, prisotnost v tiskanih in elektronskih medijih).

SODELOVANJE Z RAZLIČNIMI UPORABNIKI

V letu 2013 smo sodelovali z Ministrstvom za kmetijstvo in okolje pri sestavljanju zaključnih strokovnih mnenj v zvezi z vplivi morebitnih plinskih terminalov. Prav tako smo za to Ministrstvo izvedli dopolnilni eksperimentalni program v okviru aplikativnega nacionalnega projekta L2-4147, kjer smo proučevali obsežnost morskih travnikov ob Debelem rtiču, kot tudi motnost morske vode pri morskem dnu tako na območju obračališča plovil 400 m pred Pomolom III in na morskem dnu plovne poti. S tem ministrstvom in tudi z Inštitutom za vode smo intenzivno sodelovali pri izvajanju razvojne študije za implementacijo Okvirne direktive morske strategije in Vodne direktive. Zaključili smo študijo o onesnaženosti in naravi morskega sedimenta v bližini Marine Portorož, ki se namerava širiti v sosednje območje in bo izvajala ukrepe za odstranitev mulja. Nadaljevali smo s preiskavami solinskega blata v sodelovanju s podjetjem SOLINE Pridelava soli, d.o.o. in z delom na vsebinah za Nacionalno komisijo za UNESCO, s katero tradicionalno odlično sodelujemo. Z Agencijo RS za okolje smo ponovno sodelovali pri izvajanju nacionalnega monitoringa ekološkega stanja.



Vzorčenje morskega sedimenta v Sečoveljskih solinah
Sampling of marine sediment in the Sečovlje Saltworks

(Foto | Photo: N. Glavaš)



Vzorčenje morskega sedimenta v Sečoveljskih solinah
Sampling of marine sediment in the Sečovlje Saltworks

(Foto | Photo: N. Glavaš)

RAZISKOVALNA INFRASTRUKTURA

V letu 2013 smo v obnovi boje Vide po petih letih delovanja dodali merilnik koncentracije kisika na morskem dnu in kamero na morskem dnu v globini 22 m. Od laboratorijske opreme smo v letu 2013 pridobili prenosni pretočni citometer. Prav tako smo uspeli pridobiti avtomatski analizator hranilnih snovi.

Prenosni pretočni citometer BD Accuri C6 za določanje mikroorganizmov v vzorcih morske vode je enostaven sistem, s katerim lahko učinkovito analiziramo vzorce na plovilu kot tudi v laboratoriju. Pomembne lastnosti BD Accuri C6 so enostaven injekcijski sistem, kompaktna in stabilna optika, kombinacija dveh laserjev z različnima ekscitacijama, ki omogočata natančno in absolutno štetje celic avtotrofnih in heterotrofnih mikroorganizmov (modri - 488 nm in rdeči - 640 nm). Sistem je opremljen z visoko občutljivimi fotopomnoževalkami in računalniškim programom za hitro določanje koncentracij avtotrofnih mikroorganizmov, kot so cianobakterije in evkariotski fitoplankton. Omenjena postavitev dovoljuje uporabo fluorescentnih barvil, ki jih vzbudimo z UV svetlobo in s tem omogočimo določanje koncentracij prokariotov.

Analizator za segmentno-pretočno analizo (SFA) vzorcev morske vode: ta visoko zmogljiv avtomatski analizator (znamke Seal Analytical, model QuAAtro 39) omogoča hkratno in hitro analizo kar štirih izbranih parametrov. Na Morski biološki postaji ga uporabljamo za določanje vsebnosti raztopljenih hranil (nitrit, nitrat, skupni dušik, ortofosfat, skupni fosfor, amonij in silikati) v vzorcih morske vode iz številnih vzorčevalnih postaj v našem morju. Opremljen je z vzorčevalnikom, ki omogoča avtomatsko analizo kar 120 vzorcev.

equipped with a suitable mechanical wiper of the optically sensitive area. The probe is used to monitor potential cases of hypoxia on the seabed.

In 2013 the IPA Adriatic project "Strengthening Common Reaction Capacity to Fight Sea Pollution of Oil, Toxic and Hazardous Substances in Adriatic Sea" HAZADR was being implemented. We carried out the first expert studies for setting up a radio system (WERA) for monitoring surface currents and waves, and directed activities towards obtaining the relevant consent for setting up receiver-transmitter antennas on a reef near the cathedral of Piran, which would enable the monitoring of currents and waves in the area of the Gulf of Trieste and the Gulf of Piran. As project partner we also took part in inventorying/classifying the equipment of professional services for intervention in the event of oil spills.

In 2013 we prepared new professional bases for the implementation of EU directives, i.e. the Water Framework Directive and the Marine Strategy Framework Directive, the result of which are guidelines for the implementation of national monitoring in the years to come.

The dissemination of knowledge and popularisation of research results were very intense in 2013; we organised several public events (Doors Open Day, Researchers' Night and lectures at MBS) and took part in many others (Science Festival, appearance in print and electronic media).

COLLABORATION WITH VARIOUS USERS

In 2013 we collaborated with the Ministry of Agriculture and the Environment on compiling the final expert opinions regarding the impacts of potential gas terminals. Furthermore, we carried out a supplementary experimental programme for the Ministry under the L2-4147 national applied project, studying the distribution of sea meadows along Debeli rtič, and the turbidity of seawater near the seabed in the area where vessels turn around, 400 m in front of Pier III, and above the seabed of the waterway. We carried out intense cooperation with the Ministry and with the Institute for Water of



Številni polipi uhatega klobučnjaka (Aurelia aurita) in dva predstavnika cevkastih mnogoščetincev in sicer vrsta Protula tubularia (zgoraj) in Serpula vermicularis (spodaj).

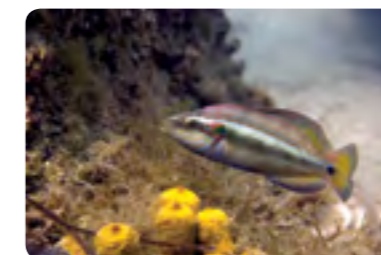
Numerous polyps of the jellyfish Aurelia aurita and two specimens of sedentary polychaetes, namely Protula tubularia (above) and Serpula vermicularis (bottom).

(Foto | Photo: T. Makovec)

Ustnače so med obrežnimi ribami znane po tem, da nekatere gradijo gnezda, ki so podobna gnezdom ptic. Najbolj umetelna so gotovo gnezda pavlinke (Symphodus ocellatus).

Among coastal fish wrasses are known to build nests that are similar to the nests of birds. The most ornate nests are certainly those prepared by the ocellated wrasse (Symphodus ocellatus).

(Foto | Photo: T. Makovec)



the Republic of Slovenia in carrying out a development study for the implementation of the Marine Strategy Framework Directive and the Water Framework Directive. We concluded a study on the contamination and nature of marine sediment near Marina Portorož; the latter plans to expand to the surrounding area and will be carrying out measures to remove the silt. We continued examining salt-pan mud in cooperation with the company SOLINE Pridelava soli, d.o.o., and our work on contents for the National Commission for UNESCO, with which we have traditional excellent cooperation. We once again cooperated with the Slovenian Environment Agency in implementing national monitoring of ecological status of coastal waters.

RESEARCH INFRASTRUCTURE

In 2013 we restored the Vida buoy after five years of operation, adding a seabed oxygen concentration meter and a camera on the seabed at a depth of 22 m. As regards laboratory equipment, we acquired a portable flow cytometer. We likewise managed to acquire an automatic analyser of nutrients.

The BD Accuri C6 portable flow cytometer for detecting microorganisms in seawater samples is a simple system for efficiently analysing samples on a vessel and in a laboratory. Important properties of BD Accuri C6 are a simple injection system, compact and stable optics, a combination of two lasers with different excitations that enable a precise and absolute count of the cells of autotrophic and heterotrophic microorganisms (blue - 488 nm and red - 640 nm). The system is equipped with highly sensitive photomultipliers and a computer program for rapid determination of the concentrations of autotrophic microorganisms such as cyanobacteria and eukaryotic phytoplankton. The above-mentioned placement allows the use of fluorescent dyes, which are excited with UV light, thus enabling the determination of prokaryote concentrations.

An analyser for segmented flow analysis (SFA) of seawater samples: this high-capacity automatic analyser (by Seal Analytical, model QuAAtro 39) enables simultaneous and fast analysis of four select parameters. It

MEDNARODNO SODELOVANJE

Oddelek Morska biološka postaja je imel tudi v letu 2013 zelo razvejano mednarodno sodelovanje. Zlasti pomembno je sodelovanje v projektih Evropske unije in sicer v sedmih projektih 7. Okvirnega programa EU ter v šestih drugih EU projektih (trije čezmejni, Eco-Innovation, DG Mare, COST). Poleg tega je v okviru šestih bilateralnih projektov teklo sodelovanje z raziskovalci iz evropskih in izven evropskih držav (Argentina, Avstrija, Črna gora, Hrvaška, Japonska, Rusija). Mednarodno sodelovanje vključuje tudi program ZN za okolje (UNEP MAP – Sredozemski akcijski načrt) in International Ocean Institute. Raziskovalci so aktivni člani različnih mednarodnih teles (MARS – Evropska mreža morskih postaj, CIESM – Komisija za raziskave Sredozemskega morja, MED GIG – sredozemska skupina za interkalibracijo metod) in vodijo neformalno čezmejno skupino štirih institucij, ki raziskuje orkansko burjo.



Dan odprtih vrat MBP
Open day of MBS

(Foto | Photo: V. Bernetič)



Dan odprtih vrat MBP
Open day of MBS

(Foto | Photo: V. Bernetič)

IZOBRAŽEVALNE DEJAVNOSTI IN PROMOCIJA ZNANOSTI

Raziskovalci so vpeti v dodiplomski in podiplomski študij na slovenskih visokošolskih institucijah univerz v Ljubljani, Mariboru, Novi Gorici ter Univerze na Primorskem, sodelovali so tudi pri izobraževanju tujih študentov, predvsem iz EU. V okviru podiplomskega študija Evro-sredozemske univerze EMUNI so tri sodelavke MBP izvajale predmeta Marine environment of the Mediterranean Sea ter Sustainable use and conservation of the Mediterranean Sea. Na MBP so tudi v l. 2013 opravljali trimesečno prakso dodiplomski študenti iz Nemčije (4) in iz Nizozemske (3, Erasmus štipendije). Študentka z Univerze Heriot Watt iz Edinburga je opravila raziskave za magistrsko nalogo, več doktorskih študentov (iz Avstrije, Češke, Italije, Španije in Ukrajine) pa eno do štirimesečno raziskovalno prakso. V okviru raziskovalnih programov so bili v l. 2013 zaključeni trije doktorati, raziskovalci so bili mentorji pri diplomskih oz. zaključnih nalogah (14) in magisterijih (3) ter štirim doktorandom.

Zelo uspešno je bilo delo na področju popularizacije znanosti: objavljeno je bilo 18 poljudnoznanstvenih člankov v različnih tiskanih medijih. Raziskovalci so velikokrat odgovarjali na vprašanja, ki so jih posredovali različni domači mediji (tiskani, radio, TV) in tudi tuji (NBCNews). Na MBP vsako leto ob Svetovnem dnevu oceanov v juniju organiziramo dan odprtih vrat za obiskovalce: predvsem za šolarje in dijake, a tudi otroke iz vrtca, študente in druge odrasle. Ta prireditve je vsako leto predstavljena tudi v IOI Newsletter, ki izhaja na Malti. Med šolskim letom organiziramo občasne obiske tudi za šole, ki svoj obisk napovejo. V letu 2013 smo imeli okoli 400 obiskovalcev, med njimi otroke iz vrtcev, šolarje, dijake ter slovenske in tuje študente. Raziskovalki MBP sta imeli predavanji na prireditvi Festival znanosti, ki ga organizira Slovenska znanstvena fundacija; pripravili smo tudi dve razstavi podvodne fotografije in sicer na razstavišču INTERNAVTIKE (mednarodne razstave navtike) v Portorožu in v Osrednji knjižnici v Kopru.

is being used at the Marine Biology Station for determining the content of dissolved nutrients (nitrite, nitrate, total nitrogen, orthophosphate, total phosphorus, ammonium and silicates) in seawater samples from numerous sampling stations in our sea. It is equipped with a sampler that enables automatic analysis of as many as 120 samples.

INTERNATIONAL COLLABORATION

The Marine Biology Station branched out its international collaboration in 2013 as well. Of special importance is its collaboration on European Union projects, namely on seven projects of the Seventh EU Framework Programme and on six other EU projects (three cross-border ones, Eco-Innovation, DG Mare and COST). In addition, it collaborated on six bilateral projects with researchers from European and non-European countries (Argentina, Austria, Montenegro, Croatia, Japan and Russia). Its international collaboration also included the UN environment programme (UNEP MAP – Mediterranean Action Plan) and the International Ocean Institute. Its researchers are active members of various international organisations (MARS – The European Network of Marine Research Institutes and Stations, CIESM – The Mediterranean Science Commission, MED GIG – Mediterranean Geographic Intercalibration Group) and are leading an informal cross-border group of four institutions researching hurricane-force Bora winds.

Educational Activities and Promotion of Science

Its researchers are engaged in undergraduate and postgraduate studies at Slovenian higher education institutions of the universities of Ljubljana, Maribor, Nova Gorica and of the University of Primorska; they have aided in educating foreign students, mostly from the EU. Within the framework of the postgraduate studies of the Euro-Mediterranean University (EMUNI), three female associates of MBS carried out the courses Marine Environment of the Mediterranean Sea and

Noč raziskovalcev
Researchers' Night



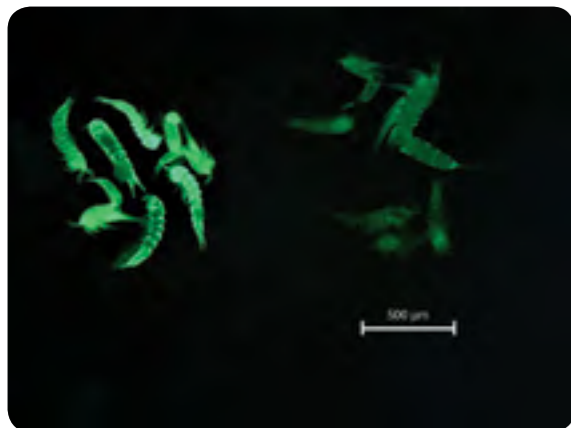
Sustainable Use and Conservation of the Mediterranean Sea. In 2013 undergraduate students from Germany (4) and the Netherlands (3, Erasmus scholarships) completed a three-month placement at MBS. A female student from the Heriot-Watt University in Edinburgh conducted research for a master's thesis and several doctoral students (from Austria, Czech Republic, Italy, Spain and Ukraine) completed from one- to four-month research placements. Within the scope of the research programmes in 2013, three doctoral dissertations were finished, and the researchers were mentors of diploma or graduation papers (14) and master's theses (3) and to four PhD students.

Polipi uhatega klobučnjaka
(Aurelia aurita)
Polyps of the jellyfish Aurelia aurita

(Foto | Photo: V. Turk)



MBS work on popularising science was very successful: 18 popular science articles were published in various print media. Its researchers often answered questions posed by various local media (print, radio, TV) and foreign media (NBCNews). Every year on World Oceans Day in June MBS organises an open doors day for visitors: primarily for pupils and secondary school students, but also for kindergarten children, university students and other adults. Every year this event is presented in the IOI Newsletter, published in Malta. During the school year it also organises occasional visits for schools that announce their visit in advance. In 2013 it had around 400 visitors, including kindergarten children, pupils, secondary school students, and Slovenian and foreign university students. Two female researchers of MBS held two lectures at the Science Festival, organised by the Slovenian Science Foundation; MBS also prepared two exhibitions of underwater photography, namely at the INTERNAUTICA (international boat show) exhibition site in Portorož and at the Public Library in Koper.



NAJPOMEMBNEJŠE OBJAVE V 2013

Primerjava uporabe CellTrackerGreen sonde in Rose Bengal barvila za ločevanje živih oz. odmrlih organizmov

Cilj naših raziskav je bil oceniti vpliv pomanjkanja kisika (anoksije) na bentoško meiofavno. Primerjali smo dve metodi označevanja meiofavne – z nevitalnim, klasičnim barvilom Rose Bengal in z vitalno sondo CellTrackerGreen. CellTrackerGreen sonda se je izkazala za veliko primernejšo pri študijah anoksije, saj je barvilo Rose Bengal obarvalo tudi tkivo (nedavno) preminulih živali, medtem ko je sonda pokazala, da manj osebkov preživi kratko anoksijo. Z uporabo CellTrackerGreen sonde tako lahko z veliko večjo natančnostjo ocenimo časovni okvir preživetja različnih vrst meiofavne (harpaktikoidnih rakov in glist) v hipoksičnih in anoksičnih razmerah v morskem sedimentu.

Površinska cirkulacija v Tržaškem zalivu: primerjava radarskih in ADCP meritev ter modelov

Površinski tokovi Tržaškega zaliva so bili merjeni od marca 2011 do oktobra 2012 s hkratnim delovanjem radijskih oddajnikov na različnih obrežnih lokacijah, med katerimi je bil eden postavljen na konico piranskega rta Madona. Te meritve smo ocenili in primerjali s podpovršinskimi meritvami tokov na boji Vidi in z rezultati prognostičnega numeričnega modela

Vzorec s CTG označenimi harpaktikoidnimi raki. Levo: močno fluorescirajoči (živi) osebki, desno: rahlo obarvani (odmrli) osebki.

Representative sample of CTG-labelled harpacticoid copepods. Left: strongly fluorescing (living) specimens, right: weakly stained (dead) individuals.

(Foto | Photo: M. Grego)

cirkulacije severnega Jadrana (NAPOM). Reproducirane so bile osnovne cirkulacijske značilnosti, kot npr. ciklonalna cirkulacija in obalni curek osladkane vodne mase ven iz zaliva ob severni (italijanski) obali. Numerični model ni v zadostni meri reproduciral nizkofrekvenčnih pojavov, deloma tudi ne v dnevnem, poldnevem in inercialnem časovnem merilu. Model in površinske radijske meritve pa niso uspešno reproducirale dnevne plimske elipse toka, izmerjene na boji Vidi. Kljub temu smo pokazali, da so radarske meritve in numerični modeli učinkovita komplementarna orodja za določanje morskih tokov in valov.

Vpliv velikosti vzorca na oceno ekološkega statusa z uporabo indeksov bentoških nevretenčarjev

Z raziskavo smo želeli optimizirati monitoring za oceno stanja ekološke kakovosti morja na podlagi bentoških nevretenčarjev. Preučili smo vpliv velikosti vzorca na referenčne vrednosti ter variabilnost v razmerju ekološke kakovosti (REK) znotraj mesta vzorčenja za šest pogosto uporabljenih ekoloških indikatorjev. Rezultati so pokazali, da je za zadostno zanesljivost določitve referenčnih vrednosti in REK v Tržaškem zalivu za posamezno mesto vzorčenja povzročiti vsaj tri paralelke.



Eksperiment degradacije meduz izveden v sklopu projekta PERSEUS

Jellyfish degradation experiment carried out within the PERSEUS project

(Foto | Photo: T. Makovec)

MOST IMPORTANT PUBLICATIONS IN 2013

Comparison of the Use of the CellTracker Green Probe and the Rose Bengal Dye for Distinguishing between Living and Dead Organisms

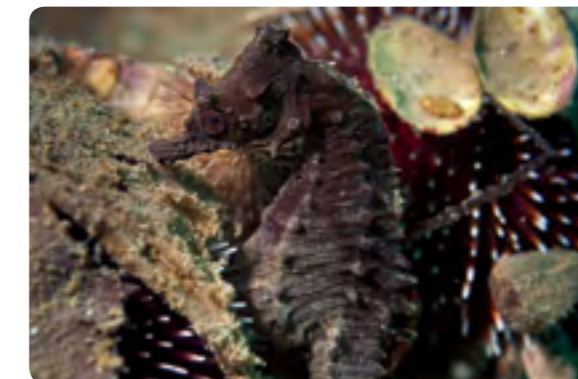
The aim of our research was to assess the impact of lack of oxygen (anoxia) on benthic meiofauna. We compared two methods of staining meiofauna – with the non-vital, classic Rose Bengal dye and with the vital CellTracker Green probe. The CellTracker Green probe proved to be much more suitable for studying anoxia, since the Rose Bengal dye also coloured the tissue of (recently) deceased animals, whereas the probe showed that fewer specimens survive brief periods of anoxia. Thus by using the CellTracker Green probe we can more accurately assess the time frame of the survival of various meiofauna species (belonging to harpacticoid copepods and nematodes) under hypoxic and anoxic conditions in marine sediments.

Surface Circulation in the Gulf of Trieste: Comparison of Radar and ADCP Measurements and Models

The surface currents of the Gulf of Trieste were measured from March 2011 to October 2012 with several radio transmitters simultaneously at various coastal locations; one of them was placed at the tip of Cape Madona in Piran. These measurements were evaluated and compared with the subsurface measurements of currents on the Vida buoy and with the results of the numerical prognostic model of circulation in the northern Adriatic (NAPOM). The basic circulation characteristics were reproduced, such as e.g. cyclonic circulation and the coastal jet of less saline water mass flowing out of the Gulf along the north (Italian) coast. The numerical model did not adequately reproduce low-frequency phenomena, nor partly at the daily, half-daily and inertial time scale. The model and the surface radio measurements failed to successfully reproduce the daily tidal current ellipses measured on the Vida buoy. We have nevertheless shown that radar measurements and numerical models are useful and complementary tools for ocean current and wave assessment.

Morski konjiček / *Hippocampus Seahorse*

(Foto | Photo: T. Makovec)



Impact of Sample Size on Assessing Ecological Status Using Benthic Invertebrate Indices

The research wished to optimise monitoring for assessing the status of the ecological quality of the sea based on benthic invertebrates. We studied the impact of sample size on reference values and the variability in the ecological quality ratio (EQR) within the sampling point for the six frequently used ecological indicators. Results have shown that, in order to determine the reference values and the EQR in the Gulf of Trieste with sufficient reliability, at least three parallels must be created for an individual sampling point.



Predelava meduz za prehrano
Processing jellyfish for food

(Foto | Photo: T. Kogovšek)

Raziskovalni program, ki ga financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Program Financed by Slovenian Research Agency*

- Raziskave obalnega morja / *Coastal Ocean Research* (P1-0237), vodja programa / *the research programme leader* prof. dr. Alenka Malej.
- Kroženje snovi v okolju, snovna bilanca in modeliranje okoljskih procesov ter ocena tveganja / *Cycling of substances in the environment, mass balances, modelling of environmental processes and risks assessment* (P1-0143), vodja programa / *the research programme leader* prof. dr. Milena Horvat.

Raziskovalni projekti, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Projects Financed by Slovenian Research Agency*

- Vpliv cirkulacije v široko odprtih zalivih in pomorskega prometa na transport sedimenta / *Influence of circulation and maritime traffic on sediment transport in wide open bays* (L2-4147), nosilec projekta / *principal investigator* prof. dr. Vlado Malačič.
- Geni, ki pogojujejo aromatiko vina / *Genes behind aroma compounds in wine* – (J4-4300) nosilec projekta / *principal investigator* prof. dr. Jure Piškur.

Mednarodni raziskovalni projekti *International Research Projects*

- Development and Pre-operational Validation of Upgraded Gmes Marine Core Services and Capabilities (MyOcean 2, EU FP7, 2012-2014), nosilec projekta / *principal investigator* prof. dr. Vlado Malačič.
- Rationally Designed Aquatic Receptors integrated in label-free biosensors platforms for remote surveillance of toxins and pollutants (RADAR, EU FP7, 2011-2013), nosilka projekta / *principal investigator* prof. dr. Valentina Turk.
- Sensing toxicants in Marine waters makes Sense using biosensors (SMS, EU FP7, 2013-2015), nosilka projekta / *principal investigator* doc. dr. Nives Kovač.
- Policy-oriented marine Environmental Research in the Southern European Seas, Collaborative Project (PERSEUS, EU FP7, 2012-2015) nosilka projekta / *principal investigator* prof. dr. Alenka Malej.
- Pan-European infrastructure for ocean and marine data Management (Seadatanet II, EU FP7, 2011- 2015) nosilec projekta / *principal investigator* dr. Branko Čermelj.
- Researchers for nature preservation and technology use for the benefit of the society (ReNATECH - Researchers Night 2013), nosilki Mirjana Oblak / dr. Neli Glavaš.
- Ecohydrological interfaces as critical hotspots for transformations of ecosystem exchange fluxes and biogeochemical cycling (INTERFACES Initial Training Networks 2013-2017), nosilka projekta / *principal investigator* prof. dr. Valentina Turk.
- Marine debris removal and preventing further litter entry (MarineClean, EU CIP Eco-Innovation, 2011-2014), nosilka projekta / *principal investigator* dr. Janja Francé
- Strengthening common reaction capacity to fight sea pollution of oil, toxic and hazardous substances in Adriatic Sea (HAZADR, IPA Adriatic Cross-border Cooperation Programme, 2007-2013), nosilec projekta / *principal investigator* dr. Branko Čermelj.
- TREzze e CORalligeno dell'ALto Adriatico: valorizzazione e gestione sostenibile nel Golfo di Trieste (Program čezmejnega sodelovanja Slovenija-Italija, 2012-2014), nosilka projekta / *principal investigator* dr. Martina Orlando Bonaca
- BALast water MAnagement System for Adriatic Sea protection (BALMAS, IPA Adriatic Cross-border Cooperation Programme, 2013-2016), nosilka projekta / *principal investigator* dr. Vesna Flander Putrle.
- Knowledge base for growth and innovation in ocean economy: assembly and dissemination of marine data for seabed mapping (EMODNET Chemistry, DG MARE/2012/10), nosilec projekta / *principal investigator* dr. Branko Čermelj.

Bilateralni raziskovalni projekti *Bilateral Research Projects*

- BI-AR/12-14-006: Možnosti komercialne rabe masovnega pojavljanja meduz / *Jellyfish blooms and the possibilities for commercial use* (slovensko-argentinsko sodelovanje), nosilka projekta / *principal investigator* prof. dr. Alenka Malej.
- Pojavi znižanih koncentracij raztopljenega kisika v severnem Jadranu: *in situ* poskusi odziva bentosa pred, med in po anoksiji / *Low dissolved oxygen events in the Northern Adriatic: in situ experimental insights into benthic responses before, during and post-anoxia*, (*The Austrian Science Fund P21542-B17*, 2011-2013), nosilka / *principal investigator* dr. Mateja Grego.
- BI-HR/12-13-030: Zaprti morski sistemi kot laboratorij bioloških fenomenov / *Enclosed marine systems as natural laboratories for biological phenomena* (slovensko-hrvaško sodelovanje), nosilka projekta / *principal investigator* izr. prof. dr. Valentina Turk.
- BI-JP/12-14-001: Slovensko-japonska študija o problemih masovnega pojavljanja meduz: mehanizmi in možni ukrepi / *Slovenia-Japan cooperative studies on problematic jellyfish blooms: mechanisms and mitigation* (slovensko-japonsko sodelovanje), nosilka projekta / *principal investigator* prof. dr. Alenka Malej.
- BI-ME/012-13-013: Modeliranje cirkulacije obalnega morja in biološki učinki onesnaženja v Črnogorskem primorju / *Modelling of coastal sea circulation and biological effects of pollution in bays of northern and southern Adriatic Sea* (slovensko - črnogorsko sodelovanje), nosilec projekta / *principal investigator* prof. dr. Vlado Malačič.
- BI-RU/12-13-028: Masovno pojavljanje želatinoznih organizmov: vplivi na ekološke značilnosti obalnega morja / *Effects of gelatinous blooms on ecology of coastal environments* (slovensko-rusko sodelovanje), nosilka projekta / *principal investigator* prof. dr. Alenka Malej.

COST raziskovalni projekti *COST Research Projects*

- EMBOS COST Action ES1003 *Development and implementation of pan-European Marine Biodiversity Observatory System*, nosilka projekta / *principal investigator* prof. dr. Alenka Malej.

Ciljni raziskovalni projekti *Target Research Projects*

- CRP Konkurenčnost Slovenije 2006-2013: Virusna in mikrobiološka kontaminacija školjk ter prisotnost morskih biotoksinov v školjkah / *Viral and microbiological contamination of bivalves and presence of marine biotoxins in bivalves* (V4-1085), pridruženi / *joint partners*.
- CRP Konkurenčnost Slovenije 2006-2013: Raziskovanje bioloških in ekoloških značilnosti ter sezonske dinamike nekaterih gospodarsko pomembnih vrst rib v Portoroškem ribolovnem rezervatu / *Determining biological and ecological characteristics and seasonal dynamics of certain commercially important fish species in the Portorož Fisheries Reserve* (V4-1071), pridruženi / *joint partners*.
- CRP Konkurenčnost Slovenije 2006-2013: Neobiota Slovenije: Invazivne tujerodne vrste v Sloveniji ter vpliv na ohranjanje biotske raznovrstnosti in trajnostno rabo virov / *Neobiota of Slovenia: Invasive alien species and their impact on biodiversity and sustainable use of resources in Slovenia* (V1-1089), pridruženi / *joint partners*.

Razvojni projekti Development Projects

- Projektna naloga za izdelavo strokovnih podlag za implementacijo Okvirne direktive o morski strategiji (2008/56/ES) v letu 2013. (Inštitut za vode RS) / *Project for the preparation of professional basis for the implementation of the Marine Strategy Framework Directive (2008/56/EC) in the year 2013.* Nosilka / *Principal investigator:* dr. Martina Orlando Bonaca.
- Projektna naloga za izdelavo strokovnih podlag za implementacijo Vodne direktive (2006/60/ES) v letu 2013 (Inštitut za vode RS). Nosilka: dr. Janja Francé. / *Project for the preparation of professional basis for the implementation of the Water Framework Directive (2006/60/EC) in the year 2013.* Nosilka / *Principal investigator:* dr. Janja Francé.
- Priprava strokovnih podlag za dopolnitev uredbe o stanju površinskih voda za obalno morje. (Inštitut za vode RS) / *Preparation of professional background to complement the Decree on marine surface water status.* Nosilka / *Principal investigator:* dr. Janja Francé.
- Izvajanje monitoringa bioloških elementov ekološkega stanja obalnega morja (Ministrstvo za kmetijstvo in okolje, Agencija RS za okolje) / *Monitoring program of coastal waters: biological elements for determination of the ecological status.* Nosilka / *Principal investigator:* doc. dr. Patricija Mozetič.
- Spremljanje kakovosti vode za življenje morskih školjk in morskih polžev (Ministrstvo za kmetijstvo in okolje, Agencija RS za okolje) / *Monitoring program of the quality of shellfish waters.* Nosilka / *Principal investigator:* doc. dr. Patricija Mozetič.
- Program spremljanja kakovosti morja in vnosov onesnaženja s kopnega v skladu z Barcelonsko konvencijo (Ministrstvo za kmetijstvo in okolje, Agencija RS za okolje) / *National monitoring program of Slovenia: assessment and control of pollution in the Mediterranean region (in compliance with Barcelona Convention).* Nosilka / *Principal investigator:* izr. prof. dr. Valentina Turk.
- Izvajanje monitoringa toksičnega fitoplanktona (Ministrstvo za kmetijstvo in okolje, Uprava RS za varno hrano, veterinarstvo in varstvo rastlin) / *Monitoring program of toxic phytoplankton species.* Nosilka / *Principal investigator:* doc. dr. Patricija Mozetič.
- Program dejavnosti NO IOC (Ministrstvo za izobraževanje, znanost in šport) / *Program of the National Board for the Intergovernmental Oceanographic Commission.* Nosilka / *Principal investigator:* prof. dr. Alenka Malej.

- Izdelava strokovnih izhodišč za pripravo nacionalnega akcijskega načrta za varstvo morske vegetacije / *Preparation of the national action plan for the protection of marine vegetation.* Nosilec / *Principal investigator:* prof. dr. Lovrenc Lipej.
- Analiza kriptobentoških mikrohabitatov v slovenskem morju in opredelitev njihove vloge pri ocenjevanju stanja biotske raznovrstnosti morskega obrežnega pasu / *Analysis of cryptobenthic microhabitats in the Slovenian sea and the evaluation of their role in assessing the state of biodiversity in marine coastal environment.* Nosilec / *Principal investigator:* prof. dr. Lovrenc Lipej.
- Onesnaženost morskega sedimenta in pregled obstoječih podatkov v Piranskem zalivu na območju Marine Portorož / *Contamination of marine sediments and analysis of historical data from the Bay of Piran in the area of Marina Portorož.* Nosilca / *Principal investigators:* izr. prof. dr. Vlado Malačič in dr. Branko Čermelj.
- Opredelitev stanja populacije leščurja in morskega datlja ter habitatnih tipov morski travniki in podvodni grebeni v NR Strunjan in priporočila za usmerjanje obiskov naravnega rezervata / *The evaluation of the populations of pen shell, date mussels and habitat types such as sea grass meadows and reefs in the NR Strunjan with recommendations for organized visits of the Nature Reserve.* Nosilec / *Principal investigator:* prof. dr. Lovrenc Lipej.
- Ekspertna analiza čezmejnega vpliva projektov plinskega terminala v Tržaškem zalivu in plinskega terminala v Žavljah in študije presoje vplivov na okolje v Republiki Sloveniji za projekt plinskega terminala v Tržaškem zalivu in plinskega terminala v Žavljah – morsko okolje / *Crossboard influences of LNG terminals in the Gulf of Trieste – marine environment.* Nosilec / *Principal investigator:* izr. prof. dr. Vlado Malačič.
- Pregled stanja morske biotske raznovrstnosti v občini Izola s posebnim poudarkom na prioriteto in ogroženost in habitatne tipe / *A survey of the status of marine biodiversity in the municipality of Izola with special emphasis on priority, threats and habitat types.* Nosilec / *Principal investigator:* prof. dr. Lovrenc Lipej.

Drugi raziskovalni projekti Other Research Projects

Organizacija znanstvenih in strokovnih srečanj Organization of Scientific and Professional Meeting

- Marine debris removal and preventing further litter entry – MarineClean. Project Consortium Meeting, Piran, 9. – 10. 4. 2013
- 3rd Colloquium of genetics, Slovensko genetsko društvo. Piran, 13. 9. 2013
- Study of pressures and impacts on pelagic ecosystem. PERSEUS workshop. Piran, 17. – 19. 11. 2013

Obiski in študijska izpolnjevanja na tujih raziskovalnih inštitucijah / Visits and Scientific Studies at Institutions Abroad

- Valentina Turk, RADAR spring meeting 2013, Neuchâtel, Švica (11. – 12. 3. 2013)
- Andreja Ramšak, Berufskolleg Hilden des Kreises Mettmann, Hilden in University of Cologne, Biocenter, Köln, Nemčija (14. – 21. 4. 2013)
- Alenka Malej, sodelovanje pri evalvaciji EU-BONUS projektov, Helsinki, Finska (22. – 25. 4. 2013)
- Tjaša Kogovšek, Univerza v Hirošimi, Japonska (april – december 2013)
- Patricija Mozetič, sestanek nacionalnih predstavnikov v IPHAB, UNESCO, Pariz, Francija (28. – 30.4. 2013)
- Andreja Ramšak, PERSEUS Training Visits Scheme, HCMR Hellenic Centre for Marine Research, Atene, Grčija (12.5. – 1. 6. 2013)
- Vesna Flander Putrle, Alenka Malej, Valentina Turk, Univerza v Hirošimi in Univerza v Tokiu, SLO – JP bilateralni projekt Japonska (3. – 12. 6. 2013)
- Alenka Malej, sestanek nacionalnih koordinatorjev MED POL, Barcelona, Španija, (18. – 22. 6. 2013)
- Valentina Turk, Tinkara Tinta, Shirshov Institute of Oceanology, RAS, Moskva, Rusija (22. – 26. 8. 2013)
- Valentina Turk, Sveučilište u Dubrovniku, Hrvaška terensko vzorčenje Mljet (projekt BI-HR/12-13-030) (18. – 22. 9. 2013)
- Janja Francé, Martina Orlando Bonaca, Nives Kovač, Borut Mavrič, Science and Technology Park Klaipeda, Litva, obisk v okviru projekta MarineClean (7. – 10. 10. 2013)
- Alenka Malej, zasedanje IOI – Pacem in Maribus, Bangkok, Tajska (2. – 10. 10. 2013)

- Tinkara Tinta, Scripps Institution of Oceanography, University of California, San Diego, ZDA, (oktober 2013 – marec 2014)
- Valentina Turk RADAR consortium meeting, DG Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italija (7. – 8. 11. 2013)
- Valentina Turk, Project kick-off meeting, School of Geography, Earth and Environmental Sciences University of Birmingham Birmingham, Združeno kraljestvo (13. – 11. 15. 2013)
- Andreja Ramšak, Institut za biologiju mora, Kotor, Črna gora, SLO-Črna gora bilateralni projekt (11. – 17. 11. 2013)
- Janja Francé, Martina Orlando Bonaca, Vesna Flander Putrle, Mateja Grego, Boris Petelin, Janez Forte, Department of Freshwater Ecology, University of Vienna, Avstrija, obisk povezan z izvajanjem EU Vodne Direktive (22. – 24. 12. 2013)

Obiski iz tujine Visitors from Abroad

- Sergio Ferreira, Project Officer, Executive Agency for Competitiveness and Innovation (EACI), Brussels, 9.-10.4.2013
- Monika Bright, Jean-Marie Volland, Salvador Espada Hinojosa, University of Vienna, Dunaj, Avstrija, 1.-31.5.2013 in 6.-31.7.2013
- Davor Lučić, Vlado Onofri, Marijana Miloslavić, Institut za more i priobalje, Sveučilišta u Dubrovniku, 16.-20.6.2013
- Jure Piškur, Univerza v Lundu, Švedska, 20.-30.6.2013
- Tamara Shiganova, Alexander Mikaelyan, Shirshov Institute of Oceanology, RAS, Moskva, Rusija, 1.-14.7.2013
- Milena Mitrić, Institut za biologiju mora, Kotor, Črna gora, 2.-22.9.2013
- Andreas Brand, Eawag, Surface Waters-Research and Management, Kastanienbaum, Švica, 20.-28.10.2013
- Karin Elisabeth Rengefors, Lund University, Aquatic Ecology Unit, Lund, Šveska, 4.10.2013
- Valentina Tirelli, Isabella D'Ambra, Osservatorio Geofisico Sperimentale, Trst, 6.11.2013
- Dror Angel, Izrael, 11.-13.11.2013
- Massimo Avian, Univerza v Trstu, Italija, 14.11.2013
- Shin-ichi Uye, Chiaki Mizota, Ryuji Furukawa, Hiroshima University, Japonska, 2.-7. 12.2013
- Simone Cosoli, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Trst, Italija, 10.12.2013

Članstva v odborih mednarodnih organizacij, delovnih teles, ekspertnih skupinah

Membership of International Boards and Expert Groups

- Malačič V., član, Vladna komisija za oblikovanje stališč do problematike plinskih terminalov v Tržaškem zalivu
- Malačič V., član, Izvršilni odbor Slovenske zveze za geodezijo in geofiziko
- Malej A., članica, Board CIESM (The Mediterranean Science Commission), Monaco
- Malej A., članica, Nacionalna komisija za UNESCO in predsednica NO IOC
- Malej A., nacionalna koordinatorica MED POL, Mediterranean Action Plan, Atene
- Mozetič P., članica IPHAB, Intergovernmental Panel on Harmful Algal Blooms (IOC-UNESCO)
- Ramšak A., članica ekspertne skupine za biomonitoring vodnega okolja pri Ministrstvu za zdravje, Urad Republike Slovenije za kemikalije
- Turk V., članica, Upravni odbor Slovenskega mikrobiološkega društva (SMD)

Sodelujoče organizacije Cooperating Institutions

Domače / National

- Inštitut J. Stefan
- Kemijski inštitut, Ljubljana
- Inštitut za Vode RS
- Univerza v Novi Gorici
- Univerza v Ljubljani
- Univerza v Mariboru
- Univerza na Primorskem
- Zavod za ribištvo Slovenije
- Zavod RS za varstvo narave, območna enota Piran

Tuje / International

- Co-ordinating Unit, Mediterranean Action Plan, Atene, Grčija
- Department of Cell and Organism Biology, Lund University, Lund, Švedska
- Hellenic Centre for Marine Research, Atene, Grčija
- Institut za oceanografiju i ribarstvo Split, Hrvaška
- Institut R. Bošković, CIM Rovinj, Zagreb, Hrvaška
- Institut za biologiju mora, Kotor, Črna gora
- International Ocean Institute, Malta
- Istituto di biologia del mare, Benetke, Italija
- Osservatorio Alto Adriatico, ARPA FVG, Trst, Italija
- Osservatorio Geofisico Sperimentale, Trst, Italija
- P.P. Shirshov Institute of Oceanology, RAS, Moskva, Rusija
- SCRIPPS Institute of Oceanology, University of California, San Diego, ZDA
- Sveučilište u Dubrovniku, Hrvaška
- Università degli Studi di Trieste, Italija
- University of Vienna, Avstrija
- University of Ghent, Marine Biology Section, Belgium
- University of Hiroshima, Japonska
- Universidade de Sao Paulo, Sao Paulo, Brazilija
- Université de la Méditerranée, Marseille, Francija
- Department of Biological Sciences University of Massachusetts, Lowell, USA
- Thayer School of Engineering, Dartmouth College, NH, USA
- CSEM Centre Suisse d'Electronique et de Microtechnique SA, Švedska
- European Commission, DG Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy
- RIKILT-Institute of Food Safety, Wageningen, The Netherlands
- School of Geography, Earth and Environmental Sciences University of Birmingham Birmingham, United Kingdom
- Berufskolleg Hilden, Hilden, Nemčija

Uredniški odbori Editors

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Nagrade in priznanja Awards

- Tjaša Kogovšek, štipendija podoktorski študij, Graduate School of Biosphere Science, Hiroshima University, Japonska
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Raziskovalno potapljanje
Scientific diving

(Foto | Photo: T. Makovec)



PI-800 »Sagita« na križarjenju
PI-800 »Sagita« on a cruise

(Foto | Photo: T. Makovec)

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INSTRUMENTALNI CENTER MORSKE BIOLOŠKE POSTAJE PIRAN *Marine Biology Station Piran – Instrumental Centre*

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Oceanografska boja »Vida«
Oceanographic Buoy »Vida«

(Foto | Photo: V. Bernetič)

INFRASTRUKTURNA DEJAVNOST

Instrumentalni center morske biološke postaje (v nadaljevanju IC MBP) deluje v okviru oddelka Morske biološke postaje v Piranu in je sestavni del infrastrukturne skupine NIB. Veliko infrastrukturno opremo IC MBP sta v letu 2013 sestavljali Raziskovalno plovilo PI-800, »Sagita« ter Oceanografska boja »Vida« s pripadajočo logistično in računalniško opremo.

GLAVNI DOSEŽKI V LETU 2013

V letu 2013 smo v okviru IC MBP nadgrajevali obstoječo merilno in terensko opremo. Zaključili smo obnovo levega pogonskega motorja na plovilu PI-800 »Sagita«. Oceanografsko bojo »Vida« smo po petih letih v septembru izvlekli na kopno in izvedli obnovo trupa in elektronike. Jeseni 2013 smo v okviru IPA Jadranskega čezmejnega projekta »Krepitev zmogljivosti za skupni boj proti onesnaženju morja z nafto, toksičnimi in nevarnimi snovmi v Jadranskem morju – HAZADR« kupili HF radarski sistem, ki bo namenjen meritvam površinskih tokov in valov po celotnem Tržaškem in Piranskem zalivu.

Sodelovanje z Univerzama v Ljubljani in Novi Gorici ima na MBP že dolgo tradicijo. V podporo skupni pedagoški dejavnosti je vključena tudi infrastruktura IC MBP. V letu 2013 smo nudili podporo izobraževalnim programom, organiziranim na Biotehniški fakulteti v Ljubljani, Fakulteti za znanosti o okolju v Novi Gorici in Fakulteti za pomorstvo in promet v Portorožu.

IC MBP je prav tako nudil podporo izvajanju pedagoške dejavnosti za osnovne in srednje šole, saj je v tem obdobju MBP obiskalo več organiziranih skupin dijakov in študentov.



Delo pod vodo
Scientific diving

(Foto | Photo: T. Makovec)

Prirjeno ogrodje (RC ELAN)
je lahko odlična rešitev
A »homemade« frame can be a useful
solution

(Foto | Photo: M. Orlando)



Poleg promocijske in pedagoške dejavnosti je IC MBP deloval tudi kot mednarodni podatkovni center za Slovenijo v okviru mednarodnega oceanografskega inštituta (IOI) saj podpira:

- podatkovno bazo oceanografske postaje (senzorji na boji, zasidrani 2,7 km od piranske Punte; 365 dni x 48 vnosov dnevno; <http://buoy.mbss.org/>) ter
- podatkovno bazo fizikalno-kemijskih parametrov, 4.500 vnosov letno; intranet: mbp-01/public/ewn), preko katerih se vključujemo v mednarodne metapodatkovne baze z oceanografskimi podatki (<http://www.seadatanet.org>).

V letu 2013 so veliko infrastrukturno opremo IC MBP uporabljali naslednji mladi raziskovalci:

1. Valentina Pitacco, NIB, Morska biološka postaja, mentor: dr. Lovrenc Lipej
2. Maja Kos Kramar, NIB, Morska biološka postaja, mentorica: dr. Valentina Turk
3. Katja Klun, NIB, Morska biološka postaja, mentor: dr. Jadran Faganeli
4. Iva Talaber, NIB, Morska biološka postaja, mentorica: dr. Patricija Mozetič
5. Lucija Raspor Dall'Olio, NIB, Morska biološka postaja, mentorica: dr. Alenka Malej
6. Martin Vodopivec, NIB, Morska biološka postaja, mentorica: dr. Alenka Malej

Oprema IC MBP se je uporabljala za izvajanje pedagoške dejavnosti pri različnih predmetih na študijskih programih na treh univerzah.

S sodelovanjem v velikih evropskih, infrastrukturnih projektih (projekt **SEADATANET 1 se nadaljuje s projektom SEADATANET 2 ter projekt MYOCEAN2, ki je nadaljevanje projekta MYOCEAN1**) se IC MBP že skoraj celo desetletje umešča v mrežo nacionalnih podatkovnih centrov (NODC) za morske podatke. Od začetnih izmenjav podatkov, je ta mreža prerasla v podatkovni sistem, ki omogoča pregled, posredovanje in izmenjavo zgodovinskih podatkov. Omogoča vpogled v podatke v realnem ali skoraj realnem času. Obširne povezave so vzpostavile zavidljivo raven nadzora kvalitete podatkov, obenem pa ponujajo večje število aplikacij, s katerimi je možen dostop do globalnih, regionalnih in klimatoloških analiz ter njihove vizualizacije na uporabniku prijazen način. Sodelovanje z raziskovalnimi institucijami in infrastrukturnimi centri ne poteka zgolj v okviru mednarodnih

INFRASTRUCTURE ACTIVITY

The Instrumental Centre of the Marine Biology Station (hereinafter IC MBS) operates under the Marine Biology Station Piran and is a constituent part of the infrastructure group of the National Institute of Biology (NIB). In 2013 the large infrastructural equipment of IC MBS consisted of the PI-800 research vessel, »Sagita«, and the »Vida« oceanographic buoy with the corresponding logistics and computer equipment.

MAIN ACHIEVEMENTS IN 2013

In 2013, within the scope of IC MBS, we upgraded the existing measuring and field equipment. We concluded the renewal of the left propulsion engine on the PI-800 »Sagita« vessel. In September the »Vida« oceanographic buoy was pulled ashore after five years and its hull and electronic equipment were restored. In autumn 2013 we purchased an HF radar system within the IPA Adriatic cross-border project »Strengthening Common Reaction Capacity to Fight Sea Pollution of Oil, Toxic and Hazardous Substances in Adriatic Sea – HAZADR«, which will be used for measuring the surface currents and waves across the entire Gulf of Trieste and the Bay of Piran.

MBS has a long tradition of collaboration with the universities of Ljubljana and Nova Gorica. The infrastructure of IC MBS also supports the joint pedagogical activity. In 2013 we supported the educational programmes organised at the Biotechnical Faculty in Ljubljana, School of Environmental Sciences in Nova Gorica and Faculty of Maritime Studies and Transport in Portorož.

Likewise, IC MBS supported the implementation of pedagogical activity at primary and secondary schools, since in that period several organised groups of secondary school and university students visited MBS.

In addition to its promotional and pedagogical activity, IC MBS also operated as an international data cen-



Boja »Vida« pred obnovo
Buoy »Vida« before restoration

(Foto | Photo: T. Makovec)



Boja »Vida« po obnovi na poti proti
svoji morski lokaciji
Buoy »Vida« after restoration on its
way back to the sea

(Foto | Photo: T. Makovec)

Oprema za sporazumevanje pod vodo
Underwater communication
equipment

(Foto | Photo: T. Makovec)



tre for Slovenia under the International Ocean Institute (IOI) by supporting:

- the database of the oceanographic station (sensors on a buoy anchored 2.7km from the Piran Punta; 365 days x 48 entries daily; <http://buoy.mbss.org/>) and
- the database of physical and chemical parameters, 4,500 entries per year; intranet: mbp-01/public/ewn), which are included in international meta-databases of oceanographic data (<http://www.seadatanet.org>).

In 2013 the following early-stage researchers used the large infrastructural equipment of IC MBS:

1. Valentina Pitacco, NIB, Marine Biology Station, mentor: Dr. Lovrenc Lipej
2. Maja Kos Kramar, NIB, Marine Biology Station, mentor: Dr. Valentina Turk
3. Katja Klun, NIB, Marine Biology Station, mentor: Dr. Jadran Faganeli
4. Iva Talaber, NIB, Marine Biology Station, mentor: Dr. Patricija Mozetič
5. Lucija Raspor Dall'Olio, NIB, Marine Biology Station, mentor: Dr. Alenka Malej
6. Martin Vodopivec, NIB, Marine Biology Station, mentor: Dr. Alenka Malej

IC MBS equipment was used to carry out pedagogical activity in various courses in the study programmes of three universities.

By collaborating on large European infrastructure projects (**SEADATANET 1 project is being continued with the SEADATANET 2 project and the MYOCEAN2 project, which is a continuation of the MYOCEAN1 project**), IC MBS has been integrated in the network of the National Oceanographic Data Center (NODC) for marine data for nearly a decade. From the initial exchange of data, this network has grown into a database system, which enables the viewing, submitting and exchanging of historical data. It enables the viewing of data in real time or near real time. Its comprehensive links have established an enviable level of data quality control, while at the same time offering a larger number of applications with which one can access global, regional and climatological analyses and their visualisation in a user-friendly way. Collaboration with research institutions and infrastructure centres is not only carried out under international projects. The scientific and research collaboration of the

projektov. Znanstveno–raziskovalno sodelovanje Morske Biološke Postaje (v nadaljevanju MBP) z Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (v nadaljevanju OGS) iz Trsta ima že dolgo zgodovino. Skupno sodelujemo na različnih mednarodnih projektih, na območju Tržaškega zaliva pa pogosto izvajamo enake ali pa celo skupne raziskave (INTERREG projekt TRECORALA).

Oceanografska boja »Vida« je nemoteno delovala od oktobra 2008 do septembra 2013. Zabeležili smo le krajše izpade energije ali podatkov, večjih okvar ni bilo. Septembra smo bojo prepeljali na kopno in do konca decembra 2013 izvedli vsa obnovitvena dela ter bojo ponovno namestili na njeno morsko lokacijo. Obnova je bila razdeljena na dva dela. V prvi fazi smo opravili temeljito obnovo trupa boje in nadgradili nekaj elementov, ki so bili potrebni nadgradnje, v drugi fazi pa smo nadgradili obstoječo elektroniko na boji in dodali nove krmilne elemente in nov nadzorni sistem, ki bo omogočal učinkovitejši nadzor instrumentov na daljavo. Obnova je bila prevelik zalogaj za Morsko biološko postajo, zato smo za finančno pomoč zaprosili javno agencijo za raziskovalno dejavnost RS in Agencijo RS za okolje. Obe sta nam ponudili finančno pomoč in obnovo smo lahko izpeljali brez velikih zamud. Naslednja obnovitvena dela so ob rednem mesečnem vzdrževanju predvidena v letih 2018–2019.

V 2013 smo v sodelovanju z Agencijo RS za okolje in v okviru projekta »Krepitev zmogljivosti za skupni odziv v boju proti onesnaženju morja z nafto, toksičnimi in nevarnimi snovmi v Jadranskem morju (HAZADR) nabavili HF radar. Gre za oddajnik sistema »WERA« (<http://www.helzel.com/de/6035-WERA-Remote-Ocean-Sensing>). Med pripravami na razpis smo na slovenski obali evidentirali vse možne lokacije, kamor bi ta radijski oddajnik lahko postavili. Za najugodnejše se je izkazalo območje ob piranski stolnici, kjer nam bo sistem omogočal meritve tako v Tržaškem kot tudi v Piranskem zalivu. Instrument smo prejeli v novembru 2013, v decembru smo zamisel in instrument predstavili na Agenciji RS za okolje in obenem pričeli s pridobivanjem najrazličnejših dovoljen in soglasij, ki so bila potrebna za namestitev HF radarja v Piranu. Sodelovali smo tudi pri postavitvi podobnega merilnega sistema, ki ga je na hrvaških otokih Brač in Vis instaliral splitski Inštitut za oceanografijo in ribištvo. Obenem smo okrepili stike z Observatorijem



Plovci
Drifters

(Foto | Photo: T. Makovec)



Zavarovanje opreme pred spustom na morsko dno

Equipment has to be well protected before it is put to the Sea floor.

(Foto | Photo: T. Makovec)

Merilnika turbulence na nosilnem ogrodju

«Vector» currentmeters on a frame

(Foto | Photo: T. Makovec)



za eksperimentalno geofiziko, partnersko institucijo, ki postavlja vzporeden radijski sistem na italijanski strani (pri Sesljanu, kjer je Laboratorij za morsko biologijo). Šele z združitvijo (superpozicijo) podatkov iz obeh lokacij lahko določimo smer in jakost površinskih tokov ter tudi osnovne informacije o valovih (npr. značilna višina in povprečna perioda). Meritve bodo nadgradile obstoječe znanje in omogočale nadzor nad širjenjem morebitnih polutantov in skrajšale intervencijski čas ekip civilne zaščite, ki so usposobljene za odstranjevanje npr. oljnih madežev na vodni gladini.

Preko spletnih strani MBP je večji del aktivnosti ažurno predstavljen domači in tuji javnosti in nič drugače ni bilo tudi v letu 2013. Uporabniki imajo dostop do trenutnih oceanografskih podatkov v skoraj realnem času. V razvoj infrastrukture in znanja aktivno vključujemo domače in tuje subjekte, kar je do sedaj v veliki meri pripomoglo k razvoju le-teh, v prihodnosti pa daje možnosti razvoja novih merilnih metod v ekotoksikologiji in oceanografiji obalnih voda. V analize in uporabo množice podatkov, ki jih ustvari raziskovalna oprema IC MBP, vključujemo v okviru pedagoških programov tudi študente Fakultete za matematiko in fiziko ter Fakultete za pomorstvo in promet (diplomska dela). Podatki so v skoraj realnem času posredovani Agenciji za okolje RS.

Marine Biology Station (hereinafter MBS) with Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (hereinafter OGS) from Trieste has a long history. We are collaborating on various international projects; in the area of the Gulf of Trieste we often carry out the same or even joint research (the TRECORALA INTERREG project).

The "Vida" oceanographic buoy operated continuously from October 2008 to September 2013. We recorded merely shorter power outages or loss of data; there were no major malfunctions. In September we transported the buoy ashore; by the end of December 2013 we carried out all the restoration works and placed the buoy back in its sea location. The restoration was divided into two parts. In the first stage we carried out a thorough restoration of the hull of the buoy and upgraded a few elements that needed upgrading; in the second stage we upgraded the existing electronic equipment on the buoy and added new controllers and a new control system, which will enable more efficient remote control of the instruments. The restoration was too costly for the Marine Biology Station, so we asked the Slovenian Research Agency and the Slovenian Environment Agency for financial aid. Both agencies provided it and we were able to carry out the restoration without greater delays. If maintenance will be carried out on a monthly basis, the next restoration works are scheduled for 2018–2019.

In 2013, in cooperation with the Slovenian Environment Agency and within the project "Strengthening Common Reaction Capacity to Fight Sea Pollution of Oil, Toxic and Hazardous Substances in Adriatic Sea" (HAZADR), we purchased an HF radar. It is a radio wave transmitter of the "WERA" system (<http://www.helzel.com/de/6035-WERA-Remote-Ocean-Sensing>). While preparing for the invitation to tender, we checked all potential locations on the Slovenian coast where this radio transmitter could be placed. The area next to the cathedral in Piran proved to be the most favourable one; there the system would enable measurements in the Gulf of Trieste and in the Bay of Piran. We received the instrument in November 2013; in December the idea and the instrument itself were presented at the Slovenian Environment Agency and we began to obtain various permits and consents needed to install the HF radar in Piran. We also participated in the installation of a similar system which was set up on Islands Brač and Vis by the Croatian Institut of oceanography and fish-

Trenutno stanje podvodnega sveta na zavarovanem območju Naravnega spomenika Rt Madona

A real time video stream from the restricted area Nature monument Cape Madona of Piran.



ries, located in Split. Simultaneously, we strengthened our contacts with Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, our partner institution, which is setting up a parallel radio system on the Italian side (near Sistiana, where the ex "Marine Biology Laboratory" is located). Only by combining (superposing) the data from both locations can we determine the course and strength of surface currents and the basic information on waves (e.g. typical height and average period). These measurements will upgrade the existing knowledge, enable control over the spreading of potential pollutants, and shorten the intervention time of civil protection teams, which are qualified to remove e.g. oil spills on the water surface.

The websites of MBS keep the domestic and foreign public up to date with a greater part of its activities; this was also the case in 2013. Users can access current oceanographic data in near real time. We actively involve domestic and foreign entities in the development of infrastructure and knowledge, which has so far greatly contributed to their development; in the future this will provide opportunities for developing new measurement methods in ecotoxicology and oceanography of coastal waters. Within the scope of pedagogical programmes, we also involve students of the Faculty of Mathematics and Physics and the Faculty of Maritime Studies and Transport (diploma theses) in the analyses and use of the multitude of data created by IC MBS research equipment. The data is submitted to the Slovenian Environment Agency in near real time.

Multiparametrična sonda »Sea&Sun« CTD probe »Sea&Sun«



SEZNAM NEKATERIH PROJEKTOV, KI SO V LETU 2013 UPORABLJALI VELIKO OPREMO IC MBP

RESEARCH PROGRAMMES AND PROJECTS FINANCED BY SLOVENIAN RESEARCH AGENCY THAT WERE USING IC MBP LARGE EQUIPMENT AND FACILITIES IN 2013

Raziskovalni program, ki ga financira Javna agencija za raziskovalno dejavnost Republike Slovenije / Research Programme Financed by Slovenian Research Agency

- Raziskave obalnega morja / Coastal Ocean Research (P1-0237), vodja programa / the research programme leader prof. dr. Alenka Malej.
- Kroženje snovi v okolju, snovna bilanca in modeliranje okoljskih procesov ter ocena tveganja / Cycling of substances in the environment, mass balances, modelling of environmental processes and risks assessment (P1-0143), vodja programa / the research programme leader prof. dr. Milena Horvat.

Raziskovalni projekti, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije / Research Projects Financed by Slovenian Research Agency

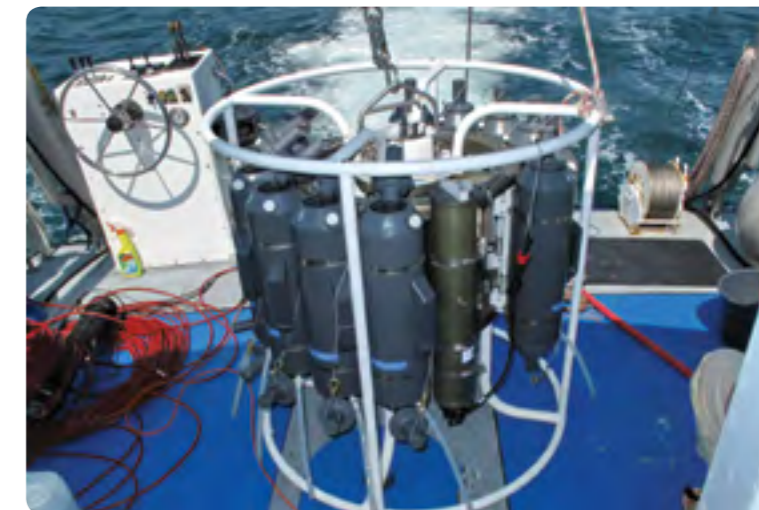
- Povezave med organsko snovjo in kovinami, s posebnim poudarkom na Hg, v obalnem morju (Tržaški zaliv) / Organic matter - metal interactions, with special reference to Hg, in coastal waters (Gulf of Trieste, northern Adriatic Sea) (J1-2136), nosilec projekta / principal investigator prof. dr. Jadran Faganeli.
- Vpliv cirkulacije v široko odprtih zalivih in pomorskega prometa na transport sedimenta, (L2-4147), izr. prof. dr. Vlado Malačič.
- Raziskovalni projekt J4-4300, Geni, ki pogojujejo aromatično vina / Genes behind aroma compounds in wine, nosilec Jurij Piškur, Univerza v Novi Gorici, za NIB izr. prof. dr. Valentina Turk.
- Raziskovalni projekt L1-5446, Optimizacija in validacija novih indikatorskih sistemov v kompleksnih okoljskih matrikah, nosilka prof. dr. Milena Horvat, Inštitut Jožef Štefan, za NIB prof. dr. Jadran Faganeli.

Raziskovalno plovilo PI-800 »Sagita«. / Research vessel PI-800 »Sagita«.

(Foto | Photo: Arhiv MBP | Archive MBP)

Razvojni projekti / Development Projects

- V4-1085 Virusna in mikrobiološka kontaminacija školjk ter prisotnost morskih biotoksinov v školjkah. CRP Konkurenčnost Slovenije 2006–2013 v letu 2010. Veterinarska fakulteta UL, Inštitut za higieno živil in bromatologijo, doc. dr. Andrej Kirbiš, dr.vet.med. Za NIB doc. dr. Patricija Mozetič.
- V4-1085 Viral and microbiological contamination of bivalve molluscs and presence of marine biotoxins in bivalve molluscs. CRP Slovenian Competitiveness 2006–2013 in 2010. Veterinary Faculty of the University of Ljubljana, Institute for Food Hygiene and Bromatology, doc. dr. Andrej Kirbiš, dr.vet.med. For NIB Assist. Prof. Dr. Patricija Mozetič.
- V4-1071 Raziskovanje bioloških in ekoloških značilnosti ter sezonske dinamike nekaterih gospodarsko pomembnih vrst rib v Portoroškem ribolovnem rezervatu. CRP Konkurenčnost Slovenije 2006–2013 v letu 2010. Zavod za ribištvo Slovenije, dr. Irena Fonda. Za NIB dr. Mateja Grego.
- V4-1071 Research into biological and ecological characteristics and seasonal dynamics of several economically important species of fish in the Portorož Fishing Preserve. CRP Slovenian Competitiveness 2006–2013 in 2010. Fisheries Research Institute of Slovenia, Dr. Irena Fonda. For NIB Dr. Mateja Grego.
- Škodljiva cvetenja želatinoznih organizmov v severnem Jadranu in Črnem morju: verjetnost pojavljanja v povezavi s klimatskimi spremembami, (sodelovanje Slovenija-Rusija), prof. dr. Alenka Malej.
- Harmful blooms of gelatinous organisms in the northern Adriatic and the Black Sea: probability of occurrence in connection with climate change, (Slovenia-Russia collaboration), Prof. Dr. Alenka Malej.
- Dinamika vodnih mas v severnem in južnem Jadranu in razširjanje onesnažil ter odziv biomarkerjev (sodelovanje Slovenija-Črna Gora), izr. prof. dr. Vlado Malačič.
- Dynamics of water masses in the northern and southern Adriatic, the spreading of contaminants and biomarker response, (Slovenia-Montenegro collaboration), Assoc. Prof. Dr. Vlado Malačič.
- Dejavniki kontrole mikrobnih in biogeokemijskih pretvorb živega srebra v porečju Soče in Tržaškem zalivu (sodelovanje Slovenija-ZDA), prof. dr. Jadran Faganeli.
- Factors controlling microbial transformations and biogeochemistry of mercury in the Soca River System and the Gulf of Trieste (northern Adriatic), (Slovenia-USA collaboration), Prof. Dr. Jadran Faganeli.



»Rozeta« - vzorčevalnik vode / »Rosette« - water sampler
(Foto | Photo: T. Makovec)

- Zaprti morski sistemi kot laboratorij bioloških fenomenov = Enclosed marine systems as natural laboratories for biological phenomena (sodelovanje Slovenija-Hrvaška), izr. prof. dr. Valentina Turk.
- Enclosed marine systems as natural laboratories for biological phenomena (Slovenia-Croatia collaboration), Assoc. Prof. Dr. Valentina Turk.
- Možnosti komercialne rabe masovnega pojavljanja meduz = Jellyfish blooms and the possibilities for commercial use, (sodelovanje Slovenija-Argentina), prof. dr. Alenka Malej.
- Jellyfish blooms and the possibilities for commercial use, (Slovenia-Argentina collaboration), Prof. Dr. Alenka Malej.
- Slovensko-japonska študija o problemih masovnega pojavljanja meduz: mehanizmi in možni ukrepi (sodelovanje Slovenija-Japonska), prof. dr. Alenka Malej.
- Slovenian-Japanese study on the problems of mass occurrence of jellyfish: mechanisms and possible measures (Slovenia-Japan collaboration), Alenka Malej.
- Pogodba z UVHVVR: Izvajanje monitoringa toksičnega fitoplanktona v letu 2013, doc. dr. Patricija Mozetič.
- Contract with the Administration of the Republic of Slovenia for Food Safety, Veterinary and Plant Protection (UVHVVR): Implementation of the monitoring of toxic phytoplankton in 2013, Assist. Prof. Dr. Patricija Mozetič.

- Pogodba z ARSO: Izvajanje monitoringa bioloških elementov ekološkega stanja obalnega morja ter Program spremljanja kakovosti vode za življenje morskih školjk in morskih polžev v letu 2013, doc. dr. Patricija Mozetič.
- *Contract with the Slovenian Environment Agency: Implementation of the monitoring of biological elements of the ecological status of coastal waters and the Programme of monitoring the quality of water for the existence of bivalve molluscs and sea snails in 2013, Assist. Prof. Dr. Patricija Mozetič.*
- Pogodba z ARSO: Izvajanje monitoringa kakovosti morja-v skladu z Barcelonsko konvencijo, izr. prof. dr. Valentina Turk.
- *Contract with the Slovenian Environment Agency: Implementation of the monitoring of sea quality-in accordance with the Barcelona Convention, Assoc. Prof. Dr. Valentina Turk.*
- Pogodba z IZVRS: Projektna naloga za izdelavo strokovnih podlag za implementacijo Okvirne direktive o morski strategiji (2008/56/ES) in Okvirne vodne direktive (2000/60/ES) v Sloveniji v letu 2013. Nosilki: dr. Martina Orlando Bonaca in dr. Janja Francé.
- *Contract with the Institute for Water of the Republic of Slovenia (IZVRS): Project assignment for preparing technical bases for the implementation of the Marine Strategy Framework Directive (2008/56/ES) and the Water Framework Directive (2000/60/ES) in Slovenia in 2013. Heads: Dr. Martina Orlando Bonaca and Dr. Janja Francé.*

Ekspedicija v »južnih« morjih
Expedition in the »Southern« Sea

(Foto | Photo: J. Forte)



- Pogodba z IZVRS: Sodelovanje pri pripravi strokovnih podlag za dopolnitev uredbe o stanju površinskih voda za obalno morje. Nosilka: dr. Janja Francé.
- *Contract with the Institute for Water of the Republic of Slovenia (IZVRS): Collaboration on preparing technical bases for supplementing the decree on surface water status for coastal waters. Head: Dr. Janja Francé.*
- Program dejavnosti NO IOC, Ministrstvo za izobraževanje, znanost, šport, prof. dr. Alenka Malej.
- *NO IOC programme of activities, Ministry of Education, Science and Sport, Prof. Dr. Alenka Malej.*
- Izdelava strokovnih izhodišč za pripravo nacionalnega akcijskega načrta za varstvo morske vegetacije, prof. dr. Lovrenc Lipej.
- *Elaboration of technical starting points for preparing a national action plan for the conservation of marine vegetation, Prof. Dr. Lovrenc Lipej.*

Akustični tokomer z nosilnim ogrodjem, namenjen meritvam tokov s plovilom
Acoustic currentmeter attached to a frame is prepared for current measurements during ship cruise

(Foto | Photo: T. Makovec)



- Analiza kriptobentoških mikrohabitats v slovenskem morju in opredelitev njihove vloge pri ocenjevanju stanja biotske raznovrstnosti morskega obrežnega pasu, prof. dr. Lovrenc Lipej.
- *Analysis of cryptobenthic microhabitats in the Slovenian sea and a definition of their role in assessing the status of biotic diversity of the coastal zone, Prof. Dr. Lovrenc Lipej.*
- Opredelitev stanja populacije leščurja in morskega datlja ter habitatnih tipov morski travniki in podvodni grebeni v NR Strunjan in priporočila za usmerjanje obiskov naravnega rezervata, prof. dr. Lovrenc Lipej.
- *Determination of the status of the noble pen shell and date mussel populations and of the habitat types of sea meadows and underwater reefs in the Strunjan Nature Reserve, and recommendations for guiding visits to the nature reserve, Prof. Dr. Lovrenc Lipej.*
- Ekspertna analiza čezmejnega vpliva projektov plinskega terminala v Tržaškem zalivu in plinskega terminala v Žavljah in študije presoje vplivov na okolje v Republiki Sloveniji za projekt plinskega terminala v Tržaškem zalivu in plinskega terminala v Žavljah – morsko okolje, izr. prof. dr. Vlado Malačič.
- *Expert analysis of the cross-border influence of projects for a gas terminal in the Gulf of Trieste and a gas terminal in Aquilinia, and studies of assessing the environmental impact in the Republic of Slovenia for the project for a gas terminal in the Gulf of Trieste and a gas terminal in Aquilinia – marine environment, Assoc. Prof. Dr. Vlado Malačič.*



Mini plovilo- natančne meritve temperature in slanosti na površini
Mini boat – precise measurements of Sea Surface Temperature and salinity on a small scale.

(Foto | Photo: T. Makovec)

- Monitoring habitatov flore in favne v krajinskem parku Strunjan, prof. dr. Lovrenc Lipej.
- *Monitoring of flora and fauna habitats in the Strunjan Landscape Park, Prof. Dr. Lovrenc Lipej.*
- Pregled stanja morske biotske raznovrstnosti v občini Izola s posebnim poudarkom na prioriteto in ogroženost in habitatne tipe, prof. dr. Lovrenc Lipej.
- *Review of the status of marine biotic diversity in the Municipality of Izola with special emphasis on priority, endangerment and habitat types, Prof. Dr. Lovrenc Lipej.*
- Onesnaženost morskega sedimenta in pregled obstoječih podatkov v Piranskem zalivu na območju Marina Portorož, izr. prof. dr. Vlado Malačič, dr. Branko Čermelj.
- *Contamination of marine sediment and review of existing data in the Bay of Piran in the area of Marina Portorož, Assoc. Prof. Dr. Vlado Malačič, Dr. Branko Čermelj.*

Pred spustom je potrebno vse še enkrat preveriti
Every detail is to be checked once again

(Foto | Photo: J. Forte)





Hrošč pušcavnik (*Osmoderma eremita*), vrsta evropsko varstvenega pomena.

Hermit beetle (*Osmoderma eremita*), species of European conservation importance.

(Foto | Photo: Andrej Kapla)

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ODDELEK ZA RAZISKOVANJE SLADKOVODNIH IN KOPENSKIH EKOSISTEMOV - EKO

*Department of Freshwater
and Terrestrial Ecosystems
Research - EKO*

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4. dr. **Tatjana Simčič**, univ. dipl. biol., višja znanstvena sodelavka
5. izr. prof. dr. **Davorin Tome**, univ. dipl. biol., znanstveni svetnik
6. doc. dr. **Al Vrezec**, univ. dipl. biol., znanstveni sodelavec



Povezanost kopenskih in sladkovodnih ekosistemov.
The linkage of terrestrial and freshwater ecosystems.

(Foto | Photo: Andrej Kapla)

Mladi raziskovalci / Young Scientists

1. **Dejan Bordjan**, univ. dipl. biol.
2. **Barbara Debeljak**, univ. dipl. biol.
3. **Martina Jaklič**, univ. dipl. biol.
4. **Maja Opalički**, univ.dipl.ekol.
5. **Allen Wei Liu**, univ. dipl. ekol.

Tehnični sodelavci / Technicians

1. **Špela Ambrožič**, samostojna strokovna sodelavka
2. **Andreja Jerebic**, mag ekon. in posl. ved, koordinatorka področij
3. **Andrej Kapla**, projektni sodelavec

RAZISKOVALNA DEJAVNOST

Na oddelku za raziskovanje sladkovodnih in kopenskih ekosistemov raziskujemo ekološke procese v okolju tako iz bazičnega kot tudi aplikativnega vidika. V raziskavah, ki jih izvajamo na kopenskih ekosistemih, se posvečamo izbranim vrstam, cehom in vlogi le-teh v prehranjevalnih spletih ter vplivu klimatskih in neposrednih antropogenih sprememb v okolju na organizme. Vrste, ki jim posvečamo največ pozornosti so različne skupine nevretenčarjev in ptice. Na področju ekologije ptic proučujemo vplive sprememb v okolju na populacije in združbe, ter odnose med pticami in pticami ter človekom. Proučujemo tudi ekologijo ter vrstno specifično dinamiko hroščev tako na površini kakor tudi v podzemnih – jamskih ekosistemih.

V okviru raziskav vodnih ekosistemov preučujemo povezave med ekološkimi lastnostmi kraških, razpoklinskih ali medzrninskih vodonosnikov, pojavljanjem podzemnih vrst, predvsem nižjih rakov ter posrednimi in neposrednimi vplivi človeka. Raziskave vodnih ekosistemov zajemajo tudi visokogorske in predalpske ekosisteme (jezera) ter tekoče vode. V laboratoriju z meritvami fiziološkega odziva organizmov proučujemo fiziološke ter ekofiziološke prilagoditve avtohtonih in tujerodnih vrst na različne fizikalne dejavnike (npr. temperatura). Pri slednjih smo še posebej osredotočeni na tujerodne vrste rakov in njihov vpliv na domorodne vrste.

V okviru programa P1-0255 (Združbe, odnosi in komunikacije), ki ga izvajamo skupaj s skupino ENTOMO in vsebuje 6 sklopov so potekale raziskave v naslednjih štirih sklopih:

3. Sklop: Okolje – organizem

- vpliv klimatskih sprememb in nadmorske višine na časovno in prostorsko dinamiko populacije gozdnih ptic
- spremljanje meteoroloških razmer, sestave jamske vodne favne in raziskovanje vpliva hidroloških in hidrokemičnih razmer na sestavo jamskega živalstva v curkih prenikle vode

Monitoring tujerodnega raka rdečeškarjevca v termalni mrtvici Topla na Prilipah.
Monitoring of redclaw crayfish (Cherax quadricarinatus) in the thermal lake Topla on Prilipe.

(Foto | Photo: Tina Jaklič)



- spremljanje pojavljanja podzemne vodne favne v kraških izvirih na stičišču saturirane in nesaturirane cone z uporabo analize stabilnih izotopov
- določanje prilagojenosti različnih vrst ceponožnih rakov, rib in kuščaric na spremembe dejavnikov v okolju, predvsem temperature, s pomočjo merjenja dihanja ter aktivnosti encimov dihalne verige in antioksidativnega obrambnega sistema

4. sklop: Interspecifični odnosi

- interspecifični odnosi v naravnih gozdnih in travniških združbah, ki povezujejo med seboj različne trofične nivoje
- odnosi med tujerodnimi in domorodnimi vrstami s podobnimi ekološkimi nišami

5. Sklop: Biodiverziteteta

- raziskave podzemne favne v medzrninskem vodonosniku na območju črpališča pitne vode za Ljubljano (Brest) v sodelovanju s podjetjem VO-KA
- revizija seznama vrst hroščev evropskega varstvenega pomena v Sloveniji, katerih populacije so podlaga za razglaševanje Natura 2000 območij
- sodelovanje v mednarodni raziskavi razširjenosti in bionomije rogača (*Lucanus cervus*) v Evropi, ki je evropska varstveno pomembna vrsta
- raziskave biogeografije in morfoloških variacij pri vrstah iz rodu *Typhlocypris* Vejdovsky, 1882 (Crustacea, Ostracoda, Candonidae) v Evropi z namenom revizije in redifinije rodu

Repaljščica (*Saxicola rubetra*).
Whinchat (Saxicola rubetra).

(Foto | Photo: Davorin Tome)



RESEARCH ACTIVITY

The main research focus at the Department of Freshwater and Terrestrial Ecosystems Research are ecological processes, from both basic and applicative aspects. The studies of terrestrial ecosystems are focused on selected species, guilds, their role in the food webs and the impact of climate and direct anthropogenic changes on organisms and their environment. Species within our research scope are mainly various invertebrates and the birds. Within the ecology of birds we study the effects of environmental change on populations, communities and interspecific relationships between birds and between birds and humans. We are also studying the ecology and species specific dynamics of the beetles inhabiting surface as well as subterranean cave ecosystems.

Within aquatic research we study the linkages between ecological characteristics of karstic fractured and porous aquifers, occurrence of groundwater species, particularly crustaceans and direct and indirect human impacts. Research on aquatic ecosystems includes also mountain and alpine ecosystems (lakes) and running waters. Moreover we study physiological and ecophysiological adaptations of native and alien species on different physical factors (e.g. temperature) under controlled laboratory conditions. We are particularly focused on non-native species of crustaceans and their impact on native species.

Within research program P1-0255 (Communities, relations and communications), which is carried out together with the ENTOMO research group and contains 6 main topics the research was conducted within the following four topics:

3. topic: Environment – organism

- The impact of climate change and altitude on the temporal and spatial population dynamics of forest birds
- Monitoring of meteorological conditions and the composition of cave fauna and explore the impact from the hydrological and hydrochemical conditions on the composition of cave fauna in the water drips



Spremljanje preleta ptic zaradi predlagane postavitve vetrnih elektrarn na Senožških brdih.

Monitoring of birds migration of proposed wind-farm area Senožška brda.

(Foto | Photo: Davorin Tome)

- The study of groundwater fauna from karst spring at a contact of saturated and unsaturated zone – understanding the patterns by using stable isotope analyses
- Determining the adaptability of various species of copepods, fish and lizards to changes in environmental factors, especially temperature by measuring respiration and activity of enzymes in respiratory chain and antioxidant defence system

4. topic: Interspecific relations

- Interspecific relationships in the natural forest and grassland communities that link different trophic levels
- Relations between invasive and native species with similar ecological niches

5. topic: Biodiversity

- Surveys of groundwater fauna in the porous aquifer near Ljubljana (Brest) in the cooperation with the company VO-KA
- Reviewing the species list of beetles of European conservation importance in Slovenia, which are the basis for the Natura 2000 sites
- Participation in international studies of distribution and bionomics of stag Beetle (*Lucanus cervus*) in Europe, which is a European species of conservation importance
- Building of a biodiversity database on aquatic groundwater fauna from crossborder karstic aquifer of the river Reka/Timavo
- Investigating the biogeography and morphological variation of the species from the genus *Typhlocypris* Vejdovsky, 1882 (Crustacea, Ostracoda, Candonidae) across the Europe with the aim to revise and redefine the genus

6. topic: Complex and integral research of ecosystems – the impact of humans on the environment

- Human interactions with the environment in the meadows and urban areas, and impacts on biodiversity

- postavitve baze podatkov o podzemni biodiverziteti čezmejnega vodonosnika reke Reke/Timavo na matičnem Krasu

6. sklop: Integralne raziskave v ekosistemih – vpliv človeka na okolje

- interakcija človeka z okoljem v travniškem in mestnem okolju, ter vplivi na biodiverzitetu s poudarkom na pticah in hroščih
- raziskave na področju invazivnih tujerodnih vrst v vodnih ekosistemih, še posebej invazivnih tropskih vrst v termalnih vodnih telesih
- vpliv rabe prostora na ekosistemske procese izbranih vodotokov osrednje Slovenije

GLAVNI DOSEŽKI V LETU 2013

V sklopu mednarodnega projekta Evropske znanstvene fundacije EURAPMON (v originalu »Research and Monitoring for and with Raptors in Europe«), katerega namen je vzpostavitev mednarodnega sodelovanja pri raziskavah in monitoringu populacij ter prisotnosti okoljskih onesnažil pri ujedah in sovah, smo v letu 2013 objavili tematsko številko revije *Acrocephalus* z



Raziskovanje habitata hrošča puščavnika (*Osmoderma eremita*).
*Habitat study of hermit beetle (*Osmoderma eremita*).*

(Foto | Photo: Andrej Kapla)

naslovom »Posebna številka o preliminarnem pregledu monitoringa populacij ptic roparic v Evropi«. V reviji so zbrani prispevki nacionalnih koordinatorjev iz 25 Evropskih držav ter pregledni članek, kar predstavlja pomemben korak pri inventarizaciji obstoječega monitoringa ptic roparic. Sodelovali smo tudi pri organizaciji tematske delavnice v Murciji (Španija), z naslovom Inventar obstoječega monitoringa ptic ujed in sov v Evropi. Predsedujoči projektne odbora EURAPMON je doc. dr. Al Vrezec, mesto zunanje koordinatorja projektnih aktivnosti vodi dr. Irena Bertoncelj.

V letu 2013 smo zaključili projekt »Raziskava favne hroščev v krajinskem parku Tivoli, Rožnik in Šišenski hrib v Ljubljani s posebnim poudarkom na varstveno pomembnih vrstah za Mestno občino Ljubljana. Naloga je pomembna kot osnova za pripravo smernic upravljanja s parkom glede na biodiverzitetu. Rezultati so pokazali, da je okolje mestnega parka in gozda s stališča favne hroščev še dokaj ohranjeno, saj smo potrdili kar tri vrste evropskega varstvenega pomena. Še posebej velja izpostaviti varstveno prednostno vrsto puščavnika (*Osmoderma eremita*), ki je v mestnem parku Tivoli še dokaj številna, in močvirskega krešiča (*Carabus variolosus*), ki živi v sicer izoliranem gozdu Šišenskega hriba, kar je posebnost v evropskem merilu.

Izpopolnjujemo metode za meritve stresa pri vodnih in kopenskih organizmih s pomočjo porabe kisika (merjenje s pomočjo visokoobčutljivih optod), kot tudi aktivnostjo nekaterih encimov (encimi dihalne verige in antioksidativnega sistema). Metode smo vpeljali v raziskave na različnih vrstah ceponožnih rakov in kuščaric. Pri soški postrvi smo izvedli meritve optimalne temperature za razvoj iker in ribjih mladice pri soški postrvi, kar se lahko uporabi pri gojitvenih postopkih te avtohtone in endemične vrste.

Nadaljevali smo z rednim monitoringom izbranih vrst hroščev evropskega varstvenega pomena v okviru nalog Ministrstva za kmetijstvo in okolje. Poleg tega smo izvajali večji inventarizaciji favne hroščev z narovarstvenim vrednotenjem na območju reke Mure (Dravske elektrarne Maribor d.o.o.) in reke Voglajne (Ministrstvo za kmetijstvo in okolje). Kot podizvajalci smo vključeni v Life+ projekt LIVEDRAVA (vodilni partner: DOPPS), kjer smo zadolženi za raziskave in monitoring izbranih vrst hroščev in sicer ovratniškega plavača (*Graphoderus bilineatus*), puščavnika

- *Research on invasive alien species in aquatic ecosystems, especially tropical invasive species in the thermal water bodies*
- *Impact of land use on rivers ecosystem services*

IMPORTANT ACHIEVEMENTS IN 2013

Within the European Science Foundation project EURAPMON (Research and Monitoring for and with Raptors in Europe), which aims to establish international coordination in research and monitoring of birds of prey, we published a thematic issue of the journal *Acrocephalus* entitled »Special issue on a preliminary inventory of monitoring for raptors in Europe«. This issue compiles reports of National Coordinators from 25 European countries and an overview article. This publication is a key contribution towards preparing the inventory of existing raptor monitoring and provides a first and preliminary overview of the state of monitoring for raptors in Europe. We were also involved in organisation of a thematic workshop in Murcia (Spain) entitled *Inventory of existing raptor monitoring activities in Europe (monitoring »for« raptors)*. President of project committee is doc. dr. Al Vrezec, coordinator for project activities is dr. Irena Bertoncelj.

We finished the project »Fauna of beetles in krajinski park Tivoli, Rožnik in Šišenski hrib« with emphasize on conservation of species important for municipality of Ljubljana. This is a significant basis for a preparation of activities for managing of this protected area. Results showed that environment is still well protected from point of view of beetle fauna. We found three European conservation important species, the two of them are *Osmoderma eremita* and *Carabus variolosus*.

We modified the methods for the measurement of stress in aquatic and terrestrial organisms using the oxygen consumption (measured with highly sensitive optodes), as well as the activity of some enzymes (enzymes of respiratory chain and antioxidant system). These methods were also introduced into the studies on different copepod and lizard species. We were performed the measurements to determine the optimum



Vodni hrošč ovratniški plavač (*Graphoderus bilineatus*), vrsta evropskega varstvenega pomena.

*Species of diving beetle (*Graphoderus bilineatus*), species of European conservation importance.*

(Foto | Photo: Andrej Kapla)

temperature for the development of eggs and larval fish in the marble trout, which can be used in the breeding process of this native and endemic species.

We continued a long-term project *Monitoring of conservation priority species of beetles in the Natura 2000 network, where we conducted surveys of important species by means of conservation priority. The development of new sampling methods and principles of monitoring population dynamics of specialists and methodologically demanding species was carried out. Among the 23 saproxylic beetles listed at EU Habitat Directive, the occurrence of 11 species was confirmed in Slovenia. For seven species, tests of monitoring protocols were conducted (Lucanus cervus, Morimus funereus, Rosalia alpina, Cerambyx cerdo, Cucujus cinnaberinus, Rhysodes sulcatus, Osmoderma eremita). In general, large scale species monitoring should provide insight into two issues: distribution and population trends. To establish appropriate monitoring protocols for a long-term population survey, we tested the efficiency of several sampling methods. The methods were based on non-lethal sampling methods. The distribution monitoring protocol was based on natural-geographic regions in Slovenia, which were determined by unique climate and habitat conditions. The presence/absence of species is planned to be detected in the period of five years with the sampling methods used in the population monitoring scheme.*



Vzorčenje nevretenčarjev v hiporeiku.
Collecting of invertebrates in hyporheic zone.

(Foto | Photo: Barbara Debeljak)

(*Osmoderma eremita*) in škrlatnega kukuja (*Cucujus cinnaberinus*). V letu 2013 smo izvedli prva vzorčenja in sodelovali pri renaturaciji okolja za ovratniškega plavača in škrlatnega kukuja.

SODELOVANJE Z RAZLIČNIMI UPORABNIKI

Storitve, ki jih nudimo uporabnikom, so inventarizacije biotskih elementov, presoje vplivov na okolje ter ekološke analize pri reševanju aktualnih okoljskih problemov. V letu 2013 smo sodelovali z Mestno občino Ljubljana, podjetjem Aquarius d.o.o. in Inštitutom ERICO. Za Ministrstvo za kmetijstvo in okolje (MKO) smo nadaljevali monitoring hroščev v sklopu Natura 2000 omrežja, ki ga zahteva evropska Direktiva o habitatih 92/43/EEC. Sodelovali smo s komunalnim podjetjem JP Vodovod-Kanalizacija (VO-KA) v Ljubljani. V podzemnih vodah so prisotni različni večcelični organizmi (zlasti drobni rakci iz skupine Copepoda). Njihova prisotnost in tudi številčnost je dober pokazatelj kakovosti podzemne vode. Pri analizah podzemne favne sodelujemo s tujimi skupinami, kjer predlagamo, da se podzemno živalstvo vključi v redni monitoring kakovosti podzemnih vod. Smo ena redkih raziskovalnih skupin v Evropi, ki to problematiko vrhunsko obvladuje tako po strokovni (poznavanje organizmov) kot tudi tehnični plati (metode za odvzem vzorcev). Poleg analize živalstva lahko z vrhunsko opremo sodelujemo tudi pri fizikalnih, kemijskih in mikrobioloških analizah podzemnih in površinskih voda. Raziskovali smo vpliv tujerodnih vrst potočnih rakov na domače vrste in ugotavljali okuženost divjih populacij potočnih rakov z račjo kugo *Aphanomyces astaci*, kjer smo sodelovali z Veterinarsko fakulteto. M. Jaklič in A. Vrezec sta sodelovala s Termami Čatež, kjer sta spremljala populacijo invazivnega potočnega raka rdečeškarjevca *Cherax quadricarinatus* v mrtvici na Prilipah. Za naročnika VEPA smo spremljali prelete ujed na območju načrtovanega vetrnega polja Senožeška brda.

Del raziskav, ki jih izvaja raziskovalna skupina spadajo v t.i. podporne aktivnosti pri različnih odločitvah pri



Prvo odkritje na povzročitelja račje kuge *Aphanomyces astaci* odporne populacije koščaka (*Austropotamobius torrentium*) smo v letu 2013 objavili v reviji *Diseases of Aquatic Organisms*.

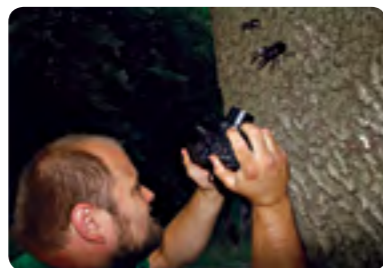
First discovery of on crayfish plague agent Aphanomyces astaci resistant population of the Stone Crayfish (Austropotamobius torrentium) was published in 2013 in Diseases of Aquatic Organisms.

(Foto | Photo: Tina Jaklič)

Monitoring hroščev evropskega varstvenega pomena, na sliki najdba rogača (*Lucanus cervus*).

Monitoring of beetles of European conservation concern; the Stag Beetle (Lucanus cervus).

(Foto | Photo: Dejan Bordjan)



posegih v prostor, ki se navezujejo zlasti na okoljske direktive v povezavi s celinskimi površinskimi in podzemnimi vodami in kopenskimi okolji (travniki, pašniki, gozdovi). Raziskave so uporabne za gospodarske dejavnosti, kot so vodarstvo, kmetijstvo, gozdarstvo, veterina, turizem in tudi naravovarstvene aktivnosti. Za podporo strokovnim odločitvam izvajamo tudi fizikalne in kemijske analize površinskih ali podzemnih vod, zlasti z vidika organskega onesnaževanja in prisotnosti najpomembnejših spojin v vodi. Za podporo rezultatom izvajamo ekofiziološke meritve, ki s pomočjo merjenja encimske aktivnosti in meritve porabe kisika ocenjujejo stres organizmov zaradi strupenih ali škodljivih snovi v vodi ali v zraku.

Z obstoječo opremo in znanjem lahko opravljamo:

- pobiranje vzorcev sedimenta in živalstva v različnih vodnih okoljih (kraške jame, vodnjaki, jezera, reke)
- analize kakovosti vode
- meritve pretokov vode
- meritve koncentracij kisika, pH in prevodnosti v vodi
- strupenost/škodljivost določenih kemijskih spojin v vodi ali v zraku, ki vplivajo na vedenje/dihanje organizmov
- izvajanje monitoringa na izbranih skupinah vodnih in kopenskih organizmov (plankton, raki, ptice, hrošči, dvoživke)
- meritve aktivnosti biofilma na rečnih sedimentih za oceno obremenjenosti vodotoka s hranili
- svetovanja pri posegih v okolje z vidika omilitvenih ukrepov

RAZISKOVALNA INFRASTRUKTURA

POMEMBNI INŠTRUMENTI IN OPREMA

- Ionski kromatograf IC Metrohm Compact 761 Compact 2x.
- Plinski kromatograf z masnim detektorjem Agilent 6890N – 6890N z avtomatskim podajalnikom vzorcev 7683B.
- Spektrofotometer Lambda 25
- Merilec kisika OXY 4-mini (Presens) 2x

COLLABORATION WITH VARIOUS USERS

Services that we provide for end-users are the inventory of biological elements, environmental impact assessment and environmental analysis to address current environmental problems. In 2013, we cooperated with Municipality of Ljubljana, company Aquarius d.o.o. and ERICO Institute. We continued to monitor beetles within the Natura 2000 network for the Ministry of Agriculture and the Environment (MKO), as requires the European Habitats Directive 92/43/EEC. We also cooperated with the municipal company JP Vodovod-Kanalizacija (VO-KA) in Ljubljana. The ground waters are inhabited with very different multicellular organisms (especially small crustaceans from the group Copepoda). Their presence and abundance are good indicators of the quality of ground water. Analysis of groundwater fauna are carried out in cooperation with foreign groups, where we suggest that underground fauna is included in the regular monitoring of the quality of ground water. We are one of few research groups in Europe, which deals with this issue superior from both professional (knowledge of organisms) as well as the technical aspects (sampling methods). In addition to the analysis of fauna, we can perform the physical, chemical and microbiological analyses of ground water as well as surface water. We investigated the impact of alien crayfish species on native ones and identified wild populations infected with crayfish plague *Aphanomyces astaci*, where we cooperated with the Veterinary Faculty. M. Jaklič in A. Vrezec cooperated with Terme Čatež, where they investigated the population of invasive crayfish spe-



Oksimeter z optičnimi senzorji.
Oximeter with fiber-optic sensors.

(Foto | Photo: Tatjana Simčič)

Merjenje intenzivnosti dihanja pri jamski vrsti *Niphargus stygius*.
Measurement of respiration rate in Niphargus stygius.

(Foto | Photo: Tatjana Simčič)

cies redclaw *Cherax quadricarinatus* in the natural river oxbow lake at Prilipe. For the client VEPA we survey raptor flyways over the area planned for construction of windfarm in Senožeška brda.

Part of our research includes the support activities for various decisions regarding land use and spatial planning, in order to follow the European environmental directives and national laws coping with the management of inland surface water, groundwater and terrestrial environments (meadows, pastures, forests). Our research can be support for sustainable approaches within economic activities such as water use, agriculture, forestry, veterinary science, tourism and conservation actions. We are carrying out physical and chemical analysis of surface or ground waters, particularly in terms of organic pollution. Ecophysiological measurements by measuring enzyme activity and oxygen consumption under controlled laboratory conditions enable us to estimate the stress due to toxic substances or thermal stress.

With the existing equipment and knowledge we can:

- Collect samples of sediment and fauna in different aquatic environments (caves, wells, lakes)
- Analyse water quality
- Measure flow and discharge
- Measure oxygen concentrations, pH and conductivity in the water
- Estimate toxicity/dangers of certain chemical compounds in the water or in the air affecting the behaviour or respiration of organisms
- Monitor selected groups of aquatic and terrestrial populations (plankton, crustaceans, birds, beetles, amphibians)
- Consult which mitigation measures are the most efficient projects

RESEARCH INFRASTRUCTURE

IMPORTANT INSTRUMENTS AND EQUIPMENT

- Ion Chromatograph Compact IC Metrohm 761 Compact 2x

- Optične sonde za merjenje kisika in sonde za merjenje prevodnosti in pH
- Merilec pretoka vode v odprtih kanalih (ADC Flow meter, OTT)
- Centrifuga (hlajena, Sigma)
- Tehnici (Sartorius BP210 in ME-5).
- Zamrzovalna omara (-80 °C) (Thermo Scientific)
- Mikroskopa Olympus (BH2 & BX50)
- Lupi Olympus (SZH & SZX12)
- Terenska oprema za odvzem vzorcev podzemne vode – do globine 2 m v prodiščih oz. do 100 m v vodnjakih (mreže, vzorčevalniki)
- Terenska oprema za odvzem vzorcev na stoječih površinskih vodah (čolni, mreže vzorčevalniki, merilni instrumenti za fizikalne lastnosti vode)
- Terenski digitalni profesionalni snemalnik zvoka (Marantz PMD660)
- Parabolični občutljivi mikrofoni (Telinga)
- optična oprema za opazovanje prostoživečih vrst vretenčarjev (daljnogledi, teleskopi)
- oprema za telemetrijo vretenčarjev
- oprema za vzorčenje kopenskih nevretenčarjev

MEDNARODNO SODELOVANJE

V letu 2013 se je nadaljevalo sodelovanje na projektu HYDROKARST. Projekt je sofinanciran v okviru Programa čezmejnega sodelovanja Slovenija-Italija 2007-2013, iz sredstev Evropskega sklada za regio-



Črpališče Brestovica na Krasu (Projekt Hidrokarst).

Pumping station Brestovica na Krasu (Project Hidrokarst).

(Foto | Photo: Anton Brancelj)

V okviru bilateralnega projekta Finska-Slovenija smo raziskovali vpliv onesnaženosti s težkimi kovinami na združbe talnih organizmov; na sliki dimnik talilec v Harjavalta na Finskem.

In the scope of Bilateral Project between Finland and Slovenia we have been studying effects of heavy metal pollution on soil fauna; the smelter in Harjavalta in Finland is shown.

(Foto | Photo: Al Vrezec)



nalni razvoj in nacionalnih sredstev. Cilj projekta je usklajeno upravljanje in zaščita čezmejnega vodnosnika Reka-Timava ter izboljšanje kvalitete pitne vode, ki napaja Tržaško, Kras in del Istre. Biologi z NIB-a sodelujejo s hidrogeologi in geokemiki iz Univerze v Trstu, Geološkega zavoda Slovenije, Inštituta za raziskovanje Krasa ter lokalnimi podjetji za oskrbo s pitno vodo

V okviru bilateral so potekala sodelovanja s Kitajsko (Kazalci za zgodnje ugotavljanje človekovih vplivov na visokogorskih jezerih – na primeru jezera Ran-wu v jugozahodnem Tibetu; namenjena trajnostni rabi jezer za turistične namene), z Brazilijo (Vpliv klimatskih sprememb na življenjske procese vodnih živali).

V letu 2013 se je zaključilo bilateralno sodelovanje s Hrvaško (Ocena stopnje biokontaminacije reke Save – korak pred skupno strategijo spremljanja statusa tujerodnih invazivnih vrst v čezmejnih vodotokih Slovenije in Hrvaške). Skupaj z raziskovalci s Prirodoslovno-matematične fakultete iz Zagreba (Hrvaška) in raziskovalci iz Srbije, ki sodelujejo s hrvaškimi raziskovalci v okviru enakega bilateralnega projekta, smo vzorčili reko Savo vzdolž toka. Na podlagi favne v nabranih vzorcih smo določili okvirno sliko kontaminacije reke Save z invazivnimi vrstami. V okviru projekta smo izpeljali laboratorijske poskuse na avtohtoni in na invazivni vrsti školjk. Projekt je omogočil tudi izvedbo preliminarnih ekofizioloških raziskav na dveh invazivnih vrstah amfipodnih rakov (*Dikerogammarus villosus* in *Dikerogammarus haemobaphes*), ki sta že prisotni v rekah na Hrvaškem, v Sloveniji pa jih zaenkrat še nismo zasledili.

Skupaj z raziskovalci z Institute of Freshwater Ecology & Inland Fisheries (Nemčija) smo izpopolnili metodo merjenja dihalnega potenciala pri zooplanktonu.

Glavna tema bilateralnega projekta z Univerzo v Helsinkih (University of Helsinki, Department of Environmental Sciences) je bil vpliv urbanizacije na vrste in združbe talnih organizmov. Znano je da ima urbanizacija in onesnaženost tal velik vpliv na spremembo sestave združb, ki so posledica različnih odzivov vrst na okoljske razmere. Tokrat smo se odločili za fiziološko analizo organizmov istih vrst pod različnimi okoljskimi pogoji onesnaženosti tal s težkimi kovinami. Kot modelne organizme smo vzeli krešiče (*Ca-*

- Gas chromatograph with mass detector and out-sampler Agilent 6890N - 6890N-7683B
- Spectrophotometer Lambda 25
- Oxygen meter OXY 4-mini (Presens) 2x
- Optical probes to measure oxygen and probes to measure conductivity and pH
- Flow meter in open channels (ADC Flow meter, OTT)
- Centrifuge (refrigerated, Sigma)
- Microbalances Sartorius BP210 and ME-5
- Freezer (-80 °C) (Thermo Scientific)
- Olympus microscope (BH2 & BX50)
- Compound microscope Olympus (SZH & SZX12)
- Field equipment for the sampling of groundwater water – up to 2 m in gravels and up to 100 m in wells (nets, samplers)
- Field equipment for the sampling of standing waters (boats, nets, samplers, instruments for the measurements of physical water properties)
- Field professional digital sound recorder (Marantz PMD660)
- Sensitive parabolic microphone Telinga
- optical equipment for surveillance of wild vertebrates (binoculars, scopes)
- equipment for telemetry of vertebrates
- equipment for sampling of terrestrial invertebrates

INTERNATIONAL COLLABORATION

In 2013 we continue with our cooperation in the project HYDROKARST. The project is co-financed within the framework of Operative programme Italy-Slovenia 2007-2013 of European Regional Development Fund (ERDF) and national funding. The main aim of the project is a synergistic management and protection of crossborder karst aquifer Reka-Timava and improvement of the quality of drinking water for Trieste, Kras and part of Istra regions. The biologists from NIB are working together with hydrogeologists and geochemists from the University of Trieste, Geological Survey of Slovenia, Karst Research Institute in Postojna and local water supply companies.



Degradirana gozdna tla zaradi onesnaženosti s težkimi kovinami v okolici talilca v Harjavalta na zahodu Finske.

Study site with polluted forest floor with heavy metals in the vicinity of the smelter in Harjavalta in Western Finland.

(Foto | Photo: Al Vrezec)

Obisk Zemaljskega muzeja v Sarajevu v sklopu projekta Bilaterale Slovenija - Bosna in Hercegovina; pregled preparata ptiča brkatega sera (*Gypaetus barbatus*).

Visit of National museum in Bosnia and Hercegovina within the Bilateral Project Slovenia - Bosnia and Hercegovina; examination of specimen Beardet vulture (*Gypaetus barbatus*).

(Foto | Photo: Dejan Bordjan)



Within the bilateral projects, we cooperate with China (Early-warning indicators for detecting human influence on remote lakes – a case study of Lake Ranwu in Southeastern Tibet; for sustainable use of the lakes for touristic purposes), Brazil (Effects of climate changes to animals in temporary water bodies).

In 2013, the bilateral project with Croatia (Biocontamination assessment of the Sava River – a step towards common strategy for invasive species management in transboundary waterbodies of Croatia and Slovenia) has finished. Together with the researchers from the Faculty of Science in Zagreb (Croatia) and the researchers from Serbia which cooperated with the Croatian researchers in equal bilateral project, we sampled macroinvertebrates along the Sava river flow. Collected fauna in the samples gave information about the contamination of the Sava river with invasive species. Within the project, a laboratory experiment was carried out on native and invasive mussel species. Within bilateral project, a preliminary ecophysiological study on two invasive amphipods (*Dikerogammarus villosus* and *Dikerogammarus haemobaphes*) which are already present in Croatia waters, but they have not been found in Slovenia yet, was performed.

Together with the researchers from the Institute of Freshwater Ecology & Inland Fisheries (Germany) we modified and improved the method for respiratory potential measurement on zooplankton.

The main topic of the bilateral project with University of Helsinki (Department of Environmental Sciences) was impact of urbanisation on species and assemblages in soil fauna. It is well known that urbanisation and pollution have high impact on structure of species assemblages in the soil as a result of differential responses of different species to environmental conditions. In the scope of the project we have conducted ecophysiological study of selected species in the soil with different level of pollution with heavy metals. As model organisms species of carabids (*Carabidae*), earthworms (*Lumbricidae*) and ants (*Formicidae*) have been selected. In the scope of the visit several field sampling trips were conducted at areas with known soil pollution level in the vicinity of the smelter in Harjavalta, shotgun area near Hälvälä, organic polluted area near Luumäki and at control sites, mainly in Lahti (all in Finland). Collected material was identified and prepared for further analyses in the laboratory of De-

rabidae), deževnike (*Lumbricidae*) in mravlje (*Formicidae*). V okviru obiska smo opravili več terenskih vzorčenj na območjih z znano stopnjo onesnaženja v okolice livarne v mestu Harjavalta, strelišča Hälvälä, onesnaženega območja pri mestu Luumäki in kontrolnih območij, večinoma v okolici Lahtija (vse lokacije so bile izbrane na Finskem). Zbrani material smo obdelali v laboratoriju Oddelka za okoljske znanosti Univerze v Helsinkih v Lahtiju. Na Nacionalnem inštitutu za biologijo smo nato opravili meritve ETS aktivnosti, na Univerzi v Helsinkih pa merjenje vsebnosti težkih kovin v tleh in modelnih organizmih. Z raziskavo smo testirali uporabnost ekofizioloških pristopov pri vrednotenju ekološkega potenciala vrst vzdolž urbanega gradienta glede na onesnaženost tal, kar je novost v raziskavah urbanih ekosistemov. Raziskava bo dala vpogled v različnost odzivov različnih vrst na gradient onesnaženosti tal, s čimer bo omogočeno mehanicistično razumevanje selektivnosti onesnaženega okolja. V okviru sodelovanja smo na Finsko Akademijo prijavili tudi skupen projekt, katerega nosilec je prof. dr. Heikki Setälä, z naslovom »The legacy of urbanisation and its role in structuring invertebrate communities in urban forests«, na Javno agencijo za raziskovalno dejavnost RS pa raziskovalni projekt z naslovom »Vidiki zgodovine in vrstnih značilnosti na oblikovanje gozdnih življenjskih združb v spreminjanju svetov: primer krešičev (*Carabidae*)« (nositelj doc. dr. Al Vrezec).

V okviru bilateralnega projekta z Zemaljskim muzejem BiH v Sarajevu (Bosna in Hercegovina) smo pripravili bazo zgodovinskih podatkov za gozdne sove. V Zemaljskem muzeju BiH smo pregledali ornitološko zbirko, ki je največja zbirka ptic iz Balkanskega polotoka, ki je bila večji del narejena konec 19. in v začetku 20. stoletja. Drug sklop aktivnosti, je bil prenos standardizirane metode popisa gozdnih sov (lesna sova, kozača, koconogi čuk in mali skovik), ki smo jo razvili v Sloveniji, kolegom iz BiH. Izvedbo in uporabnost metode smo prikazali na terenu na območju Igmana in Tajana v okolici Sarajeva. Pripravili smo prvi skupni izvirni znanstveni članek z naslovom »Autumn survey of the Pygmy Owl (*Glaucidium passerinum*) at Mts. Igman and Tajan (central Bosnia and Herzegovina)«, ki je bil objavljen v bosanski ornitološki reviji Bilten mreže posmatrača ptica u Bosni i Hercegovini. S projektom smo odprli novo področje sodelovanja na področju raziskav plenilskih ptic, zlasti vrst evropske-



Prvi popis gozdnih sov v Bosni in Hercegovini na Igmanu.

The first survey of forest owls in Bosnia and Herzegovina at Mt. Igman.

(Foto | Photo: Dejan Bordjan)

ga varstvenega pomena, ki so na območju Bosne in Hercegovine še vedno dokaj slabo poznane, medtem ko so te raziskave v Sloveniji mednarodno dokaj odmevne. Z izvedenimi obiski v Bosni in Hercegovini in Sloveniji smo odprli tudi nekaj novih tem raziskav tako s področja muzejske (historične) kot terenske (ekološke) ornitologije

IZOBRAŽEVALNE DEJAVNOSTI IN PROMOCIJA ZNANOSTI

Člani naše raziskovalne skupine so aktivno vključeni v različne programe bolonjskega študija Univerz v Ljubljani, v Novi Gorici, v Mariboru in na Mednarodni podiplomski šoli Jožef Stefan.

V raziskovalni skupini skrbimo za prenos strokovnega znanja v laično javnost, za promocijo znanosti ter njeno popularizacijo. V letu 2013 smo objavili več poljudnoznanstvenih prispevkov v najbolj branih medijih, kot denimo priloge dnevnega časopisa Delo (Znanost, Polet), revije Gea, National geographic in Adria Airways In-Flight Magazine ter v poljudni ornitološki reviji Svet ptic. Poleg tega smo se predstavili v TV oddajah na nacionalni televiziji TV Slovenija (1. Program, oddaje Dobro jutro, Dobra ura z Andrejem, avtor: A. Vrezec) in na Radiu Slovenija (1. Program oddaja Dobro vprašanje – Kako golob pismoša ve kam leti?, avtor A. Vrezec; 3. Program, oddaja Podobe znanja, avtor A. Vrezec)

Izdali smo dvojezično knjigo Ptice Ljubljane in okolice, ki na poljuden način predstavlja rezultate istimenskega projekta, zaključenega v letu 2012. Knjiga ima 198 strani in več kot 200 barvnih fotografij. Avtorji, D. Tome, A. Vrezec, D. Bordjan

partment of Environmental Sciences (University of Helsinki) in Lahti. At National Institute of Biology measurements of ETS activities were conducted and at University of Helsinki measurements of heavy metals in the soil and in model organisms have taken place. In the study we aimed to test the use of ecophysiological analyses in evaluation of ecological potentials along urbanisation gradient taking into account soil pollution, which is a novel approach in studies of urban ecosystems. In the scope of this visit we have agreed to prepare another common paper on assemblage shifts of carabids along urban-rural gradient, on the basis of data that have been collected in Ljubljana according to GLOBENET protocol, which was developed at University of Helsinki. In the cooperation we have prepared also project application at Academy of Finland entitled »The legacy of urbanisation and its role in structuring invertebrate communities in urban forests« (principal investigator Prof Heikki Setälä), and research project at Slovenian Research Agency entitled »Time-scale and species traits aspects of structuring forest biotic communities in a changing world: the carabid beetles case« (principal investigator Assist Prof Al Vrezec).

In the scope of bilateral project with National Museum of Bosnia and Herzegovina in Sarajevo we have prepared database of historical data for owls. In the National Museum of BIH we have studied in ornithological collection, which is the largest collection of birds from Balkan Peninsula, mainly build up at the end of 19th and at the beginning of 20th century. We have conducted field surveys at Mts. Igman and Tajan in the vicinity of Sarajevo. We have prepared first scientific paper entitled »Autumn survey of the Pygmy Owl (*Glaucidium passerinum*) at Mts. Igman and Tajan (central Bosnia and Herzegovina)«, which was published in Bosnian ornithological journal Bilten mreže posmatrača ptica u Bosni i Hercegovini. The project has opened new area of cooperation between Slovenian and Bosnian researchers at the field of studies of raptorial birds, which are still quite poorly known in Bosnia and Herzegovina, but relative well studied in Slovenia with several internationally important publications. The visits in Bosnia and Herzegovina and Slovenia some new research topics have been started in the fields of museum (historical) and field (ecological) ornithology.

Meritve respiracije in aktivnosti encimov smo v letu 2013 prvič testirali tudi na plazilcih; na sliki pozidna kuščarica (*Podarcis muralis*).

*Measurements of respiration and enzyme activity were conducted for the first time also on reptiles in 2013; on the Photo is Common Wall Lizard (*Podarcis muralis*).*

(Foto | Photo: Dejan Bordjan)



EDUCATIONAL ACTIVITIES AND PROMOTION OF SCIENCE

The members of our research group were actively involved in various educational Bologna programs at the University of Ljubljana, the University of Nova Gorica, the University of Maribor and the Jožef Stefan International Postgraduate School.

In our research group we take care for flow of knowledge to laic public, for promotion of science and its popularization. In 2013, we published several popular science articles in the most popular media, such as the daily Delo (Polet, Znanost), then Gea, National geographic, Adria Airways In-Flight Magazine and in the popular ornithological journal Svet ptic. In addition, we contributed to the TV broadcasts on national television TV Slovenia (1st Program, Dobro jutro, Dobra ura z Andrejem by: A. Vrezec) and, to radio show on Radio Slovenia (1st Program Dobro vprašanje – How the mail pigeon know where to fly? 3rd Program, Podobe znanja by A. Vrezec).

We published a bilingual book »Birds of Ljubljana and its environs«, which in a popular manner presents results of the research project we have finished in 2012. Book has 198 pages and more than 200 colour photographs. Authors: D. Tome, A. Vrezec, D. Bordjan.

Vzorčenje planktona. Sampling of plankton.

(Foto | Photo: Anton Brancelj)



NAJPOMEMBNEJŠE OBJAVE V 2013

- LIU Wei Allen, BRANCELJ Anton. A study of temperature characteristics in the shallow karstic Velika Pasica Cave, Slovenia. In: Filippi M., Bosák P. (eds.). Proceedings of 16th International Congress of Speleology, Brno, 2013, vol. 2, str. 427-431.

Temperatura v jamah je pod vplivom sezonskih sprememb zunanjih klimatskih razmer. V jami so nihanja temperature bolj ... kar kaže, da se toplota prenaša s površine v notranjost s kondukcijo. Na vhodnih predelih jame se toplota prenaša tudi s konvekcijo po zraku, predvsem pozimi, ko v jamo iz zunanosti pride hladen in težji zrak.

- MORI, Nataša, BRANCELJ, Anton. Differences in aquatic microcrustacean assemblages between temporary and perennial springs of an alpine karstic aquifer. International journal of speleology, ISSN 0392-6672, 2013, vol. 42, no. 3, str. 257-266

Predstavili smo tesno povezavo med pojavljanjem favne, ki jo občasni ali stalni izviri prinesejo iz podzemnih voda in hidrološkimi razmerami vodonosnika. Objava je prispevek k boljšemu poznavanju ekoloških zahtev vrst iz prehodnih biotopov med podzemno in nadzemno vodo.

- KUŠAR, Darja, VREZEC, Al, OCEPEK, Matjaž, JENČIČ, Vlasta. Aphanomyces astaci in wild crayfish populations in Slovenia : first report of persistent infection in a stone crayfish Austropotamobius torrentium population. Diseases of aquatic organisms, ISSN 0177-5103, 2013, vol. 103, no. 2, str. 157-169. [COBISS.SI-ID 3658362]

V raziskavi so bile za prisotnostjo zajedavca in povzročitelja račje kuge Aphanomyces astaci pregledane vse vrste potočnih rakov, ki naseljujejo Slovenijo. Pri analizi navidez zdravih osebkov smo uporabili A. astaci specifični PCR v realnem času. Izkazalo se je, da se patogen ne pojavlja le pri tujerodnih vrstah, kot je signalni rak (*Pacifastacus leniusculus*), pač pa tudi pri domorodnih vrstah, denimo pri koščaku (*Austropotamobius torrentium*). Opisan je prvi primer per-

zistentne infekcije raka iz rodu *Austropotamobius*, znano pa je že neletalna okužba pri jelševcu (*Astacus astacus*). Odkritje kaže na verjetno koevolucijo med domorodnim gostiteljem in tujerodnim zajedavcem in odpira nove vidike širjenja račje kuge.

- HOMBURG, Katharina, DREES, Claudia, GOSSNER, Martin M., RAKOSY, Laszlo, VREZEC, Al, ASSMANN, Thorsten. Multiple glacial refugia of the low-dispersal ground beetle *Carabus irregularis* : molecular data support predictions of species distribution models. PloS one, ISSN 1932-6203, 2013, vol. 8, issue 4, str. e61185. <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0061185>, doi: 10.1371/journal.pone.0061185. [COBISS.SI-ID 2764879]

Klasična ledenodobna pribežališča, kot je južna Evropa, veljajo za pomembna pri preživetju in kasnejšem ponovnem postglacialnem širjenju vrst. Vendar so se nekatera ledenodobna pribežališča nahajala tudi severneje. V študiji so povezani prostorski modeli iz izsledki filogeografske analize hladnoljubnega, stenotopnega in neletečega debeloglavega krešiča *Carabus irregularis*. Kot kaže je vrsta imela več ledenodobnih pribežališč.

Akcija »Rešujemo ljudi in živali« v sklopu projekta Favna hroščev evropskega varstvenega pomena v krajinskem parku Tivoli, Rožnik in Šišenski hrib.

Action »Rescue of people and animal« within the project Beetle fauna of european conservation importance in the Landspace Park Tivoli, Rožnik and Šišenski hrib.

(Foto | Photo: Špela Ambrožič)



MAIN PUBLICATIONS IN 2013

- LIU Wei Allen, BRANCELJ Anton. A study of temperature characteristics in the shallow karstic Velika Pasica Cave, Slovenia. In: Filippi M., Bosák P. (eds.). Proceedings of 16th International Congress of Speleology, Brno, 2013, vol. 2, str. 427-431.

The cave temperature is controlled by the external climate, due to seasonal oscillations. The temperature curve of inner cave area was much smoother in comparison with the surface indicating that thermal energy was transferred from the surface through the matrix by conduction. Air convection also occurred in the cave, especially during the winter time in the section close to the entrance. The colder, heavier air flowed through the entrance into the cave, which resulted in significant and irregular temperature variation.

- MORI, Nataša, BRANCELJ, Anton. Differences in aquatic microcrustacean assemblages between temporary and perennial springs of an alpine karstic aquifer. International journal of speleology, ISSN 0392-6672, 2013, vol. 42, no. 3, str. 257-266

In this study we demonstrated close link between groundwater fauna drifting from perennial and temporary springs and hidrological conditions in the aquifer. The publication is new contribution to the better knowledge on ecological requirements of species inhabiting transitional habitats between groundwater and surface waters.

- KUŠAR, Darja, VREZEC, Al, OCEPEK, Matjaž, JENČIČ, Vlasta. Aphanomyces astaci in wild crayfish populations in Slovenia : first report of persistent infection in a stone crayfish *Austropotamobius torrentium* population. Diseases of aquatic organisms, ISSN 0177-5103, 2013, vol. 103, no. 2, str. 157-169. [COBISS.SI-ID 3658362]

All the crayfish species that inhabit Slovenian freshwaters were inspected for the presence of *Aphanomyces astaci*, the crayfish plague causative agent. Wild crayfish populations were inspected, showing no clinical signs of infection, by employing *A. astaci*-specific real-time PCR. Results revealed the presence of *A. astaci*



Vzorčenje hiporeika
Sampling of hyporheic zone

(Foto | Photo: Barbara Debeljak)

Vzorčenje hiporeika na Kitajskem v sklopu projekta Bilateralne Slovenija - Kitajska.

Sampling of hyporheic zone within the Bilateral Project Slovenia - China.

(Foto | Photo: Anton Brancelj)



not only in the resistant non-indigenous species, i.e. *Pacifastacus leniusculus*, but also in indigenous species, i.e. *Austropotamobius torrentium*. This is the first reported population of the *Austropotamobius* genus with persistent infection, in addition to the already known populations of the *Astacus* genus. Findings of the presumable co-evolution of *A. astaci* and indigenous hosts open new perspectives, since crayfish plague could spread much faster with indigenous carriers due to their different ecological features.

- HOMBURG, Katharina, DREES, Claudia, GOSSNER, Martin M., RAKOSY, Laszlo, VREZEC, Al, ASSMANN, Thorsten. Multiple glacial refugia of the low-dispersal ground beetle *Carabus irregularis* : molecular data support predictions of species distribution models. PloS one, ISSN 1932-6203, 2013, vol. 8, issue 4, str. e61185. <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0061185>, doi: 10.1371/journal.pone.0061185. [COBISS.SI-ID 2764879]

Classical glacial refugia such as the southern European peninsulas were important for species survival during glacial periods and acted as sources of postglacial colonization processes. However, many recent studies have provided evidence for glacial refugia far north of the southern European peninsulas. In this study, we combined species distribution models (SDMs) with phylogeographic analyses (using mitochondrial DNA = mtDNA) to investigate if the coldadapted, stenotopic and flightless ground beetle species, *Carabus irregularis*. The coincidences between the results of both methods confirm the assumption of multiple glacial refugia for the studied species and the usefulness of the combination of methodological approaches for the understanding of the history of lowdispersal insect species.



Velika sinica (*Parus major*).
Great tit (*Parus major*).
(Foto | Photo: Davorin Tome)

Raziskovalni program, ki ga financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Program Financed by Slovenian Research Agency*

- Združbe, odnosi in komunikacije v ekosistemih / Communities, relations and communications in the ecosystems (P1-0255), vodja programa / the research programme leader prof. dr. Anton Brancelj.

Raziskovalni projekti, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Projects Financed by Slovenian Research Agency*

- Invazivnost tujerodnih vrst potočnih rakov ter njihov vpliv na avtohtone vrste v Sloveniji / Invasive potential of alien crayfish species and their effects on native species in Slovenia (L1-2169), nosilec projekta / principal investigator prof. dr. Anton Brancelj.
- Ocena tveganja za receptorske organizme iz antropološko spremenjenih travniških in gozdnih habitatov / Ecological Risk Assessment of Receptor Organisms Inhabiting Anthropogenically Influenced Grasslands and Forest Habitats (L1-4320), (NIB – prof. dr. Davorin Tome), pridruženi / joint partners.

Mednarodni raziskovalni projekti *International Research Projects*

- EURAPMON (Research and Monitoring for and with Raptors in Europe), RNP project of European Science Foundation, vodja projekta in predsednik upravnega odbora/project manager and chairman of steering committee doc. dr. Al Vrezec; koordinator projekta/project coordinator dr. Irena Bertonec
- HYDROKARST (Kraški vodonosnik kot strateški čezmejni vodni vir); INTERREG IIIA (Italija-Slovenija) (2012-2015). Vodja projekta: prof. dr. Anton Brancelj
- HYDROKARST(Karstic aquifer as strategic cross-border water source); INTERREG IIIA (Italija-Slovenija)(2012-2015). Project leader: prof. dr. Anton Brancelj

Bilateralni raziskovalni projekti *Bilateral Research Projects*

- Bilateralna Slovenija – Bosna in Hercegovina: BI-BA/12-13-028: Ocena dolgoročnih populacijskih trendov pri klimatsko občutljivih vrstah sov (Strigidae) s povezovanjem zgodovinskih in recentnih podatkov ter primerjava med Slovenijo in Bosno in Hercegovino (2012-2013), vodja projekta: doc. dr. Al Vrezec
- *Bilateral Project Slovenia – Bosnia and Herzegovina: BI-BA/12-13-028: Estimation of long-term population trends in climate sensitive owl species (Strigidae) by combining historical and recent data with comparison between Slovenia and Bosnia and Herzegovina (2012-2013); project manager: Assit. Prof. Al Vrezec, PhD*
- Bilateralna Slovenija – Hrvaška: BI-HR/12-13-026: Ocena stopnje biokontaminacije reke Save – korak pred skupno strategijo spremljanja statusa tujerodnih invazivnih vrst v čezmejnih vodotokih Slovenije in Hrvaške (2012-2013); vodja projekta: dr. Tatjana Simčič
- *Bilateral Project Slovenia – Croatia: BI-HR/12-13-026: Biocontamination assessment of the Sava River – a step towards common strategy for invasive species management in transboundary waterbodies of Croatia and Slovenia (2012-2013); project manager: Tatjana Simčič, PhD*
- Bilateralna Slovenija – Finska: BI-FI/12-13-017: Ekološke in fiziološke značilnosti vrst v združbi krešičev v gradientu urbanega okolja (2012-2013); vodja projekta: doc. dr. Al Vrezec
- *Bilateral Project Slovenia – Finland: BI-FI/12-13-017: Ecological and physiological species traits of carabid beetle assemblages along urban-rural gradients (2012-2013); project manager: Assit. Prof. Al Vrezec, PhD*
- Bilateralna Slovenija – Brazilija: BI-BR/11-13-00: Vplivi klimatskih sprememb na življenjske procese vodnih živali Brazilija (2011-2013); vodja projekta: prof. dr. Anton Brancelj
- *Bilateral Project Slovenia – Brazil: BI-BR/11-13-00; (2011-13: Effects of climate changes to animals in temporary water bodies (2011-2013); project manager: prof. dr. Anton Brancelj*
- Bilateralna Slovenija – Kitajska: BI-CN/11-13-010: Kazalci za zgodnje ugotavljanje človekovih vplivov na visokogorskih jezerih – na primeru jezera Ranwu v jugovzhodnem Tibetu (2011-2013); vodja projekta: prof. dr. Anton Brancelj
- *Bilateral Project Slovenia – China: BI-CN/11-13-010: Early-warning indicators for detecting human influence on remote lakes – a case study of Lake Ranwu in Southeastern Tibet (2011-2013); project manager: prof. dr. Anton Brancelj*

- Bilateralna Slovenija – Japonska: BI-JP/11-13-008: Vloga hiporeične cone v rečnih ekosistemih – primerjalna študija (2011-2013); vodja projekta: dr. Nataša Mori
- *Bilateral Project Slovenia – Japan: BI-JP/11-13-008: The functional role of hyporheic zone in different river ecosystems: a comparative study; (2011-13); project manager: Nataša Mori, PhD*

Ciljni raziskovalni projekti Targer Research Projects

- Zagotovimo si hrano za jutri: Kazalci ohranitvenega stanja in ukrepi za zagotavljanje ugodnega stanja ohranjenosti vrst in habitatnih tipov v gozdovih Nature 2000 (V4-1143), (NIB – doc. dr. Al Vrezec), pridruženi partnerji
- *Providing the food for tomorrow: Indicators of conservation status and measures to ensure the favorable conservation status of species and habitats in forests of Natura 2000 (V4-1143), (NIB – doc. dr. Al Vrezec), joint partners*

Razvojni projekti Development Projects

- Favna hroščev evropskega varstvenega pomena v krajinskem parku Tivoli, Rožnik in Šišenski hrib (financer: Mestna občina Ljubljana, pogodba št. 430-268/2012-4) (vodja projekta doc. dr. Al Vrezec)
- *Beetle fauna of European conservation importance in the landscape park Tivoli, Rožnik in Šišenski hrib* (financier: Municipality of Ljubljana; contract no. 430-268/2012-4 (project manager: doc. dr. Al Vrezec)
- Life+ projekt LIVEDRAVA: Vpliv projektnih akcij na hrošče, 2013-2017 (naročnik: Društvo za opazovanje in proučevanje ptic Slovenije – DOPPS; pogodba št. LIVEDRA IZ05-2013) (nosilec na NIB doc. dr. Al Vrezec)
- Inventarizacija favne območja reke Mure: poglavje Hrošči (naročnik: Dravske elektrarne Maribor d.o.o. zanj Center za kartografijo favne in flore; pogodba št. 0457/2012) (nosilec doc. dr. Al Vrezec)
- Ocena stanja za območje Natura 2000 na porečju Voglajne – sklop hrošči (naročnik: Ministrstvo za kmetijstvo in okolje, zanj Center za kartografijo favne in flore; pogodba št. 1/2003-MG) (nosilec doc. dr. Al Vrezec)
- Ujede na območju Senožeških brd – naročnik: VEPA

Drugi raziskovalni projekti Other Research Projects

- Inventarizacija potočnih rakov na območju predvidene trase AC Postojna/Divača – Jelšane (naročnik: Lutra, Inštitut za ohranjanje naravne dediščine) (nosilec doc. dr. Al Vrezec)

Organizacija znanstvenih in strokovnih srečanj / Organization of Scientific and Professional Meeting

- Vrezec A.: Review of inventory of monitoring for raptors (EURAPMON), Murcia, Španija, 31.5.-1.6.2013 (predsednik znanstvenega odbora; predavanje: Overview of the results of the Murcia 2012 monitoring for raptors workshop results)

Obiski in študijska izpolnjevanja na tujih raziskovalnih inštitucijah / Visits and Scientific Studies at Institutions Abroad

- dr. Simčič T in dr. A. Brancelj.: Nacional de Pesquisas da Amazônia – INPA, Laboratório de Ecofisiologia e Evolução Molecular – LEEM, Manaus, Brazilija (24.-31.8.2013)
- dr. Simčič T.: Institute of Freshwater Ecology & Inland Fisheries, Dept. of Experimental Limnology, Neuglobsow, Nemčija (10.-21.11.2013)
- doc. dr. Vrezec A., dr. Bordjan D.: Zemaljski muzej Bosne i Hercegovine, Sarajevo, Bosna in Hercegovina (4.-9.11.2013)
- doc. dr. Vrezec A.: University of Helsinki, Department of Environmental Sciences, Lahti, Finska (6.-19.10.2013)
- doc. dr. Vrezec A., Jaklič M.: Naturhistorisches Museum Wien, Dunaj, Avstrija (19.11.2013)

Obiski iz tujine / Visitors from Abroad

- Tobias Romankiewicz, Institute of Freshwater Ecology & Inland Fisheries, Dept. of Experimental Limnology, Neuglobsow, Nemčija (10.-12.02.2013)
- Adalberto Luis Val in Daiani Kochian – Instituto Nacional des Pesquas de Amazonas.
- mag. Dražen Kotrošan, Zemaljski muzej Bosne i Hercegovine, Sarajevo, BIH
- dr. Miguel A. Carretero, CIBIO Research Centre in Biodiversity and Genetic Resources, InBIO, Universidade do Porto, Portugalska (18.6.2013)
- dr. Chris Wernham, BTO Scotland, Velika Britanija (31.7.-1.8.2013)

Sodelujoče organizacije Cooperating Institutions

Domače / National

- Oddelek za biologijo, Biotehniška fakulteta, Univerza v Ljubljani / Department of Biology, Biotechnical Faculty, University of Ljubljana
- Center za kartografijo favne in flore (CKFF), Miklavž na Dravskem polju / Center for Cartography of Fauna and Flora (CKFF), Miklavž na Dravskem polju
- Prirodoslovni muzej Slovenije, Ljubljana / Natural History Museum, Ljubljana
- Ministrstvo za kmetijstvo in okolje, Ljubljana / Ministry of agriculture and environment
- Gozdarski inštitut Slovenije, Ljubljana / Slovenian Forestry Institute, Ljubljana
- Veterinarska fakulteta, Univerza v Ljubljani, Ljubljana / Veterinary Faculty, University of Ljubljana, Ljubljana
- Zavod RS za varstvo narave, Ljubljana, Maribor / Institute for nature conservation, Ljubljana, Maribor
- Zavod RS za šolstvo, Ljubljana / Institute for education, Ljubljana
- Inštitut »Jozef Stefan«, Ljubljana / Institute »Jozef Stefan«, Ljubljana
- Ribiška družina Tolmin / Tolmin Angling Association
- Mestna občina Ljubljana / Municipality of Ljubljana
- Aquarius d.o.o., Ljubljana / Aquarius d.o.o., Ljubljana
- Inštitut ERICO, Velenje / ERICO Institute, velenje
- Univerza v Novi Gorici / University of Nova Gorica
- AKSIOMA – Zavod za sodobne umetnosti, Ljubljana / Aksioma – Institute for modern art, Ljubljana
- Društvo za opazovanje in proučevanje ptic Slovenije (DOPPS), Ljubljana / DOPPS-BirdLife Slovenia, Ljubljana

Obisk v sklopu projekta Bilateralne Slovenija – Kitajska.
Visit in the scope of the Bilateral Project Slovenia – China.

(Foto | Photo: Arhiv EKO | Archive EKO)



Tuje / International

- Zemaljski muzej Bosne i Hercegovine, Sarajevo, BIH
- University of Helsinki, Department of Environmental Sciences, Lahti, Finland
- Institute of Ecology, Leuphana University Lüneburg, Lüneburg, Germany
- Molecular Zoology Unit, Technische Universität München, Freising, Germany
- Nationalparkverwaltung Bayerischer Wald, Grafenau, Germany
- CIBIO, Centro de Investigação em Biodiversidade e Recursos Genéticos, Campus Agrário de Vairão, Vairão, Portugal
- University of Zagreb; Faculty of Science; Division of Biology, Zagreb, Croatia
- Nacional de Pesquisas da Amazônia – INPA, Laboratório de Ecofisiologia e Evolução Molecular – LEEM, Manaus, Brazil
- University of Basel, Dept. of Environmental Sciences, Section of NLU-Biogeography, Basel, Switzerland
- University of Gdansk, Department of Genetics, Gdansk, Poland
- EAWAG, Department for Aquatic research, Dübendorf, Switzerland
- Echime University, Matsuyama, Japan
- University of Graz, Institute of Earth Sciences (Geology and Palaeontology), Graz, Austria
- Institute of Zoology, Faculty of Biology, Belgrade, Serbia
- Institute of Freshwater Ecology & Inland Fisheries, Dept. of Experimental Limnology, Neuglobsow, Nemčija

Uredniški odbori / Editors

- VREZEC Al: Acrocephalus (član uredniškega odbora)
- VREZEC Al: National Geographic (Slovenija / Slovenia) (član uredniškega odbora)
- VREZEC Al: Scopolia (član uredniškega odbora)
- VREZEC Al: Svet ptic (član uredniškega odbora)
- MORI Nataša: Natura Sloveniae (član uredniškega odbora)
- BRANCELJ Anton; International Journal of Biodiversity (open access)
- BRANCELJ Anton: Artropods (international Academy of Ecology and Environmental Sciences Hong Kong)

Predavanja in seminarji Lectures and Seminars

- SIMČIČ Tatjana: Aquatic toxicology : in situ biomonitoring systems for water quality assessment : International summer school 2013 Aquatic toxicology, Nova Gorica, 9–22. junij 2013. Nova Gorica.
- MORI, Nataša. Celovit pogled na vlogo vodotokov v naravni in kulturni krajini : predavanje ob Dnevu voda, JZ Kozjanski park, Uprava, Podsreda, 22. 3. 2013 ob 18. uri. Podsreda, 2013. [COBISS.SI-ID 30557401]
- MORI, Nataša. Predstavitev ekoloških raziskav na reki Soči in pritokih : Upravljanje z vodami – primer povodja reke Soče, predstavitev sofinanciranih projektov v okviru Programa čezmejnega sodelovanja Slovenija–Italija 2007–2013, 13. nov. 2013, Nova Gorica. Nova Gorica, 2013. [COBISS.SI-ID 2990159]
- MORI, Nataša. Department of freshwater and terrestrial ecosystems research : predavanje na Slovenskem znanstvenem inštitutu, Dunaj, 16. maj 2013. Dunaj, 2013. [COBISS.SI-ID 2805583]
- BRANCELJ Anton: Visokogorska jezera: Prirodoslovni muzej Slovenije
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(Foto | Photo: Irena Bertoncelj)



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Pedagoška dejavnost in mentorstva Teaching and Mentorship

Diplomski študij / Graduate Studies

1. Prof. dr. Brancelj A. (nosilec): Limnologija. Fakulteta za znanosti o okolju, Univerza v Novi Gorici
 - Prof. dr. Brancelj A. (leading lecturer): *Limnology. Faculty of environmental sciences, University of Nova Gorica*
2. Prof. dr. Brancelj A. (nosilec): Ekologija podzemnih voda. Fakulteta za znanosti o okolju, Univerza v Novi Gorici
 - Prof. dr. Brancelj A. (leading lecturer): *Ecology of subterranean waters. Faculty of environmental sciences, University of Nova Gorica*
3. Prof. dr. Tome D. (nosilec): Uvod v ekologijo. Biotehniška fakulteta, Oddelek za gozdarstvo in obnovljive vire, Univerza v Ljubljani
 - Prof. dr. Tome D. (leading lecturer): *Introduction in ecology. Biotechnical faculty, Department for forestry and renewable resources, University of Ljubljana*
4. Prof. dr. Tome D. (nosilec): Populacijska ekologija. Univerza v Mariboru, Fakulteta za naravoslovje in matematiko (sopredavatelj dr. Denac D.)
 - Prof. dr. Tome D. (leading lecturer): *Population ecology. University of Maribor, Faculty of natural sciences and mathematics (co-lecturer dr. Denac)*
5. Doc. dr. Vrezec A. (nosilec): Ornitologija. Biotehniška fakulteta, Oddelek za biologijo, Univerza v Ljubljani
 - Doc. dr. Vrezec A. (leading lecturer): *Ornithology. Biotechnical faculty, Department of Biology, University of Ljubljana*
6. Doc. dr. Vrezec A.: Kopenski ekosistemu. FAMNIT, Univerza na Primorskem (nosilka: doc. dr. Petra Košir)
 - Doc. dr. Vrezec A.: *Terrestrial Ecosystems. FAMNIT, University of Primorska (leading lecturer: doc. dr. Petra Košir)*

Podiplomski študij / Postgraduate Studies

1. Prof. dr. Brancelj A. (nosilec): *Izbrana poglavja iz ekologije vod*, Fakulteta za znanosti o okolju III, Univerza v Novi Gorici
 - Prof. dr. Brancelj A. (leading lecturer): *Selected topics of water ecology. Faculty of environmental sciences III, University of Nova Gorica*
2. Prof. dr. Tome D. (nosilec): Biomonitoring. Fakulteta za znanosti o okolju, Univerza v Novi Gorici (sopredavatelj dr. Vrezec, dr. Simčič)
 - Prof. dr. Tome D. (leading lecturer): *Biomonitoring. Faculty of environmental sciences, University of Nova Gorica (co-lecturers dr. Vrezec, dr. Simčič)*
3. Prof. dr. Tome D., Vrezec A. (sopredavatelja): Ekologija. Interdisciplinarni doktorski študij Bioznanosti, Biotehniška fakulteta, Oddelek za biologijo, Univerza v Ljubljani
 - Prof. dr. Tome D., Vrezec A. (co-lectures): *Ecology. Biotechnical faculty, Department of Biology, University of Ljubljana*

4. Doc. dr. Vrezec A. (nosilec): Invazijska ekologija in pomen medvrstnih odnosov v ekosistemih. III. stopnji bolonjskega študija Ekotehnologija, Mednarodna podiplomska šola Jožefa Stefana, Ljubljana
 - Doc. dr. Vrezec A. (leading lecturer): *Invasion ecology and importance of interspecific interactions in ecosystems. third-level study of programme Ecotechnology, Jožef Stefan International Postgraduate School, Ljubljana*

Diplomska dela / Graduate Theses

- OPALIČKI Maja. Podzemna vodna favna kot indikator hidrogeoloških lastnosti kraškega vodonosnika = Groundwater fauna as bioindicator of hydrogeological characteristics of the alpine karstic aquifer. Mentor/supervisor: prof. dr. Anton Brancelj, dr. Nataša Mori.
- MEŽNARŠIČ, Barbara. *Karakterizacija zaledja kraških izvirov na območju Krimskega jezera s pomočjo drifta* : diplomsko delo. Univerza v Novi Gorici.
- NOVAK, Diana. *Znotrajvrstna in medvrstna teritorialna agresivnost lesne sove : diplomsko delo : univerzitetni študij = Intraspecific and interspecific territorial aggressiveness of Tawny Owl : graduation thesis : university studies*. Ljubljana: (mentor: doc. dr. Al Vrezec)
- ZAGORŠEK, Tjaša. *Gnezditvena gostota in izbor habitata velikega skovika (Otus scops) ob Jadranski obali : zaključna naloga*. Koper: [T. Zagoršek], 2013. (mentor: doc. dr. Al Vrezec)

Magistrska dela / Master Theses

- BITENC, Katja. *Plenilski pritisk na pozidno in velebitsko kuščarico v sintopičnih in alotopičnih populacijah : magistrsko delo : magistrski študij – 2. stopnja = Predation pressure on common wall lizard and horvath's rock lizard in syntopic and allotopic populations : M. Sc. Thesis : Master Study Programmes*. Ljubljana: (mentor: doc. dr. Al Vrezec)

Doktorska dela / Doctoral Theses

- BOONYANUSITH, Chaichat. *Species diversity and distribution of copepods in caves in western part of Thailand : thesis approval*. Khon Kaen University, Tajska. Somentor/cosupervisor: dr. Anton Brancelj
- BORDJAN, Dejan. *Vpliv nadmorske višine na gnezditveno biologijo velike sinice (Parus major Linnaeus, 1758) : doktorska disertacija = Effect of altitude on breeding biology of great tit (Parus major Linnaeus, 1758) : doctoral dissertation – mentor/supervisor: dr. Davorin Tome*



Svetli zemeljski čmrlj *Bombus lucorum*
White-tailed bumblebee *Bombus lucorum*

(Foto | Photo: D. Bevk)

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ODDELEK ZA ENTOMOLOGIJO - ENTOMO Department of Entomology – ENTOMO

Vodja / Head:

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Raziskovalci / Scientific Staff

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2. prof. dr. **Andrej Blejec**, univ. dipl. ing. mat., znanstveni svetnik
3. prof. dr. **Andrej Čokl**, univ. dipl. biol., znanstveni svetnik*
4. dr. **Nataša Stritih**, univ. dipl. biol., znanstvena sodelavka
5. dr. **Maja Zorovič**, univ. dipl. biol., znanstvena sodelavka
6. dr. **Alenka Žunič Kosi**, univ. dipl. biol., znanstvena sodelavka



Mladi raziskovalci / Young Scientists

1. **Maja Derlink**, univ. dipl. biol. *
2. **Andreja Kavčič**, univ. dipl. biol.*
3. **Anka Kuhelj**, univ. dipl. biol.
4. **Vera Zgonik**, univ. dipl. biol. *

Tehnični sodelavci / Technicians

1. **Jernej Polajnar**, univ. dipl. biol., znanstveni asistent *

* delovno razmerje prenehalo v letu 2013/ employment ended in 2013

RAZISKOVALNA DEJAVNOST

Oddelek za entomologijo v skladu s svojo vizijo in dolgoročno usmeritvijo raziskuje življenje žuželk na različnih nivojih. Temeljne raziskave so osredotočene na vedenje žuželk v povezavi z znotrajvrstno in medvrstno komunikacijo, na študij živčne podlage tega vedenja, populacijsko genetiko ter vpliv bolezni na vedenje in fiziologijo žuželk. Predmet raziskav so ekonomsko pomembne vrste žuželk kot so čebele, rastlinske stenice, škržatki in hrošči ter vrste, ki so značilne za ekstremna okolja kot na primer jamske kobilice, ki živijo v slovenskem podzemlju. Aplikativne raziskave so zasnovane na izsledkih temeljnih raziskav in posegajo na področja vpliva pesticidov na vedenje in imunski sistem izbranih vrst žuželk, alternativnih metod kontrole ter na področje uporabe laserske tehnologije pri nadzoru karantenskih škodljivcev.

PROGRAM P1-0255 – Združbe, odnosi in komunikacija v ekosistemi

Raziskovalno delo Oddelka za entomologijo poteka v okviru naslednjih smiselno povezanih sklopov:

- (a) vedenje in komunikacija žuželk,
- (b) nevrobiologija,
- (c) genetsko molekularne raziskave,
- (d) raziskave čebel,
- (e) bioakustične metode za zgodnjo detekcijo škodljivcev
- (f) kemična ekologija.

a) Pri škržatku vrste *A. makarovi*, ki je ena od modelnih vrst v proučevanju vibracijske komunikacije, smo raziskovali vpetost v komunikacijsko omrežje na osnovi rivalnega vedenja pri samcih in samicah. Proučevali smo tudi porabo energije med oddajanjem vibracijskih signalov ter vpliv napora vložnega v reprodukcijo na preživetje samcev.

b) Jamske kobilice so domnevno najprimitivnejša, gluha skupina dolgotipalčnih žuželk. Pri vrsti *Troglophilus neglectus*, razširjeni v slovenskem podzemlju, smo opravili primerjalno-anatomske študije oživčnosti in projekcij vibracijskih čutilnih organov v no-

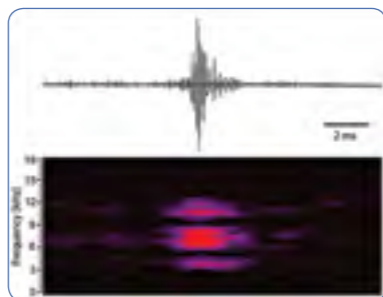


Škržatek iz rodu *Aphrodes*
Leafhopper of the genus Aphrodes

(Foto | Photo: A. Kuhelj)

Vibracije azijskega kozlička
Anoplophora glabripennis v lesu
(oscilogram in sonogram)
Vibrations of the Asian longhorn beetle measured in wood (oscillogram and sonogram) (image: M. Zorović)

(Foto | Photo: M. Zorović)



gah. Opisali smo verjetno izvorno nevro-anatomsko stanje organa, iz kakršnega so se razvili slušni organi v nogah kobilic in murnov.

c) Za škržatke (Hemiptera: Cicadellidae) na splošno velja, da so taksonomsko zahtevna skupina. Pri rodu *Aphrodes* bomo poleg vedenjskih, morfoloških in ekoloških razlik opisali tudi genetsko raznolikost med populacijami; v ta namen smo razvili nove mikrosatelitne markerje, ki jih bomo uporabili za analizo populacijske genetike.

d) Testirali smo varnost biokontrolnega agensa (BKA) glive *Gliocaldium catenulatum* za medonosno čebelo. Da bi videli, ali vpliva na vedenje čebel, smo s pomočjo kamer spremljali njihovo vedenje na vhodu v panj. Vpliv na učenje smo testirali s pogojevanjem refleksa iztegovanja jezička (PER). Testirali smo tudi življenjsko dobo čebel, ki so bile BKA izpostavljene v kletkah. Prvi rezultati so pokazali, da BKA nima velikega vpliva na vedenje in je zato varen za čebele.

e) Z globalno trgovino z lesom in lesnimi izdelki se je povečal tudi vnos organizmov, ki v novem okolju predstavljajo grožnjo avtohtonim vrstam in ekosistemu. Z uporabo laserske vibrometrije smo v sklopu EU projekta Q-DETECT razvijali nove tehnike za ugotavljanje prisotnosti invazivnih žuželčnih vrst v lesu. S pomočjo zgodnje detekcije lahko preprečimo razvoj odraslih osebkov in s tem širjenje invazivnih organizmov v novo okolje.

f) V sklopu kemične ekologije smo testirali učinkovitost že poznanih feromonov hroščev iz družine kozličkov za privabljanje vrst, prisotnih na področju Slovenije. S pomočjo vrstno specifičnih feromonskih pasti smo ugotavljali razširjenost izbranih vrst. Pri vrstah, katerih feromoni še niso poznani, smo z metodo aeracije zbirali morebitne kemične signale samcev in samic.

RESEARCH ACTIVITY

Department of Entomology is investigating various aspects of insect biology according to the department's vision and its long term research goals. Basic research is focused on insect behaviour within a larger context of insect intra- and interspecific communication, on research of neurological basis for this behaviour, on population genetics, and on impact of disease on behaviour and physiology of insects.

Research subjects are economically important groups of insects such as honeybees, stink bugs, planthoppers, leafhoppers, beetles, as well as insect species, typical for extreme environments such as cave crickets found in the Slovenian underground. Applied work is based on the results of our basic research and covers the area of pesticide impact on behaviour and immune systems of selected insect species, the area of alternative pest control methods, and the area of the quarantine pest detection using laser technology.

PROGRAM P1-0255 – Communities, relations and communications in the ecosystems

Research activities at the Department of Entomology are carried out within the following interconnected research topics:

- (a) Insect behaviour and communication,
- (b) Neurobiology,
- (c) Molecular biology,
- (d) Honeybee research,
- (e) Bioacoustic methods for early pest detection,
- (f) Chemical ecology.

a) In our model species, the leafhopper *Aphrodes makarovi*, we studied intraspecific vibrational communication within a communication network by investigating rivalry behaviour in males and females. At the same time we were also interested in the impact of aging on intersexual communication in males. In addition we investigated energy expenditure during vibrational signalling and the effect of calling effort on male longevity.

b) Cave crickets are presumably the most primitive of the non-hearing groups of *Ensifera*. In *Troglophilus*



Individualno označevanje čebel.
Individually marking of honeybees.

(Foto | Photo: D. Bevk)

Nameščanje vabe v feromonsko past.
Placing pheromone lure into the cross-vane panel trap.

(Foto | Photo: M. Zorović)



neglectus, inhabiting Slovenian undergrounds, we have carried out a comparative study of the neuro-anatomy of the vibration sensitive organs in the legs. We described the peripheral innervation pattern and central projections of sensory neurons as the likely plesiomorphic organisation with respect to the hearing organs such as developed in katydids and crickets.

c) It is generally known that leafhoppers (Hemiptera: Cicadellidae) are a taxonomically very challenging group. In genus *Aphrodes* we described behavioural, morphological, ecological, as well as genetic variability among populations; in order to do so, we developed new microsatellite markers that will be used in the analysis of population genetics.

d) We have tested the safety of a biocontrol agent (BCA) for a fungus *Gliocaldium catenulatum* for a honeybee. In order to see its effect on the behaviour of the honeybees, we have recorded their behaviour on the cameras at the entrance of the beehive. We have tested the impact on learning by conditioning the proboscis extension reflex (PER). We have also tested a life span of honeybees that were exposed to BCA in cages. First results have shown that BCA doesn't have an important impact on the behaviour of honeybees and is therefore safe for them.

e) Global trade in wood and wood products has resulted in an increased introduction of invasive organisms to new areas, which represent a threat to the native species and entire ecosystems. In frame of the EU project Q-DETECT we have been developing new techniques using laser vibrometry to detect the presence of invasive insect species in wood. Using early detection we can prevent development of adult insects and stop the spread of the invasive organisms within new environments.

f) Within the section of chemical ecology we have tested the efficiency of already known longhorned beetle family (Cerambycidae) pheromones to attract species that are present in Slovenian territory. Using species specific pheromone traps we have been investigating the presence and spread of the selected species. Using a method of aeration we have collected possible chemical signals from males and females of species with no known pheromones.

GLAVNI DOSEŽKI V LETU 2013

V letu 2013 je Oddelek za entomologijo objavil 7 izvornih znanstvenih člankov, od katerih so bili vsi objavljeni v revijah z IF. Znanstvena dela so bila objavljena na vseh nosilnih področjih raziskovalne dejavnosti skupine.

Dolgoletni vodja oddelka prof. dr. Andrej Čokl je prejel Nagrado Miroslava Zei-a za življensko delo.

Mlada raziskovalka Anka Kuhelj je na 14th Invertebrate Sound and Vibration meeting prejela nagrado 'von Helversen Student Award' za najboljšo študentsko raziskovalno delo.

Smo partnerji BICOPOLL-a, evropske raziskave zaščite jagod pred najpomembnejšo boleznijo sivo plesnijo (*Botrytis cinerea*) z uporabo biokontrole. Čebele uporabljamo za prenos biološkega agensa, glive *Gliocladium catenulatum*, in tako rastline zaščitimo pred boleznimi in izboljšamo opravevanje.

Oddelek je v sodelovanju s skupino prof. dr. Jocelyna Millarja iz Univerze v Kaliforniji, Riverside, razširil tudi aplikativno dejavnost na področju semiokemikalij, ki predstavljajo alternativno, okolju bolj prijazno sredstvo za monitoring in zatiranje škodljivih vrst hroščev iz družine kozličkov (*Cerambycidae*), sadnih muh (*Tephritidae*) in ščitastih stenic (*Pentatomidae*).

SODELOVANJE Z RAZLIČNIMI UPORABNIKI

Temeljna daljnoročna usmeritev Oddelka za entomologijo je zagotavljanje vrhunskega temeljnega znanja za dobrobit celotne družbe. Poleg prenosa tega znanja na vseh nivojih študija ga uporabljamo tudi pri delu na področju ekonomsko pomembnih žuželčnih škodljivcev, čebelarstva in divjih opravevalcev ter varovanja okolja. Ekološka pridelava je eden od najhitreje rastočih segmentov kmetijstva v



Čebela je na cvet jagode prinesla biološko zaščitno sredstvo (projekt BICOPOLL)

The biological control agent is delivered to the strawberry flower by the honeybee (BICOPOLL project)

(Foto | Photo: D. Bevk)

Aeracija – postopek za vzorčenje vonjav žuželk

Aeration – a procedure for sampling insect volatiles

(Foto | Photo: A. Žunič Kosi)



EU in hkrati segment, v katerem so v mnogih primerih zgoraj omenjena področja med seboj neločljivo povezana. Velik del naše raziskovalne dejavnosti je usmerjen na področje zagotavljanja varne hrane z zmanjšanjem uporabe pesticidov.

Na področju ekonomsko pomembnih žuželčnih škodljivcev razvijamo alternativne pristope nadzora, ki omogočajo zmanjšanje vnosa kemičnih sredstev v okolje (npr. za nadzor prenašalcev zlate trsne rumenice in rumenice tipa počrnelosti lesa na vinski trti ter pritlikavosti pšenice in plodove vinske mušice) ali pa zgodnjo detekcijo karantenskih škodljivcev v lesu na osnovi akustičnih metod (laserska vibrometrija).

Na področju čebelarstva in divjih opravevalcev ugotavljamo vpliv stresnih dejavnikov (bolezni in pesticidov) na vedenje medonosne čebele in zgube družin. Raziskujemo tudi možnosti uporabe opravevalcev za nanos bioloških sredstev za učinkovit nadzor sive plesni jagod v ekološki pridelavi.

Na področju varovanja okolja razvijamo in uvajamo nove, okolju prijazne načine za izboljšanje detekcije in monitoringa naravovarstveno in ekonomsko pomembnih saproksilnih vrst hroščev, ki so pomembni kot indikatorji stanja okolja, pa tudi kot škodljivci.

RAZISKOVALNA INFRASTRUKTURA

Oddelek za entomologijo je opremljen z vrhunsko opremo za laboratorijsko in terensko registracijo ter analizo mehanskih dražljajev, ki se prevajajo po zraku ali podlagi, s standardnimi laboratoriji za raziskave delovanja živčevja žuželk na nivoju posamezne celice, z opremo za svetlobno in fluorescenčno mikroskopijo z možnostjo laserske ablacije identificiranih celic v živem zarodku ter z laserskim sistemom za določanje resonančnih lastnosti bioloških materialov in detekcijo škodljivcev v lesu.

IMPORTANT ACHIEVEMENTS IN 2013

In the year 2013 the Department of Entomology published seven original scientific papers, all of them published in journals included in WOS. Scientific works have been published in all main areas of the total research activity of the department.

Head of Department of many years Prof. Dr. Andrej Čokl received a Miroslava Zei award for lifelong scientific achievements.

Young scientist Anka Kuhelj was a recipient of the 'von Helversen Student Award' for the best student research work at 14th Invertebrate Sound and Vibration meeting.

In the frame of Bicopoll European Project we study the use of biocontrol agent on Strawberries against grey mould (Botrytis cinerea). Bees are used to transfer biological agent fungus Gliocladium catenulatum to flowering plants in order to protect them and improve the crop yield.

Through collaboration with the research group lead by Prof. Dr. Jocelyn Millar at the University of California – Riverside, our department has extended its applied research activities into the area of semiochemicals that represent an alternative and more eco-friendly method for monitoring and control of harmful species from the longhorned beetle family (Cerambycidae), fruit flies (Tephritidae), and stink bugs (Pentatomidae).

COLLABORATION WITH VARIOUS USERS

A fundamental long-term goal at the Department of Entomology is the excellence in basic research for the benefit of the entire society. Besides conveying this knowledge at all study levels, we are also using it in applied work on economically important insect pests, production of honey, wild pollinators, and in the protection of the environment. Organic farming is one of



Ličinka hrošča Azijski kozliček (*Anoplophora glabripennis*).
Larva of the Asian loghorn beetle (*Anoplophora glabripennis*).

(Foto | Photo: J. Polajnar)

Terensko delo s prenosnim laserskim vibrometrom.

Field work with a portable laser vibrometer.

(Foto | Photo: M. Zorović)



the fastest growing areas in agriculture in the EU and at the same time vitally interconnects many of the above mentioned areas of research. A large portion of our research activities is directed toward safe food production by decreasing the use of pesticides.

In the area of economically important insect pests we are developing alternative approaches for control that enable a reduction in release of chemical agents into the environment (for example the control of insect vectors of two grapevine phytoplasmas, Flavescence dorée and Bois noir, insect vectors of wheat dwarf virus, and control of the spotted wing Drosophila), and early detection of quarantine pests in wood using acoustic methods (laser vibrometry).

In the area of honey production and wild pollinators, we are investigating the impact of stress factors (diseases and pesticides) on the behaviour of the honeybee and the loss of entire honeybee hives. We are also investigating various uses of pollinators for application of bioagents for effective biocontrol of the grey mould in the ecological strawberry production.

In the field of environmental protection we are developing and introducing new environmentally friendly methods for improving detection and monitoring of environmentally as well as economically important species of saproxylic beetles that are important as indicators of the environmental health status and also as pests.

RESEARCH INFRASTRUCTURE

Department of Entomology is equipped with state-of-the-art instruments for laboratory and field registration and analysis of mechanical stimuli that are conducted via air or substrate, with standard laboratories equipped for research in insect neurobiology at the single cell level, with light and fluorescence microscope that also enable laser ablation of identified cells in a living embryo, and with a laser system for determination of resonance properties of biological materials and detection of wood-boring pests.

MEDNARODNO SODELOVANJE

V l. 2013 je Oddelek nadaljeval s sodelovanjem v projektu Q-DETECT 7. Okvirnega programa EU, ki združuje 15 partnerjev iz devetih držav. Nadaljevali smo z raziskavami v okviru bilateralnih projektov znanstvenega sodelovanja z Brazilijo (EMBRAPA Brasilia), s Turčijo (Ondokuz Mayis Univerza), ZDA (Oddelek za entomologijo Univerze v Kaliforniji v Riversidu in Italijo (Edmund Mach Foundation, Istituto Agrario di San Michele all'Adige). Mednarodno sodelovanje se je bistveno poglobilo na področju raziskav čebel z začetkom izvajanja mednarodnega projekta BICO POLL v okviru CORE Organic II programa. Razvejano mednarodno sodelovanje skupini omogoča izmenjavo informacij, izkušenj in tehnologije, kar je pomembno tudi zaradi možnosti dela na področjih, za katere skupina ni opremljena oz. za katera nima potrebnih izkušenj.

IZOBRAŽEVALNE DEJAVNOSTI IN PROMOCIJA ZNANOSTI

Člani Oddelka za Entomologijo sodelujejo v programih na Univerzah v Ljubljani, Mariboru in Novi Gorici ter na Visoki šoli za varstvo okolja v Velenju. Za promocijo znanosti skrbijo s pisanjem člankov za dnevni tisk in poljudno-znanstvene revije. Vedno aktualno tematiko čebel in drugih opraševalcev je dr. Danilo Bevk predstavil v intervjuju na Radiu Slovenija v oddaji Podoba znanja, ki je bila predvajana na 3. programu ter v sklopu predavanj 'Znanost na cesti'.



Zdrave jagode (projekt BICO POLL).

Healthy strawberries (BICO POLL project).

(Foto | Photo: D. Bevk)

Promocija znanosti. Popularisation of science.

(Foto | Photo: K. Žagar)



NAJPOMEMBNEJŠE OBJAVE V 2013

- ZOROVIĆ M., HEDWIG, B. Descending brain neurons in the cricket *Gryllus bimaculatus* (de Geer): auditory responses and impact on walking. *Journal of Comparative Physiology A*, 199: 25-43. [COBISS.SI-ID 2698575]

V članku smo opisali fiziološke in morfološke značilnosti spuščajočih akustičnih nevronov v možganih murnov in pokazali njihovo vlogo pri fonotaksiji in hoji. Članek je pomemben prispevek k razumevanju nevronalnega nivoja vedenja žuželk.

- KAVČIČ, A., ČOKL, A., LAUMANN, R.A., MORAES, M.C.B., BORGES, M. Tremulatory and abdomen vibration signals enable communication through air in the stink bug *Euschistus heros*. *PLoS ONE*, 8, e56503. [COBISS.SI-ID 2743887]

V članku smo pokazali, da se vibracijski signali lahko prenašajo z rastline na rastlino tudi kadar le-te niso v fizičnem kontaktu. Pojav je ključen za razumevanje širjenja vibracijskih signalov v okolju.

- ŽUNIČ, A., CHINTA, S.P., HEADRICK, D., ČOKL, A., MILLAR, J.G. Do chemical signals mediate reproductive behavior of *Trupanea vicina*, an emerging pest of ornamental marigold production in California? *Entomologica Experimentalis et Applicata*, 149: 44-56. [COBISS.SI-ID 2856015]

V članku smo opisali spolno vedenje pri muhi *Trupanea vicina* in identificirali spojino značilno samo za samce. Raziskava spolnega vedenja te muhe predstavlja osnovo za razvoj monitoringa in kontrolo te vrste, ki postaja vedno večji problem pri vzgoji žametnic.

- MAZZONI, V., ANFORA, G., VIRANT-DOBERLET, M. Substrate vibrations during courtship in three *Drosophila* species. *PLoS ONE*, 8, e61185. [COBISS.SI-ID 2979151]

V članku smo opisali vibracijske signale treh vrst vinskih mušic iz rodu *Drosophila*. Čeprav je bil ta način sporazumevanja vinskih mušic do sedaj spregledan, naši rezultati kažejo, da je v tem rodu splošno razširjen.

INTERNATIONAL COLLABORATION

In 2013 the Department has continued its collaboration in the project Q-DETECT within the 7th EU Framework that brought together fifteen partners from nine countries. Within the project we are closely collaborating with the Austrian institute of forestry in Vienna (BFW). We have continued with the research in the frame of bilateral scientific projects with Brazil (EMBRAPA, Brasilia), Turkey (Ondokuz Mayis University), United States (Department of Entomology, University of California, Riverside), and Italy (Edmund Mach Foundation, Istituto Agrario di San Michele all'Adige). International collaboration has deepened in the area of honeybee research as we started carrying out the activities within the international project BICO POLL in the frame of CORE Organic II program. Widespread international collaboration enables exchange of information, expertise, and technology that among other things enable research in the areas for which the departments are not equipped or don't have the necessary expertise.

EDUCATIONAL ACTIVITIES AND PROMOTION OF SCIENCE

Members of the Department of Entomology are participating in programs at the University of Ljubljana, University of Maribor, University of Nova Gorica, and at the Environmental Protection College in Velenje. The members are promoting science by contributing popular science articles to daily newspapers and popular science magazines. The perpetually hot topic of honeybees was presented by Dr. Danilo Bevk in his interview on Radio Slovenia in the series Portraits of Knowledge broadcasted on program 3 (Ars) and at a public lecture in the series Science on the Streets.



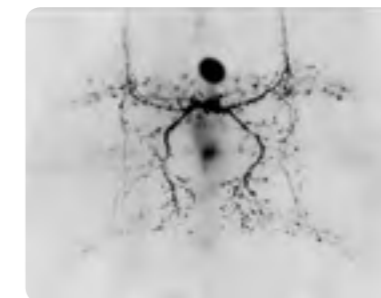
Terensko vzorčenje žuželk s sesalnikom.

Field sampling of insects using a suction sampler.

(Foto | Photo: D. Bevk)

Vibracijski interneuron žuželke. Insect vibratory interneuron.

(Foto | Photo: M. Zorovič)



MAIN PUBLICATIONS IN 2013

- ZOROVIĆ M., HEDWIG, B. Descending brain neurons in the cricket *Gryllus bimaculatus* (de Geer): auditory responses and impact on walking. *Journal of Comparative Physiology A*, 199: 25-43. [COBISS.SI-ID 2698575]

We described physiology and morphology of descending auditory brain neurons in crickets and demonstrated their involvement in walking and phonotaxis. The study is an important contribution towards understanding the neuronal level of insect behaviour.

- KAVČIČ, A., ČOKL, A., LAUMANN, R.A., MORAES, M.C.B., BORGES, M. Tremulatory and abdomen vibration signals enable communication through air in the stink bug *Euschistus heros*. *PLoS ONE*, 8, e56503. [COBISS.SI-ID 2743887]

In this study we showed that vibrational signals are transmitted from plant to plant even when plants are not in physical contact. This phenomenon is crucial to understanding the transmission of vibrational signals in the environment.

- ŽUNIČ, A., CHINTA, S.P., HEADRICK, D., ČOKL, A., MILLAR, J.G. Do chemical signals mediate reproductive behavior of *Trupanea vicina*, an emerging pest of ornamental marigold production in California? *Entomologica Experimentalis et Applicata*, 149: 44-56. [COBISS.SI-ID 2856015]

We have described reproductive behaviour of the fruit fly *Trupanea vicina* and identified a male-specific compound. The work represents the first detailed investigation of the sexual behaviour of this species with the goal of developing methods of monitoring and managing of this emerging pest species in ornamental marigolds.

- MAZZONI, V., ANFORA, G., VIRANT-DOBERLET, M. Substrate vibrations during courtship in three *Drosophila* species. *PLoS ONE*, 8, e61185. [COBISS.SI-ID 2979151]

We have described substrate vibrations generated during courtship in three fruit fly species of the genus *Drosophila*. Although the existence of vibrational signals in fruit fly communication has been so far almost completely overlooked, evidence suggests that vibrational signalling may be widespread among *Drosophila* species.

Raziskovalni program, ki ga financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Program Financed by Slovenian Research Agency*

- Združbe, odnosi in komunikacije v ekosistemih / Communities, relations and communications in the ecosystems (P1-0255), vodja programa / the research programme leader prof. dr. Anton Brancelj.

Raziskovalni projekti, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Projects Financed by Slovenian Research Agency*

- Interakcije med nanodelci z različno površino in modelnimi biološkimi sistemi / Interactions between nanoparticles with different surfaces and model biological systems (J1-4109), (NIB – prof. dr. Andrej Čokl), pridruženi / joint partners.

Mednarodni raziskovalni projekti *International Research Projects*

- EU projekt 245047, Q-DETECT, Razvoj metod za določanje karantenskih škodljivih organizmov za uporabo v nacionalnih programih in inšpekcijskih službah / Developing quarantine pest detection methods for use by national plant protection organizations (NPPO) and inspection services, koordinator / coordinator Food and environment research organisation (FERA), dr. Neil Boonham; koordinator WP Akustika / Acoustics: dr. Andrej Čokl.
- EU projekt BICOPLL, Tarčno precizna biokontrola in pospeševanje v ekoloških poljedelskih sistemih / BICOPLL, Targeted precision biocontrol and pollination enhancement in organic cropping systems / (grant 2311-11-000180), ERA-NET CORE Organic 2 (koordinator za SLO / coordinator for Slovenia: dr. Andrej Čokl).

Prebiranje nabranih
žuželk na terenu.
*Sorting of collected
insects in the field.*

(Foto | Photo: D. Bevk)



Bilateralni raziskovalni projekti *Bilateral Research Projects*

- BI-IT/11-13-006: Uglášenost vibracijskih signalov, s katerimi se sporazumevajo prenašalci trsnih rumenic, z gostiteljskimi rastlinami: možnost za razvoj alternativnega pristopa za nadzor škodljivcev / Tuning of vibrational signals emitted by vectors of phytoplasma grapevine diseases with host plants: potential for an alternative approach of pest management, (2011-2013), nosilka projekta/principal investigator dr. Meta Virant Doberlet
- BI-TR/11-13-005: Določanje načinov intraspecifične zvočne komunikacije stenice vrste Palomena prasina L. (Heteroptera: Pentatomidae) / Determination of intraspecific sound communication ways of Green Shield Bug (Palomena prasina L. Het.: Pentatomidae), (2011-2013), nosilec projekta / principal investigator prof. dr. Andrej Čokl.
- BI-US/12-13-018: Monitoring hroščev družine Cerambycidae v Sloveniji s pomočjo spolno specifičnih in agregacijskih feromonov v kombinaciji s hlapnimi snovmi gostiteljskih rastlin, s poudarkom na potencialno škodljivih in zavarovanih vrstah kozličkov / Monitoring the cerambycid beetle fauna of Slovenia using sex and aggregation pheromones in combination with host plant odours; a focus on potential pest and protected longhorn beetles, (2012-2013), nosilec projekta / principal investigator prof. dr. Andrej Čokl.
- BI-BR/12-14-002: Komunikacija pentatomid in njena uporaba pri zatiranju škodljivcev na soji. Faza II: Uporaba na polju / Pentatomide communication and its implication to soybean pest management. Phase II: application in the field (2010-2012), nosilec projekta / principal investigator prof. dr. Andrej Čokl.

Ciljni raziskovalni projekti *Target Research Projects*

- CRP „Zagotovimo.si hrano za jutri“: Trsne rumenice: metode zgodnjega odkrivanja in obvladovanja / Grapevine yellows: methods for their early detection and control (V4-1103), nosilka projekta/principal investigator prof. dr. Marina Dermastia
- CRP „Zagotovimo.si hrano za jutri“: Čebelarjenje v AŽ panju in zagotavljanje kakovostnih in varnih pridelkov / Beekeeping in back load national AŽ hive and production of quality and safety products (V4-1114), (NIB – dr. Danilo Bevk), pridruženi / joint partners.

Obiski in študijska izpolnjevanja na tujih raziskovalnih inštitucijah *Visits and Scientific Studies at Institutions Abroad*

- dr. Andrej Čokl, EMBRAPA Recursos Geneticos e Biotecnologia, Brasilia, Brazilija
- dr. Meta Virant-Doberlet, School of Biosciences, Cardiff University, UK
- dr. Meta Virant-Doberlet, Department of Biodiversity and Systematic Biology, National Museums & Galleries of Wales, Cardiff, UK
- dr. Alenka Žunič Kosi, Department of Entomology, University of California, Riverside, ZDA

Obiski iz tujine / *Visitors from Abroad*

- dr. Valerio Mazzoni, Edmund Mach Foundation, Istituto Agrario di san Michele all' Adige, Italy

Sadna muha vrste *Trupanea vicina*.
Marigold fruit fly Trupanea vicina.

(Foto | Photo: A. Žunič Kosi)

Članstva v odborih mednarodnih organizacij, delovnih teles, ekspertnih skupinah / *Membership of International Boards and Expert Groups*

- Royal Entomological Society London
- Entomological Society of America
- Entomological Society of Brasil
- The New York Academy of Science
- The American Association for the Advancement of Science
- National Geographic Society
- Slovensko entomološko društvo
- Komisija za alternativne opraveševalce pri Čebelarski zvezi Slovenije



Sodelujoče organizacije Cooperating Institutions

Domače / National

- Kmetijski inštitut Slovenije, Ljubljana
- Univerza v Ljubljani, Biotehniška fakulteta, Oddelek za biologijo
- Kmetijsko-gozdarski zavod, Nova Gorica
- Čebelarstva zveza Slovenije

Tuje / International

- Zoologisches Institut, Karl-Franzens Universität Graz, Avstrija
- Department C.D.S.L., Section of Agricultural Entomology, University of Pisa, Italija
- Zoologisches Institut, Abteilung Neurobiologie, Georg-August-Universität, Göttingen, Nemčija
- Institut für Tierphysiologie, Integrative Sinnesphysiologie, Justus-Liebig Universität Giessen, Nemčija
- Department of Biodiversity and Systematic Biology, National Museums & Galleries of Wales, Cardiff, UK
- Department of Biology & Environmental Science, School of Life Sciences, University of Sussex, UK
- School of Biosciences, Cardiff University, Wales, UK
- Edmund Mach Foundation, Istituto Agrario di San Michele all'Adige, Italy
- Ondokuz Mayıs University, Samsun, Turkey
- Department of Entomology, University of California, Riverside, ZDA
- EMBRAPA Recursos Genéticos e Biotecnologia, Brasília, Brazilija
- Bundesforschungs- und Ausbildungszentrum für Wald, Naturgefahren und Landschaft, Wien, Avstrija



Ulov žuželk v feromonski pasti.
The catch in a cross-vane panel pheromone trap.

(Foto | Photo: M. Žvar)

Feromonske pasti za hrošče.
Cross-vane panel traps for beetles.

(Foto | Photo: M. Zorović)



Uredniški odbori / Editors

- Virant-Doberlet M.: Bulletin of Entomological Research, Cambridge University Press, ISSN 1408-4853, član uredniškega odbora, 2005 –

Pedagoška dejavnost in mentorstva Teaching and Mentorship

Dodiplomski študij / Graduate Studies

- Blejec A.: Statistika = *Statistics*, Univerza v Ljubljani, BF, Oddelek za biologijo
- Blejec A.: Bioinformatika = *Bioinformatics*, Univerza v Ljubljani, BF, Oddelek za biologijo
- Blejec A.: Vzorčenje in statistično načrtovanje poskusov = *Sampling and statistical design of experiments*, Univerza v Ljubljani, BF, Oddelek za biologijo
- Čokl A.: Ekofiziologija = *Ecophysiology*, Univerza v Novi Gorici, Fakulteta za znanosti o okolju
- Čokl A.: Vplivi okolja na življenske procese = *Effects of environment on life processes*, Visoka šola za varstvo okolja Velenje

Podiplomski študij / Postgraduate Studies

- Blejec A.: Statistična analiza bioloških podatkov = *Statistical analysis of biological data*, doktorski študij *Bioznanosti*, Univerza v Ljubljani
- Blejec A.: Uvod v znanstveno-raziskovalno delo = *Introduction to scientific research work*, Varstvo okolja, Univerza v Ljubljani
- Blejec A.: Računalniško podprta statistika = *Computational statistics*, doktorski študij *Statistika*, Univerza v Ljubljani
- Čokl A.: Komunikacija živali = *Animal communication*, Univerza v Ljubljani, Biotehniška fakulteta
- Čokl A.: Izbrana poglavja iz komunikacije živali = *Selected topics of animal communication*, Univerza v Mariboru, Fakulteta za naravoslovje

Opečnordeči vitki kozliček
(Stictoleptura rubra)
*Red longhorn beetle
(Stictoleptura rubra)*

(Foto | Photo: A. Žunič-Kosi)



Čebelja družina v nasadu jagod.
Honeybee colony in a strawberry field.

(Foto | Photo: D. Bevk)



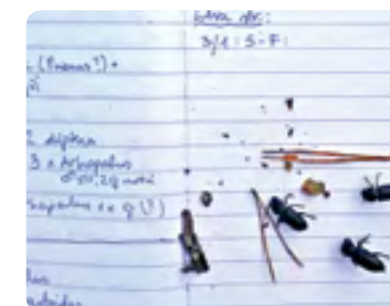
Terensko delo.
Fieldwork.

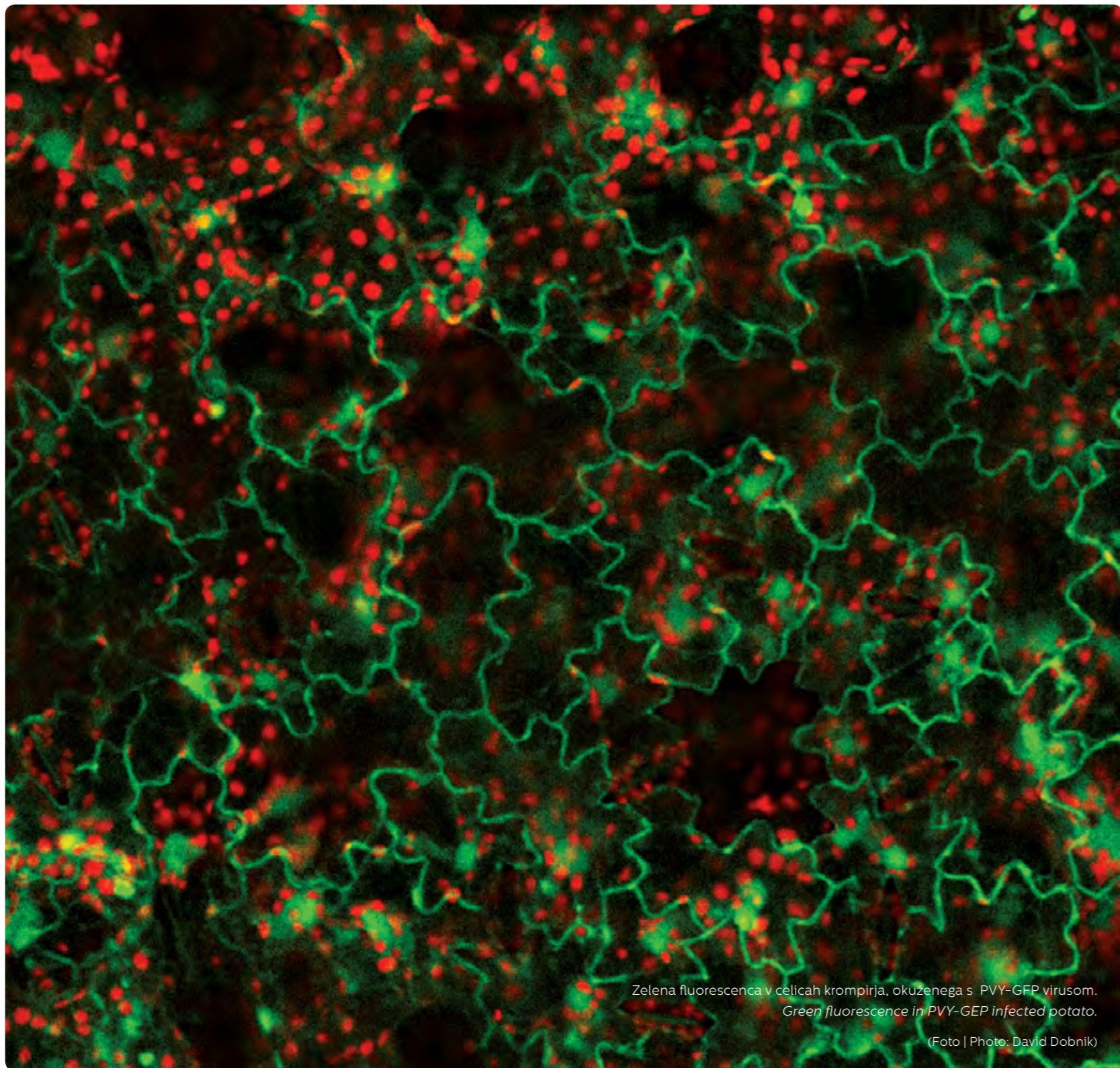
(Foto | Photo: D. Bevk)



Terenski zapiski ob pregledovanju ulova v feromonskih pasteh
Fieldnotes on checking the catch in pheromone traps

(Foto | Photo: M. Zorović)





5.0

0105 - 003

ODDELEK ZA BIOTEHNOLOGIJO IN SISTEMSKO BIOLOGIJO - FITO

Department of Biotechnology and Systems Biology - FITO

Vodja / Head:

izr. prof. dr. **Maja Ravnikar**, univ. dipl. biol., znanstvena svetnica

Naslov / Address

Nacionalni inštitut za biologijo / *National Institute of Biology*

Večna pot 111, SI-1000 Ljubljana

Tel.: + 386 (0)59 232 800 · Fax: + 386 1 257 38 47

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1. Dr. **Špela Baebler**, univ. dipl. biol., znanstvena sodelavka
2. Dr. **Anna Coll Rius**, univ. dipl. biokem. in molek. biol., znanstvena sodelavka
3. Dr. **Urška Čepin**, univ. dipl. biol., asistentka z doktoratom
4. Dr. **Tina Demšar**, univ. dipl. biol., višja strokovno – raziskovalna asistentka
5. Prof. dr. **Marina Dermastia**, univ. dipl. biol., znanstvena svetnica
6. Dr. **David Dobnik**, univ. dipl. biol., asistent z doktoratom
7. Dr. **Tanja Dreo**, univ. dipl. mikrobiol., znanstvena sodelavka
8. Doc. dr. **Cene Gostinčar**, univ. dipl. biol., znanstveni sodelavec
9. Izr. prof. dr. **Kristina Gruden**, univ. dipl. biol., vodja DE III, znanstvena svetnica
10. Dr. **Ion Gutierrez Aguirre**, univ. dipl. biokem., višji znanstveni sodelavec
11. Dr. **Polona Kogovšek**, univ. dipl. mikrobiol., asistentka z doktoratom
12. Dr. **Rok Lenarčič**, univ. dipl. mikrobiol., asistent z doktoratom *
13. Mag. **Nataša Mehle**, univ. dipl. biol., višja strokovno – raziskovalna asistentka
14. Dr. **Mojca Milavec**, univ. dipl. biol., strokovno – raziskovalna sodelavka
15. Dr. **Dany Morriset**, univ. dipl. biokem., višji znanstveni sodelavec *
16. Dr. **Marko Petek**, mag. farmacije, asistent z doktoratom
17. Dr. **Manca Pirc**, univ. dipl. biol., strokovno–raziskovalna sodelavka
18. Doc. dr. **Maruša Pompe Novak**, univ. dipl. biol., vodja IC II – znanstvena sodelavka
19. Dr. **Ana Rotter**, univ. dipl. mikrobiol., asistentka z doktoratom



20. **Katja Stare**, univ. dipl. biol., samostojna strokovna sodelavka
21. **Dejan Štebih**, univ. dipl. biol., višji strokovno – raziskovalni asistent
22. Dr. **Magda Tušek Žnidarič**, univ. dipl. biol., višja strokovno – raziskovalna sodelavka
23. Izr. prof. dr. **Jana Žel**, univ. dipl. biol., vodja DE III, znanstvena svetnica

Mladi raziskovalci / Young Scientists

1. **Špela Alič**, univ. dipl. biokem.
2. **Marko Chersicola**, univ. dipl. biol.
3. **Maja Čigoj** (MR iz gospodarstva, RRA severne Primorske d.o.o.)
4. **Jana Erjavec**, univ. dipl. mikrobiol.
5. **Anastazija Jež** (MR iz gospodarstva, RRA severne Primorske d.o.o.)
6. **Denis Kutnjak**, univ. dipl. biol.
7. **Ana Lazar**, univ. dipl. biol.
8. **Tjaša Lukan**, univ. dipl. biokem.
9. **Nina Mencin** (MR iz gospodarstva, Instrumentation Technologies d.d.)
10. **Jernej Pavšič**, univ. dipl. biol.
11. **Nina Prezelj**, univ. dipl. biol.
12. **Nejc Rački**, univ. dipl. biotehnol.
13. **Živa Ramšak**, univ. dipl. biotehnol.
14. **Matevž Rupar**, univ. dipl. biotehnol.
15. **Tjaša Stare**, univ. dipl. biokem.
16. **Ida Šmid**, univ. dipl. biol.
17. **Klemen Zupančič** (MR iz gospodarstva, Omega d.o.o.)

Strokovno tehnični sodelavci / Technicians

1. **Aleš Blatnik**, inženir laboratorija, specialist
2. dr. **Marjana Camloh**, univ. dipl. biol., strokovni svetnik z doktoratom
3. **Selma Dobnik**, mag. org., poslovna sekretarka
4. **Lidija Matičič**, projektna sodelavka
5. **Ana Mihevc**, dipl. ekon., koordinatorica področij
6. **Špela Prijatelj Novak**, projektna sodelavka
7. mag. **Neža Turnšek**, univ. dipl. biol., samostojna strokovna sodelavka

*delovno razmerje prenehalo v letu 2013/ employment ended in 2013

RAZISKOVALNA DEJAVNOST

Raziskovalci na Oddelku za biotehnologijo in sistemsko biologijo (FITO) ustvarjajo vrhunsko znanje za celostno razumevanje bioloških procesov s poudarkom na interakcijah med rastlinami in škodljivimi organizmi.

Njihova prednost so visoko usposobljeni in motivirani sodelavci, ki prihajajo tudi iz mednarodnega okolja, uporaba najmodernejše opreme in vpeljan sistem kakovosti. Poznani so po uporabi kvantitativne in kvalitativne molekulske biologije in razvijanju pristopov sistemske biologije, vključno z bioinformatiko in biostatistiko.

Dobra organiziranost in fleksibilnost jim omogočata uspešno povezavo med znanjem in njegovo uporabo. Ustvarjeno znanje o biologiji patogenih in gensko spremenjenih organizmov ter razvite metode za njihovo določanje, uspešno prenašajo na področja kmetijstva, ekologije, farmacije in medicine.

Njihovi partnerji so državne in evropske institucije, akademske institucije in industrija. Skupaj z njimi prispevajo k reševanju aktualnih problemov s področja našega delovanja in so dobro vpeti v družbeno ekonomski prostor.

Raziskovalni program P4-0165: "Biotehnologija in sistemska biologija rastlin"

Vodja programa: izr. prof. dr. Maja Ravnikar

Raziskovalni program podpira odličnost v raziskovalni in pedagoški dejavnosti ter je osnova delu za različne proračunske uporabnike in gospodarska podjetja na področju biotehnologije, kmetijstva, farmacije, okolja in varne hrane.

Glavni cilji raziskovalnega programa so:

- pridobivanje novega znanja o interakcijah med gostitelji in patogeni/škodljivci s pristopi sistemske biologije
- boljše razumevanje biologije, raznolikosti, patogenosti in epidemiologije mikroorganizmov in na osnovi novega znanja razvijati boljše metode za njihovo detekcijo in zatiranje



Ličinke koloradskega hrošča se hranijo na listih krompirja

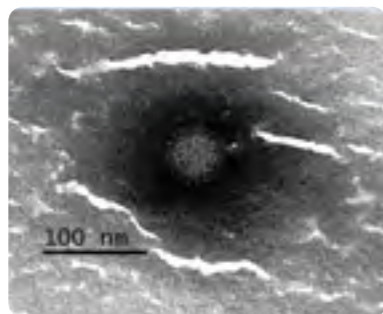
Colorado potato beetle larvae feeding on the potato leaves.

(Foto | Photo: Marko Petek)

Elektronska mikrografija ortoreovirusa.

Electron micrographs of orthoreovirus strain.

Iz Steyer in sod., 2013. J. Clin. Microbiol. | From Steyer et al. 2013. J. Clin. Microbiol.



- razvijanje novih metodoloških biotehnoloških pristopov za bolj učinkovito identifikacijo in detekcijo gensko spremenjenih organizmov, glede na njihovo pričakovano povečano uporabo v prihodnjih letih.

V letu 2013 smo nadaljevali z raziskavami interakcij med krompirjem in koloradskim hroščem in ugotovili, da proteinazni inhibitorji iz orjaškega dežnika – makrocipini, inhibirajo rast in razvoj hroščevih ličink. Pokazali smo, da β -1,3-glukanaza iz razreda III pospešuje širjenje virusa PVY^{NTN} in izboljša proizvodnjo beljakovin v rastlini.

V sodelovanju z Inštitutom za mikrobiologijo in imunologijo Medicinske fakultete v Ljubljani, Infekcijsko kliniko ter podjetjem Omega d.o.o. smo z uporabo metode sekvenciranja nove generacije (NGS) z napravo Ion Torrent Personal Genomic Machine, pri otroku s črevesnimi motnjami (akutni gastroenteritis) odkrili okužbo z novim ortoreovirusom. To je prva opisana okužba s tem ortoreovirusom pri ljudeh in hkrati prva določitev celotnega genoma novega virusa pri ljudeh z metodo NGS v Sloveniji. S primerjalno analizo celotnega genoma virusa smo ugotovili, da je najbolj soroden ortoreovirusom, ki so jih pred kratkim dokazali pri netopirjih. Pomemben korak smo naredili tudi pri predpripravi vzorca, kjer smo prvi uporabili konveksijsko monolitno kromatografijo CIM® (slovenski visokotehnološki produkt podjetja BIA Separations d.o.o.) in dokazali njene prednosti pri obogatitvi virusnega vzorca v predpripravi na sekvenciranje. Razvili smo test z uporabo metode RT-LAMP za hitro detekcijo viroida vretenatosti krompirjevih gomoljev in njegovo koncentriranje iz vodnih vzorcev z metakrilatnimi kratkimi monolitnimi kromatografskimi kolonami. Kot prvi smo pokazali uporabo digitalnega kapljičnega qPCR za kvantifikacijo virusov RNA v vodi. S površinsko plazmonsko resonanco in uporabo monoklonskih protiteles smo opazovali interakcijo virusa PVY s krompirjem. Z SNaPshot in enostopenjskim RTqPCR lahko zdaj ločujemo podskupine virusa PVY. Z metodo minisatelitov smo določili filogeografijo in populacijsko zgradbo biološko invazivne fitopatogene bakterije *Erwinia amylovora*. Izdelali smo tudi molekulske analize njegovih sevov iz Rusije, Poljske, Slovenije in Avstrije. Razvili smo izotermalno LAMP metodo za določanje viroida vretenatosti gomoljev krompirja (PSTVd) ter CIM metodo za njegovo koncentriranje iz vodnih vzorcev.

RESEARCH ACTIVITY

Members of the Department of Biotechnology and Systems Biology (FITO) are committed to generate highest quality scientific knowledge about biological processes with an emphasis on interactions between plants and harmful organisms. Their advantages lie in up-to-date equipment, an established quality control system and an international community that is highly educated and motivated. They are recognized for their applications in quantitative and qualitative molecular biology and development of tools for systems biology, including bioinformatics and statistics.

Their successful combination of knowledge and application is the result of good organization and flexibility of work. They transmit newly created knowledge about the biology of pathogenic and genetically modified organisms together with new methods for their determination to the fields of agriculture, ecology, pharmacy and medicine.

Their partners are governmental and European organizations, academic institutions and industry. They work together in solving practical problems related to their research work, and are thus an indispensable contributor to the socio-economic sphere of Slovenia.

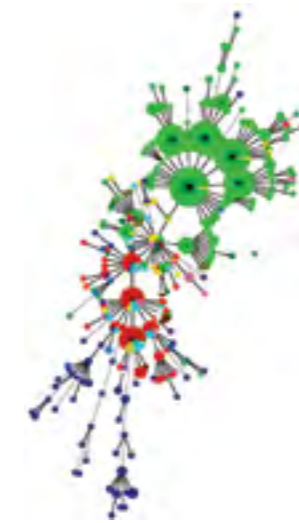
Research program P4-0165: "Biotechnology and Plant Systems Biology"

Project leader: Associate Prof. Dr. Maja Ravnikar

The research program supports excellence in research and teaching activities, and provides expertise for different governmental and commercial users in the fields of biotechnology, agriculture, pharmacy, and environment and food safety.

The main objectives of the program are:

- to gain better understanding of host-pathogen/pest interactions using systems biology approaches
- to gain better insight into the biology of microorganisms in order to understand their diversity, pathogenicity and epidemiology, and on this basis to develop better detection and eradication methods
- to develop new methodological approaches in biotechnology as the background for more efficient identification and detection of GMOs in view of their expected increase on the world market in the coming years.



Diverzitetna izolata fitopatogene bakterije *Erwinia amylovora*.

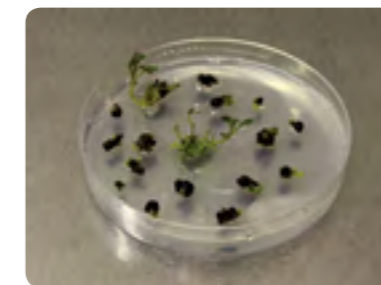
Diversity within isolates of the phytopathogen *Erwinia amylovora*.

Iz Bühlmann in sod. 2014. Env. Microbiol. | From Bühlmann et al. 2014. Env. Microbiol.

Rast poganjkov pri transformiranih izsečkih navadnega repnjakovca.

Growth of the transformed *Arabidopsis* shoots.

(Foto | Photo: FITO)



In 2013, the members of FITO continued to study interactions between potato and Colorado potato beetle. They discovered that proteinase inhibitors from the parasol mushroom – macrocypins inhibit the growth and development of the beetle larvae. They also showed that β -1,3-glucanase of the class III accelerate the spread of potato virus PVY and improve the production of proteins in plant.

In collaboration with the Institute of Microbiology and Immunology at the Medical School in Ljubljana, Department of Infectious Diseases and Febrile Illnesses and Omega d.o.o. We detected a new mammalian orthoreovirus, which causes mild enteric and respiratory infections in humans. The first whole-genome sequence of a new virus in humans in Slovenia was obtained with the Ion Torrent next-generation sequencing platform and its analyses revealed a similarity with the orthoreovirus recently found in bat. We also showed the usefulness of the convective interaction medium (CIM) monolithic chromatographic method of the BIA Separation d.o.o. to purify and concentrate the target viral nucleic acid prior to sequencing. We developed a fast real-time detection of Potato spindle tuber viroid by a RT-LAMP method and its concentration from water samples with short metaacrylic monolithic chromatographic columns. We were the first who used a digital droplet qPCR for the quantification of RNA viruses in water. We observed the interaction of PVY with potato with using the surface plasmon resonance and monoclonal antibodies. The subgroups of PVY can now be distinguished by SNaPshot and one-step RTqPCR. The phylogeography and the population structure of the biologically invasive phytopathogenic bacterium *Erwinia amylovora* were determined with a method of microsatellites. We also performed molecular analyses of its strains from Russia, Poland, Slovenia and Austria. We developed a method based on the LAMP technology for detection of PSTVd and the CIM based method to concentrate it from the water samples.

We developed several new methodological approaches for GMO detection; e.g. a tool for an optimisation of their detection with a decision support, development and validation of duplex, triplex and multiplex tests based on qPCR, LAMP method for detection and the application of digital droplet PCR for the quantitative analysis.

Razvili smo več novih metodoloških pristopov za detekcijo GSO, kot so orodje za optimizacijo detekcije, ki ima odločitveno podporo; razvoj in validacija testov dupleksov, tripleksov in multipleksov na osnovi PCR v realnem času, LAMP metoda za njihovo detekcijo in uporaba kapljičnega digitalnega PCR pri kvantitativni analizi.

GLAVNI DOSEŽKI V LETU 2013

Določanje gensko spremenjenih organizmov v hrani in krmi

Na osnovi dolgoletnega dela na detekciji GSO v hrani in krmi, za katero smo tudi nacionalni referenčni laboratorij, smo bili povabljeni, da napišemo šest poglavij za knjigo, ki je izšla pri založbi Blackwell. Svoje delo na tem področju smo javnosti predstavili tudi s televizijskim prispevkom.

Razvoj metod za določanje karantenskih povzročiteljev bolezni rastlin za uporabo v službah za zdravstveno varstvo rastlin

S povečanjem prostega pretoka blaga in povečevanjem količin tovora se je povečala tudi nevarnost širjenja povzročiteljev bolezni rastlin na nova področja. Z namenom razvoja novih, primernejših diagnostičnih metod za detekcijo povzročiteljev bolezni, so se nekateri najboljši evropski raziskovalni laboratoriji in visokotehnološka podjetja združili v evropskem projektu Q-DETECT. Cilj projekta je oblikovati metode, ki bi se jih lahko uporabilo na terenu in bi omogočale občutljivo zaznavanje prisotnosti povzročiteljev bolezni rastlin. Ker pa so povzročitelji bolezni zelo različni – od virusov, bakterij, gliv in do žuželk, smo razvili metode, ki temeljijo na zaznavanju z vonjem, sluhom in vidom. Za natančnejšo določitev organizma pa smo razvili še molekularne metode, ki se jih lahko izvede in



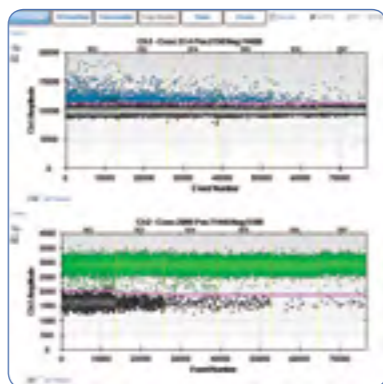
Pelargonija, okužena s TSWV.
Pelargonium infected with TSWV.

(Foto | Photo: Nataša Mehle)

Redčitvena vrsta vzorca transgene koroze (pomnoževanje s kapljično digitalno PCR).

Dilution series of transgenic maize DNA sample (amplification with droplet digital PCR).

(Foto | Photo: David Dobnik)



odčita na terenu. V organizaciji Evropske Organizacije za varstvo rastlin (EPPO) in NIB je v Ljubljani od 19.2. do 21. 2. 2013 potekala predstavitev rezultatov projekta Q-DETECT v obliki delavnice, ki se je je udeležilo 70 udeležencev, raziskovalcev, diagnostikov in inšpektorjev iz 20 evropskih držav, Kitajske in Peruja. Mednarodna projektna skupina raziskovalcev, med katerimi so bili tudi raziskovalci s FITO, je prikazala uporabo povsem novih metod za določanje povzročiteljev bolezni na terenu.

Sodelovanje na 5. dnevih zaščite in reševanja v okviru projektne sodelovanja z MORS

Od 2. do 5. 10. 2013 so v Velenju potekali 5. dnevi zaščite in reševanja, na katerih se je predstavil tudi FITO. Predstavili smo metode in tehnologije, ki jih uporabljamo za detekcijo patogenih organizmov v vodah, kot so: CIM kromatografska metoda za koncentriranje in detekcijo virusov iz vod, ki jo je možno izvajati na terenu; in novo tehnologijo detekcije patogenov s pomočjo izotermalnega pomnoževanja nukleinskih kislin – LAMP.

Nacionalni etalon za področje množina snovi v hrani rastlinskega izvora

Oddelek FITO je 8. 5. 2013 gostil delavno srečanje mednarodnega projekta z naslovom »Metrologija za nadzor infektivnih bolezni, antimikrobne rezistence in škodljivih mikroorganizmov« (INFECTMET), ki se je začel jeseni 2012. Udeležili so se ga predstavniki vseh sodelujočih inštitutov in klinik iz Velike Britanije (LGC in UCL), Nemčije (BAM in PTB), Turčije (TUBITAK), Belgije (IRMM/JRC) ter Slovenije (NIB in Klinika Golnik). V projektu smo eden od vodilnih partnerjev, zaradi svojih bogatih izkušenj na področju določanja in kvantifikacije nukleinskih kislin, zato je najobsežnejši delovni paket zaupan vodenju dr. Mojce Milavec. Udeleženci so predstavili napredek svojih raziskav, razpravljali o aktualnih problematikah, na koncu pa začrtali nadaljnje skupno delo za uresničitev vizije projekta INFECTMET. V projektu lahko sodelujemo,

IMPORTANT ACHIEVEMENTS IN 2013

Detection of genetically modified organisms

Based on our long lasting work on GMO detection in food and feed, for which we are also the national reference laboratory, we were invited to write six chapters in book, published by Blackwell. We also show our work in a TV show.

Development of detection methods for quarantine plant pests for use by plant health services

By increasing the free movement of goods and by increasing cargo volumes, the risk of the spread of plant pathogens to new areas also increased. In order to develop new, more appropriate diagnostic methods, some of the best European research laboratories and hightech companies joined their strength in the EU project Q-DETECT. The aim of the project is to develop methods that can be used in the field and would allow sensitive detection of plant pathogens. However, since pathogens are very different from viruses, bacteria, fungi and insects, we have developed methods, based on the perception of smell, hearing and sight. For a more accurate determination of the organism, we have developed molecular methods that can be performed and results read in the field. The results of the project Q-DETECT were presented at the workshop with more than 70 participants, researchers, diagnosticians and inspectors coming from 20 European countries, China and Peru. It was organized by the European Plant Protection Organization (EPPO) and NIB and took place in Ljubljana from February 19 to 21, 2013. During workshop, the international project group, which also included researchers from FITO, presented the use of entirely new methods for detection of pathogens in the field.



Srečanje mednarodnega projekta INFECT-MET
International meeting for INFECT-MET project

(Foto | Photo: FITO)

Participation at 5th Days of Civil Protection and Rescue in the frame of our project cooperation with the Ministry of defense

We participated at 5th Days of Civil Protection and Rescue, which took place in Velenje from October 2 to 10, 2013. We presented methods and technologies for detection of pathogens in water, i.e. CIM chromatography and LAMP.

National etalon of amount of substance from food and plant origin

Second international Metrology for monitoring infectious diseases, antimicrobial resistance, and harmful microorganisms (INFECTMET) interim meeting took part on May 8, 2013 on the NIB. Institutes and hospitals from UK (LGC and UCL), Germany (BAM and PTB), Turkey (TUBITAK), European Union (JRC) and Slovenia (NIB and Golnik hospital) participated at the meeting. Department of Biotechnology and Systems Biology was, under the leadership of PhD Mojca Milavec, given the leading role in the biggest work package because of its valuable experiences in quantification and detection of nucleic acids. Partners presented the progress of their research and discussed the actual topics. At the end, new approaches for accomplishing the vision of INFECTMET project were set. We are able to participate in the project because the Metrology Institute of the Republic of Slovenia named us as a holder of the National etalon of amount of substance from food and plant origin.

Poskus širjenja virusov z vodo.
Experiment on the spreading of viruses with water.

(Foto | Photo: Nataša Mehle)



ker smo s strani Urada za meroslovje imenovani za nosilca nacionalnega etalona za področje Množina snovi v hrani rastlinskega izvora.

SODELOVANJE Z RAZLIČNIMI UPORABNIKI

Pomen raziskav FITO za državo in politike

Kot akreditirani nacionalni referenčni laboratorij za detekcijo GSO je oddelek FITO po odločbah Ministrstva za kmetijstvo in okolje v letu 2012 opravljali monitoring in analize GSO v hrani, krmu in semenih za uradno kontrolo pristojnih inšpekcijskih služb in ministrstev ter za trg.

Kot uradno imenovani »The National Laboratories Responsible for the Enforcement of the EU Regulations for GMO« s strani EC JRC IHCP je oddelek FITO opravil validacije metod in opravljal laboratorijske analize v okviru spremljanja prisotnosti GSO, ki so dovoljeni za pridelavo, v kmetijskih rastlinah, krmu, hrani in pridelkih na kmetijskih gospodarstvih.

Kot pooblaščen laboratorij za opravljanje nalog na področju varstva rastlin je oddelek FITO za Upravo Republike Slovenije za varno hrano, veterinarstvo in varstvo rastlin pri Ministrstvu za kmetijstvo in okolje opravljal ekspertno svetovanje, še posebej za bolezen zlato trsno rumenico, in diagnostične analize za več kot 40 mikroorganizmov.

Opravljali so dejavnosti in izpolnjevali obveznosti nosilca nacionalnega etalona enote za množino snovi/hrana rastlinskega izvora.

Po 15-letni pogodbi z Upravo za zaščito in reševanje pri Ministrstvu za obrambo RS oddelek FITO sodeluje s svetovanjem pri materialnih in kadrovskih pripravah na ukrepanje v primeru napada z biološkimi orožji ali sredstvi za množično uničevanje.

Mareljice, okužene s fitoplazemsko povzročiteljico bolezni ESFY.

Apricots infected with the phytoplasma causal agent of ESFY.

(Foto | Photo: Nataša Mehle)



APLIKACIJE NAŠIH RAZISKAV

V soorganizaciji z odcepljenim podjetjem BioSistemika d.o.o. smo tudi v letu 2013 izvajali zelo obiskane qPCR delavnice; od 3. do 6. 12. 2013 tudi v sodelovanju s projektom BICOPOLL in European Research Area Network Core Organic 2. Delavnice združujejo odlično znanje s praktičnimi izkušnjami pri dizajniranju, validaciji in uporabi PCR v realnem času v uradni diagnostiki in raziskavah v rastlinski patologiji. Del delavnic so tudi najnovejša spoznanja s področja, kot tudi težave, katerih reševanje je prilagojeno potrebam udeležencev. Zadnje delavnice se je udeležilo veliko raziskovalcev in diagnostikov iz Avstrije, VB, Francije, Poljske, Finske, Latvije, Črne gore in Slovenije.

Kot člani Centra odličnosti za biosenzoriko, instrumentacijo in procesno kontrolo (COBIK) so člani oddelka FITO sodelovali v dveh laboratorijih, kjer so razvijali biosenzorje ter različne aplikacije virusov za cepiva in eliminacijo bakterij.

V Kompetenčnem centru za biološki razvoj in inovacije (BRIN) so razvijali orodja sistemske biologije za povečanje zdravih učinkovin.

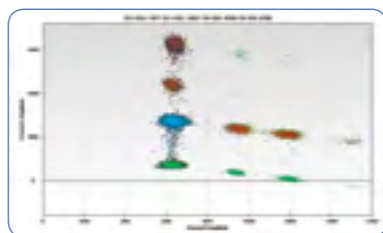
S podjetjem BIA Separations d.o.o. so razvijali metode za koncentriranje virusov na monolitnih kromatografskih nosilcih.

S projektnimi transkriptomskimi raziskavami z Lek Sandoz d.d. so izboljševali industrijske mikroorganizme.

Prikaz različnih pozitivnih in negativnih kapljic po uporabi kapljicne digitalne PCR

Presentation of different positive and negative droplets when using droplet digital PCR.

(Foto | Photo: Dejan Štebih)



COLLABORATION WITH VARIOUS USERS

The importance of FITO research for the state officials and politics

FITO carried out monitoring and analysis of GMOs in food, feed and seeds for official control by inspection services and ministries, and the market, as an accredited national reference laboratory for GMO detection. FITO also performed validation of methods and laboratory analyses for monitoring the presence of GMOs that are authorized for cultivation in agricultural crops, feed, food and crops on farms, as the officially appointed "National Laboratory Responsible for the Enforcement of EU Regulations for the GMO" by EC JRC IHCP.

As an accredited laboratory for diagnostics in the field of plant protection, FITO performed diagnostic tests for more than 40 microorganisms for the Phytosanitary Administration and Phytosanitary Inspection. It also offered them expert advice on Flavescence dorée grapevine yellows disease.

As a National holder for the amount of substance: food of plant origin FITO met the obligations that followed from this appointment.

Delo v rastlinjaku. Working in the glasshouse.

(Foto | Photo: FITO)



Delo v laboratoriju. Working in the laboratory.

(Foto | Photo: FITO)

In a 15-year-long contract with the Administration for Civil Protection and Disaster Relief of the Ministry of Defense FITO took part in advising and preparing for actions in the event of an attack with biological weapons or the means of mass destruction.

APPLICATIONS OF FITO RESEARCH AND LINKS WITH COMMERCIAL ENTITIES

The international workshop on high technology research and the molecular diagnostics of pathogens using real-time PCR was held in Ljubljana from December 3 to 6, 2013. This international workshop was coorganized by FITO and BioSistemika d.o.o., in collaboration with the European project Bicopoll (<http://www.coreorganic2.org/>) and was one in a series of similar workshops organized by the members of FITO and Biosistemika d.o.o. qPCR Workshops integrate excellent technical knowledge with vast practical experience in design, validation and use of realtime PCR in official diagnostics and research in plant pathology. Up to date news from the field are part of the course as well as a special section of troubleshooting tailored to participants. Also this time researchers and diagnosticians from many European countries attended the workshop: Austria, UK, France, Poland, Finland, Lithuania, Latvia, Montenegro and Slovenia.

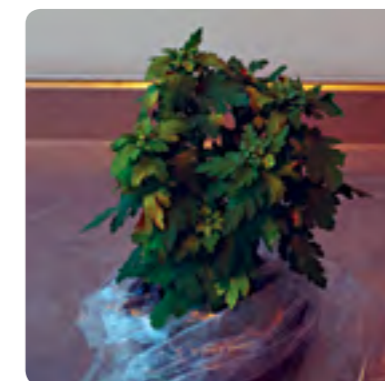
As a member of the Centre of Excellence for Biosensors, Instrumentation and Process Control (COBIK) FITO participated in two projects in which their members developed biosensors and various applications of virus vaccine and bacteria elimination.

In the competence center for biological research and innovation (BRIN) the members of FITO developed systems biology tools to increase the active ingredients in bacteria.

Together with BIA Separations d.o.o. the members of FITO developed methods for concentrating viruses on monolithic chromatographic supports.

Krizantema, okužena s TSWV. Chrysanthemum infected with TSWV.

(Foto | Photo: Nataša Mehle)



Za različna podjetja in ustanove so opravljali pogodbeno raziskave na področju karantenskih bakterij in virusov ter določanja gensko spremenjenih rastlin.

RAZISKOVALNA INFRASTRUKTURA

Oddelek FITO je najsodobneje opremljen in skupaj z visokokvalificiranimi operaterji zagotavlja odlične rezultate. Poleg dobro opremljenega biokemijskega in molekulskega laboratorija vso najsodobnejšo veliko raziskovalno opremo vzdržuje skladno s standardom ISO 17025 v okviru instrumentalnega Centra PLANTA. V letu 2013 je bil oddelek FITO partner v Centru za funkcijsko genomiko in mikročipe in v Centru za površinsko plazmno resonanco.

MEDNARODNO SODELOVANJE

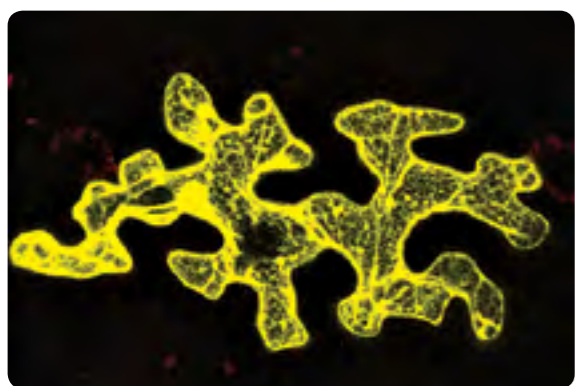
Oddelek FITO je v letu 2013 sodeloval s številnimi tujimi partnerji na različnih ravneh. Na formalni ravni je imel z njimi podpisanih 27 pogodb, ki so vključevale sodelovanje v več partnerskih projektih ali bilateralna sodelovanja. V letu 2013 so člani oddelka kot partnerji sodelovali v šestih evropskih projektih okvirnih programov. V evropskem meroslovnem projektu INFECT-MET so vodili delovni paket. Sodelovali



Gensko spremenjen krompir v tkivni kulturi.

Genetically modified potato in a tissue culture.

(Foto | Photo: FITO)



Krompirjeva celica kot jo vidimo s konfokalnim mikroskopom.

Potato cell as seen with the confocal microscope.

(Foto | Photo: David Dobnik)

so v petih EraNet EUPHRESKO projektih, od katerih projekt GRAFDEPI 2, ki se je začel novembra 2013, tudi vodijo. Sodelovali so v sedmih projektih COST in dveh bilateralnih projektih. Intenzivno sodelujemo z Avstrijsko agencijo za varno hrano (AGES), evropskim Inštitutom za referenčne materiale in meritve (IRMM), ter Norveškim veterinarskim inštitutom.

IZOBRAŽEVALNE DEJAVNOSTI IN PROMOCIJA ZNANOSTI

Člani oddelka FITO sodelujejo v programih prve in druge bolonjske stopnje na Univerzi v Ljubljani in Univerzi v Novi Gorici. Prav tako kot predavatelji in mentorji sodelujejo v obeh doktorskih študijih Univerze v Ljubljani - Biomedicini in Bioznanostih. Še posebej dejavno se vključujejo v potekajoče programe in v pripravo novih na Mednarodni podiplomski šoli Jožef Stefan.

Intenzivno se vključujejo v promocijo in popularizacijo znanosti s sodelovanjem na festivalih znanja, pisanjem člankov za dnevni tisk in poljudno-znanstvene revije, sodelovanjem z mladinskimi revijami, intervjuji za različne medije, pisanjem učbenikov za primarno, sekundarno in terciarno izobraževanje.

NAJPOMEMBNEJŠE OBJAVE V 2013

Inhibicija rasti ličinke koloradskega hrošča z makrocipini proteaznimi inhibitorji iz gobe orjaški dežnik

V reviji, uvrščeni v kategorijo A¹, smo objavili, kako cisteinski proteazni inhibitorji iz orjaškega dežnika

Using project-oriented transcriptome research the members of FITO studied the possibilities of improvement of industrial microorganisms in collaboration with Lek d.d., Sandoz.

For various companies and institutions FITO offered a service of testing for quarantine bacteria and viruses and determination of genetically modified plants

RESEARCH INFRASTRUCTURE

FITO has the most up-to-date research equipment. Besides a well equipped biochemical laboratory and basic molecular laboratory, all large and most recently acquired research equipment was maintained in the Instrumental center Planta. The center operates within a quality system according to ISO 17025, which together with highly qualified operators guarantees excellence in analytical results. In 2013 FITO was a partner in the Center for Functional Genomics and Bio-Chips and in the infrastructural centre for Surface Plasmon Resonance.

INTERNATIONAL COLLABORATION

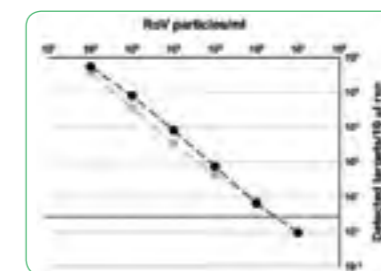
In 2013 FITO had an established international cooperation at different levels. It had 27 formally signed contracts which included cooperation in multilateral and bilateral projects. Its members were involved in six European FP projects. They led one work package in an EU metrology project INFECT-MET. They additionally participated in five EraNet EUPHRESKO projects, in one of them GRAFDEPI 2, which has started in November 2013, they are a leading partner. They additionally participated in seven COST and two bilateral projects. FITO has an intensive cooperation with the Austrian Agency for Health and Food Safety (AGES), the European Institute for Reference Materials and Measurements (IRMM) and the Norwegian Veterinary Institute.



Iz Šmid in sod. 2013. J. Agric. Food Chem.

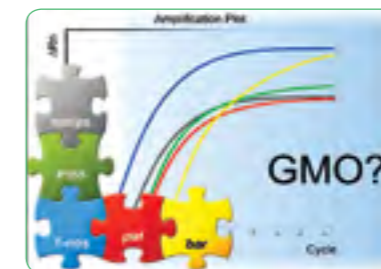
From Šmid et al. 2013. J. Agric. Food Chem.

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Iz Rački s sod. 2014. *Anal. Bioanal. Chem.*

From Rački et al. 2014. *Anal. Bioanal. Chem.*



EDUCATIONAL ACTIVITIES AND PROMOTION OF SCIENCE

The members of FITO were actively involved in various educational Bologna programs at first and second level at the University of Ljubljana and at the University of Nova Gorica. As lecturers and mentors they also participated in doctoral studies of Biomedicine and Biosciences at the University of Ljubljana. In 2013 they actively participate in current program and were involved in preparation of a new one at the International Graduate School IJS.

They were intensively involved in programs for popularization of science as participants at science festivals, as writers of popular science papers for newspapers, popular science or youth journals, and authors of text books for secondary and tertiary educational levels and as interviewees in educational and professional broadcasts.

Iz Huber s sod.. 2013. J. Agric. Food Chem.

From Huber et al. 2013. J. Agric. Food Chem.

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negativno učinkujejo na koloradskega hrošča. Kadar jih izrazimo v krompirju ali dodajamo rekombinantne analoge v hrano, zmanjšajo rast hroščevih ličink. Tarča makrocipinov so prebavne cisteinske proteaze intestatini, potencialno pa tudi drugi prebavni encimi in proteini, povezani z razvojem in primarnim metabolizmom. Makrocipini ne vplivajo na prilagoditvene prebavne encime.

ŠMID, Ida, GRUDEN, Kristina, BUH GAŠPARIČ, Meti, KORUZA, Katarina, PETEK, Marko, POHLEVEN, Jure, BRZIN, Jože, KOS, Janko, ŽEL, Jana, SABOTIČ, Jerica. Inhibition of the growth of Colorado potato beetle larvae by macrocypins, protease inhibitors from the parasol mushroom. *Journal of agricultural and food chemistry*, ISSN 0021-8561, 2013, vol. 61, issue 51, str. 12499-12509, doi: 10.1021/jf403615f. [COBISS.SI-ID 27291431]

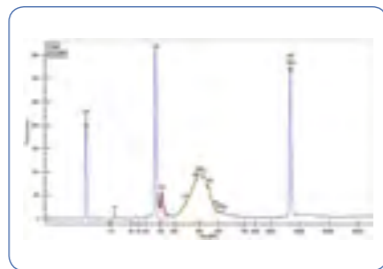
Enostopenski RT kapljični digitalni PCR: prelomnica v kvantifikaciji virusov RNA v vodi

Objavili smo prvo poročilo o absolutni kvantifikaciji virusov RNA (rotavirusov) iz različnih vzorcev površinskih voda z uporabo enostopenjskega RT kapljičnega digitalnega PCR. Nova metoda je primerna za določanje zelo nizkih koncentracij virusov, kakršne so po navadi v vodnih vzorcih.

RAČKI, Nejc, MORISSET, Dany, GUTIERREZ-AGUIRRE, Ion, RAVNIKAR, Maja. One-step RT-droplet digital PCR : a breakthrough in the quantification of waterborne RNA viruses. *Analytical and bioanalytical chemistry*, ISSN 1618-2642, 2014, vol. 406, issue 3, str. 661-667. [COBISS.SI-ID 2990415]

Razvoj in validacija dupleksnih, tripleksnih in multipleksnih presejalnih testov s PCR v relanem času za detekcijo GSO v hrani in krmi

V reviji, uvrščeni v kategorijo A", smo objavili več novih testov za detekcijo GSO v hrani in krmi.

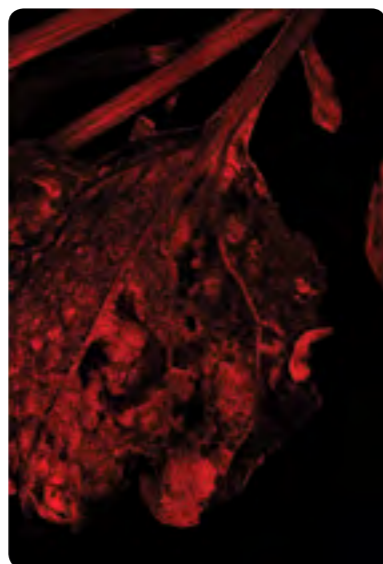


Kapilarna elektroforeza vzorca knjižnice malih RNA za sekvenciranje.
Capillary electrophoresis of small RNA library sample for sequencing.

(Foto | Photo: : Denis Kutnjak)

Avtofluorescenca lista *Nicotiana benthamiana*.
Autofluorescence of Nicotiana benthamiana leaf.

(Foto | Photo: David Dobnik)



Buba koloradskega hrošča.
Pupa of Colorado potato beetle.

(Foto | Photo: Maro Petek)

- HUBER, Ingrid, BLOCK, Annette, SEBAH, Daniela, DEBODE, Frédéric, MORISSET, Dany, GROHMANN, Lutz, BERBEN, Gilbert, ŠTEBIH, Dejan, MILAVEC, Mojca, ŽEL, Jana, BUSCH, Ulrich. Development and validation of duplex, triplex, and pentaplex real-time PCR screening assays for the detection of genetically modified organisms in food and feed. *Journal of agricultural and food chemistry*, ISSN 0021-8561, 2013, vol. 61, no. 43, str. 10293-10301. [COBISS.SI-ID 2989647]

Delo v laboratoriju.
Working in the laboratory.

(Foto | Photo: FITO)



MAIN PUBLICATIONS IN 2013

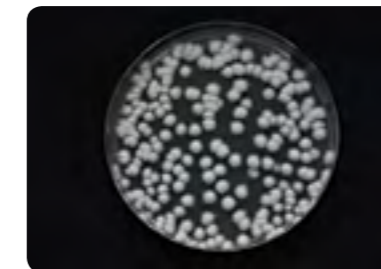
Inhibition of the growth of Colorado potato beetle larvae by macrocypins, protease inhibitors from the parasol mushroom

In a journal, which is listed in the category A", we published a paper on macrocypins, cysteine protease inhibitors from the parasol mushroom *Macrolepiota procera*. Macrocypins were evaluated for their adverse effects and their mode of action on the major potato pest Colorado potato beetle. They were shown to reduce larval growth when expressed in potato or when their recombinant analogues were added to the diet. Macrocypins target a specific set of digestive cysteine proteases, intestatins. Additionally, protein-protein interaction analysis revealed potential targets among other digestive enzymes and proteins related to development and primary metabolism. No effect of dietary macrocypins on gene expression of known adaptation-related digestive enzymes was observed in CPB guts.

ŠMID, Ida, GRUDEN, Kristina, BUH GAŠPARIČ, Meti, KORUZA, Katarina, PETEK, Marko, POHLEVEN, Jure, BRZIN, Jože, KOS, Janko, ŽEL, Jana, SABOTIČ, Jerica. Inhibition of the growth of Colorado potato beetle larvae by macrocypins, protease inhibitors from the parasol mushroom. *Journal of agricultural and food chemistry*, ISSN 0021-8561, 2013, vol. 61, issue 51, str. 12499-12509, doi: 10.1021/jf403615f. [COBISS.SI-ID 27291431]

One-step RTdroplet digital PCR: a breakthrough in the quantification of waterborne RNA viruses

A first report of one-step reverse transcription droplet digital PCR based absolute quantification of a RNA virus (rotavirus) in different types of surface water samples. This new tool is fully amenable for the quanti-

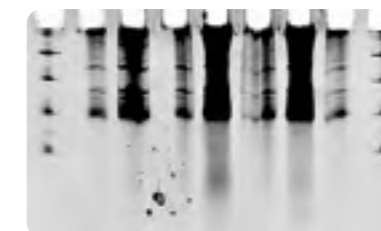


Gliocladium catenulatum
Gliocladium catenulatum

(Foto | Photo: Manca Pirc)

Totalna RNA na gelu Urea-PAGE.
Total RNA loaded on Urea-PAGE gel.

(Foto | Photo: David Dobnik)



cation of viruses in the particularly low concentrations usually found in water samples.

RAČKI, Nejc, MORISSET, Dany, GUTIERREZ-AGUIRRE, Ion, RAVNIKAR, Maja. One-step RT-droplet digital PCR : a breakthrough in the quantification of waterborne RNA viruses. *Analytical and bioanalytical chemistry*, ISSN 1618-2642, 2014, vol. 406, issue 3, str. 661-667. [COBISS.SI-ID 2990415]

Development and validation of duplex, triplex, and pentaplex realtime PCR screening assays for the detection of genetically modified organisms in food and feed

We published several new assays for detection of GMO in food and feed in a journal, which is listed in the category A".

- HUBER, Ingrid, BLOCK, Annette, SEBAH, Daniela, DEBODE, Frédéric, MORISSET, Dany, GROHMANN, Lutz, BERBEN, Gilbert, ŠTEBIH, Dejan, MILAVEC, Mojca, ŽEL, Jana, BUSCH, Ulrich. Development and validation of duplex, triplex, and pentaplex real-time PCR screening assays for the detection of genetically modified organisms in food and feed. *Journal of agricultural and food chemistry*, ISSN 0021-8561, 2013, vol. 61, no. 43, str. 10293-10301. [COBISS.SI-ID 2989647]

Raziskovalni program, ki ga financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Program Financed by Slovenian Research Agency*

- Biotehnologija in sistemska biologija rastlin (P4-0165), vodja programa / the research programme leader izr. prof. dr. Maja Ravnikar.

Raziskovalni projekti, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Projects Financed by Slovenian Research Agency*

1. Biološka raznovrstnost virusa PVY in njen vpliv na obrambni odgovor rastlin krompirja / Biological variability of potato virus Y and its influence on potato defense response (L1-2278), nosilka projekta / *principal investigator* Maja Ravnikar.
2. Funkcionalna analiza proteinov za odpornost proti suši ali žuželkam / Functional analysis of proteins responsible for resistance to drought and insects (J4-2022), nosilka projekta / *principal investigator* Jana Žel.
3. Razvoj enostavne in hitre metode za določanje rastlinskih povzročiteljev bolezni na terenu (akronim: ARRS-Q-finder) / Developing simple, rapid and on-site methods for plant pathogens detection (L4-3642), nosilec projekta / *principal investigator* Dany Morisset.
4. Funkcijska genomika interakcije med krompirjem in PVY / Functional genomics of potato – PVY interaction (J1-4268), nosilka projekta / *principal investigator* Jana Žel.
5. Kompromisi obrambe in razvoja v večtrofični interakciji med krompirjem in dvema glavnima škodljivcema / Growth and defense trade-offs in multitrophic interaction between potato and its two major pests (J4-4165), nosilka projekta / *principal investigator* Kristina Gruden.
6. Geni, ki pogojujejo aromatio vina / Genes behind aroma compounds in wine (J4-4300), (NIB – Špela Baebler), pridruženi / joint partners.
7. Inovativni proizvodni sistemi za cepiva in regenerativno medicino / Innovative production systems for vaccines and regenerative medicine (L4-4277), (NIB – Dany Morisset), pridruženi / joint partners.

Zilne nekroze na listu *Solanum venturii*
po okužbi s PVYn-GFP.
*Vein necroses on *Solanum venturii*
leaf (after PVYn-GFP infection).*

(Foto | Photo: David Dobnik)



8. Razvoj novih tehnologij za odstrajevanje patogenih mikrobov in toksinov iz različnih vodnih virov / Development of new technologies for the removal of pathogenic agents and toxins from different water sources (L2-4314), (NIB – Ion Gutierrez), pridruženi / joint partners.
9. Vloga okolja in gostitelja pri pojavu in razvoju okužbe s *Clostridium difficile* / The role of environmental and host factors in development of *Clostridium difficile* infection (J3-4298), (NIB – Tanja Dreo), pridruženi / joint partners.
10. Dvojna narava matičnih celic v raku in njihova uporaba v zdravljenju / Dual nature of stem cells in cancer and their application in therapy (J1-4247), nosilka projekta / *principal investigator* Tamara Lah Turnšek, za FITO Kristina Gruden
11. Študij epidemiologije in raznolikosti mikrobnih povzročiteljev bolezni rastlin / Epidemiology and Biodiversity Studies of Plant Pathogens (L4-5525), nosilka projekta / *Principal investigator* Maja Ravnikar
12. Identifikacija genov iz halotolerantnih gliv za izboljšanje tolerance na sol in sušo pri rastlinah / Identification of genes from halotolerant fungi for improving salt and draught tolerance of plants (Z4-5531), nosilec projekta / *Principal investigator* Cene Gostinčar
13. Asimetrija celičnih procesov v odpadanju listov in cvetov paradižnika / Asymmetry of cellular processes in abscission of leaves and flowers of tomato (J1-5444), (NIB – Marina Dermastia), pridruženi / joint partners
14. Razvoj in aplikacije novih metod semantičnega rudarjenja podatkov v znanostih o življenju / Development and applications of new semantic data mining methods in life sciences (J2-5478), (NIB – Kristina Gruden), pridruženi / joint partners
15. Razvoj novih tehnologij za detekcijo, kvantifikacijo in vrednotenje bakteriofagov / Development of novel technologies ofr detection, quantification and characterisation of bacteriophages (L7-5534), (NIB – Tanja Dreo), pridruženi / joint partners

Mednarodni raziskovalni projekti *International Research Projects*

1. EU 7 OP., projekt 245047, Q-DETECT, Razvoj metod za določanje karantenskih škodljivih organizmov za uporabo v nacionalnih programih in inšpekcijskih službah / Developing quarantine pest detection methods for use by national plant protection organizations (NPPO) and inspection services, koordinator / coordinator Food and environment research organisation (FERA), Neil Boonham, NIB Maja Ravnikar
2. EU7 OP, projekt 262032, VITISENS, Stroškovno učinkovito ročna naprava za hitro odkrivanje *Flavescence dorée* fitoplazem v vinski trti / Cost-Effective Hand-Held Device For Rapid In-Field Detection of *Flavescence doree* Phytoplasma in Grapevines, koordinator / coordinator The Secretary of State for Environment, Food and Rural Affairs acting through Food and Environment Research Agency, Mr. Adrian Belton / Mr. Mike Wray. NIB Maja Ravnikar, Marina Dermastia
3. EU 7 OP, projekt 265264, CytoThreat, Učinki citostatikov v okolju in identifikacija biomarkerjev za izboljšanje ocene tveganja v okolju / Fate and effects of cytostatic pharmaceuticals in the environment and the identification of biomarkers for and improved risk assessment on environmental exposure-CytoThreat, koordinator / coordinator NIB, prof. dr. Metka Filipič, za FITO Špela Baebler.
4. EU 7 OP, projekt 312455, ISBE, Infrastructure for Systems Biology – Europe, koordinator / coordinator Imperial College of Science, Technology and Medicine, dr. James Lloyd, NIB Kristina Gruden
5. EU 7 OP., projekt 613918, DECATHLON, Razvoj metod za določanje karantenskih škodljivih organizmov za uporabo v nacionalnih programih in inšpekcijskih službah / Developing quarantine pest detection methods for use by national plant protection organizations (NPPO) and inspection services, coordinator Stichting Dienst Landbouwkundig Onderzoek, Wageningen, Robert Gorcom, NIB Jana Žel



Paradižnik, okužen s TSWV.
Tomato infected with TSWV.

(Foto | Photo: Nataša Mehle)

6. EMRP projekt INFECT-MET, Metrologija za sledenje nalezljivih bolezni, rezistence za antibiotike in škodljivih mikroorganizmov / Metrology for monitoring infectious diseases, antimicrobial resistance, and harmful micro-organisms, koordinator / coordinator LGC Limited, Velika Britanija, dr. Carol Foy, Mojca Milavec
7. EMRP projekt, BIOSITRACE, Sledljivost biološko relevantnih molekul / Traceability for biologically relevant molecules, koordinator LGC, Helen Parkes, NIB Tanja Dreo
8. ERA NET, Bicopoll, Tarčno precizna biokontrola in pospeševanje v ekoloških poljedelskih sistemih, Targeted precision biocontrol and pollination enhancement in organic cropping system, NIB, ENTOMO, Andrej Čokl, Tanja Dreo FITO.
9. ERA NET Euphresco, GRAFDEPI 2, Zlata trsna rumenica / flavescence doree – FD, Marina Dermastia
10. GMO VAL, Validacija določanja metod za GSO / Validaton of detection methods for GMOs, Food Standard Agency, UK (FSA)/ NICE, Nick Streets, NIB Jana Žel
11. IRMM,IRMM Stability studies / Stability studies. Jana Žel
12. GSO CRL ISPRA, Validacije / Validations studies., Jana Žel
13. GMO Norveška, GSO analize za NVI / GMO analytical services for NVI, Norwegian Veterinary Institute, Arne Holst Jensen, NIB Jana Žel
14. Farma BIH, Tanja Dreo

Bilateralni raziskovalni projekti *Bilateral Research Projects*

1. BI-IN/10-12-010: Nova ekonomična metoda za določanje GSO: Prilagoditev indijskim in slovenskim potrebam / Novel cost-effective methods for GMO detection: application to the Indian and Slovenian context, nosilka projekta / *principal investigator* Jana Žel.
2. BI- SLO-FRA-PROTEUS, Analiza strukturne variabilnosti virusa PVY in njegove interakcije z gostiteljsko rastlino z različnimi pristopi / Multi approach analysis of the PVY structural variability and its interactions with host plants, nosilec projekta / *principal investigator* Ion Gutierrez Aguirre

COST raziskovalni projekti COST Research Projects

1. COST FA 0807, Integrirano upravljanje fitoplazemskih epidemij pri različnih kmetijsko pomembnih rastlinah / Integrated Management of Phytoplasma Epidemics in Different Crop Systems, Marina Dermastia.
2. COST FA 0804, Molekularno kmetijstvo: rastline kot proizvodna platforma za proteine visoke vrednosti, Molecular farming: plants as a production platform for high value proteins, Jana Žel.
3. COST FA 0806, Kontrola rastlinskih virusov z uporabo RNA cepiv: novi ne-transgeni pristopi / Plant virus control employing RNA-based vaccines: A novel non-transgenic strategy, Špela Baebler.
4. COST FA1103, Endofiti v Biotehnologiji in kmetijstvu / Endophytes in Biotechnology and Agriculture, Polona Kogovšek
5. COST FA 1106, Integriran sistemski pristop za določanje razvojnih mehanizmov, ki nadzorujejo mesnatega sadja kakovost paradižnika in vinske trte / n integrated systems approach to determine the developmental mechanisms controlling fleshy fruit quality in tomato and grapevine, Kristina Gruden
6. COST BM 1006, Next Generation Sequencing Data Analysis Network, Kristina Gruden
7. COST TA 1201, Gender STE- Gender, Science, Technology and Environment, Ana Rotter

Ciljni raziskovalni projekti Targer Research Projects

1. CRP "Zagotovimo.si hrano za jutri": Trsne rumenice: metode zgodnjega odkrivanja in obvladovanja / Grapevine yellows: methods for their early detection and control (V4-1103), nosilka projekta/*principal investigator* Marina Dermastia.
2. CRP "Zagotovimo.si hrano za jutri": Reševanje problematike ustaljenih karantenskih boleznih sadnih vrst *Prunus* spp. za ohranitev pridelave/ Solving problems of quarantine diseases for protection of stone fruit (*Prunus* spp.) production) (V4-1102), (NIB – Marina Dermastia), pridruženi / joint partners.

Žilne nekroze na listu *Solanum venturii* po okužbi s PVYn-GFP.
*Vein necroses on the *Solanum venturii* leaf after PVYn-GFP infection.*

(Foto | Photo: David Dobnik)



Razvojni projekti / Development Projects

1. MO MKO FURS, Strokovne naloge s področja zdravstvenega varstva rastlin / Expert projects in plant health protection field, Maja Ravnikar.
2. GSO Živila Rastlinskega izvora, MKO izvajanje dejavnosti analiz uradnih vzorcev živil rastlinskega izvora, krme in NRL / implementation of the analysis of official samples of foods of plant origin, feed and NRL, Jana Žel
3. GSO Živila živalskega izvora, MKO izvajanje dejavnosti analiz uradnih vzorcev živil živalskega izvora / implementation of the analysis of official samples of foods of animal origin, feed and NRL, Jana Žel
4. GSO MKO Ref lab, Referenčni laboratorij / Reference Laboratorij, Jana Žel.
5. MORS, Sofinanciranje organizacijskih, materialnih in kadrovskih priprav v Nacionalnem inštitutu za biologijo, za strokovno svetovanje in ukrepanje v primeru napada z orožji ali sredstvi za množično uičevanje ter s klasičnimi sredstvi./ Cofinancing of preparations regarding the organizational schemes, equipment, and personnel (ali pa human resources) at the National Institute of Biology for the purposes of advising and action in case of an attack by weapons of mass destruction and by classical means., NIB, FITO in GEN dr. Bojan Sedmak, Marina Dermastia.
6. MIRS, Opravljanje dejavnosti in izpolnjevanje obveznosti nosilca nacionalnega etalona enote za množino snovi/hrana rastlinskega izvora / Activities and performance as the holder of national etalon unit for amount of substance / food of plant origin, Marjana Camloh.

Drugi raziskovalni projekti Other Research Projects

1. KC BRIN, Kompetenčni center za biološki razvoj in inovacije / Center of Competence for the biological development and innovations.
2. COBIK, Center odličnosti za biosenzoriko, instrumentacijo in procesno kontrolo CO BIK / Center of Excellence for Biosensors, Instrumentation and Process Control.

Organizacija znanstvenih in strokovnih srečanj / Organization of Scientific and Professional Meeting

1. Mednarodni Dan očarljivih rastlin (ang. Fascination of Plants Day), 17. 5. 2013, Botanični vrt v Ljubljani in tudi drugod po Sloveniji. Soorganizacija dogodka pod okriljem evropske organizacije za raziskave rastlin EPSO (European Plant Science Organisation).
2. Obležitev 15. obletnice sodelovanja NIB s službo za varstvo rastlin in razširitve akreditacije na področje določanja mikroorganizmov – povzročiteljev boleznih rastlin., 22.1.2013
3. Predstavitve rezultatov evropskega projekta Q-DETECT – v soorganizaciji z Evropsko Organizacijo za varstvo rastlin (EPPO) in NIB, 19. – 21.2.2013
4. Delavno srečanje mednarodnega projekta »Metrologija za nadzor infektivnih boleznih, antimikrobne rezistence in škodljivih mikroorganizmov« (INFECT-MET) z mednarodno udeležbo, 8.5.2013
5. Organizacija seminarja "»Illumina next generation sequencing«, v organizaciji Kemomeda v sodelovanju z NIB in Illumina, 28.5.2013
6. Delavnica (CASYM – Coordinating Action Systems Medicine) in 8. CFGBC simpozij, članica znanstvenega odbora Kristina Gruden, 12.-15.6.2013
7. Organizacija delavnice »Določanje in identifikacija gensko spremenjenih organizmov (GSO), posvečeno praznovanju 10. obletnice uveljavitve Kartagenskega protokola o biološki varnosti za predstavnike Ministrstva, inšpekcijskih služb in carine, 23.10.2013
8. Diagnostics and Research (v sodelovanju s projektom Vitisens) in delavnica z istim naslovom (v sodelovanju z BICOPLL projektom in European Research Area Network Core Organic II z mednarodno udeležbo (EU države, Argentina) 3.-6.12.2013

Obiski iz tujine / Visitors from Abroad

1. Dr. Odeta Pivorienė, Head of GMO division, Mrs. Gintare Blažauskiene, Chief desk officer of GMO division, Ministry of Environment, Nature Protection Department, Predstavitve dela GSO dejavnosti in ogled laboratorijev, 13/3/2013
2. Dr. Gianfranco Diretto, Green Biotechnology Laboratory, ENEA (Italian National Agency for New Technologies, Energy and Sustainable Development) Casaccia Research Center, Roma, Italy, FA1106 STSM, 14/4 – 27/4/2013
3. Mark Friebe (student), BTA, Berufskolleg Hilden des Kreises Mettmann, Hilden, Germany, Leonardo Da Vinci program – študenti na izobraževanju, 1/8 – 31/10/2013
4. Dr. Rosa Caiazza, Italian Agricultural Research Council, Research Centre for Vegetable Crops, COST FA 1106 FleshyFruits, 18/10/2013 – 9/12/2013
5. Dr. Joel L. Vanneste, The New Zealand Institute for Plant & Food Research Limited, Raziskovalni obisk s predavanjem: "Pseudomonas syringae pv. actinidiae, three years after its discovery in New Zealand: what have we learned about the pathogen, the disease and how to control it?", 19/9/2013
6. Predstavniki: Egiptovske fitosanitarne inšpekcije in Ministrstva za zunanjo trgovino, kmetijstvo, organizacije GOEIC, Egiptovska fitosanitarna inšpekcija in Ministrstvo za zunanjo trgovino, kmetijstvo, organizacije GOEIC, organizacija obiska v okviru Ministrstva za kmetijstvo in okolje, Srečanje s pristojnimi institucijami pogovarjati o možnostih za izboljšanje sodelovanja na fitosanitarnem področju med Egiptom in Slovenijo, 11/10/2013
7. Mrs. Florence Noble, Deputy scientific director of the Institute of Biological Sciences of the CNRS (The French National Centre for Scientific Research), and Mrs. Francesca Grassia, Deputy director of the European research and international cooperation office (DERCI) of the CNRS., Francoska delegacija (of the CNRS delegation), Obisk laboratorijev, 19/11/2013
8. dr. Yves Le Hingrat, dr. Laurent Glais, dr. Emmanuel Jacquot, La Fédération Nationale des Producteurs de Plants de Pomme de Terre, FN3PT-INRA, Rennes, France in INRA, Montpellier, France, Obisk v okviru slovensko/francoskega projekta SLO FR Proteus BI-FR/13-14-PROTEUS-006, 22/7/ – 24/7 2013
9. Dr. Bjørn Spilberg, Norwegian Veterinary Institute Department of Bacteriology Food and GMO, Norway, Obisk v okviru sodelovanja med NIB in NVI (analize vzorcev, Decathlon projekt), 14/11/-15/11.2013
10. Ivana Ferenčak, dr. med., Odsjek za GMO i procjenu rizika, Hrvatski zavod za javno zdravstvo, 10000 Zagreb, Tečaj določanja GSO, 5.6. 2013 in 11/11/-15/11.2013

Članstva v odborih mednarodnih organizacij, delovnih teles, ekspertnih Skupinah / *Membership of International Boards and Expert Groups*

1. Maja Ravnikar:

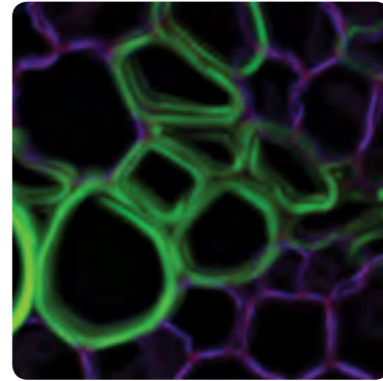
- Imenovana predstavnica Slovenije v panelu za diagnostiko in zagotavljanje kakovosti diagnostičnih laboratorijev pri EPPO. (Ad Hoc Panel on technical requirements for laboratories)
- Imenovana predstavnica Slovenije v Delovni skupini za postavitve referenčnih laboratorijev EU.
- Ustanovna članica iniciativnega odbora za ustanovitev Evropskega združenja za fitobakteriologijo (European Association of Phytobacteriology).
- Članica upravnega odbora IWGLVV vlogi izvoljene predsednice skupine
- Ustanovna članica mednarodne organizacije za raziskave virusa PVY WIDE
- Članica PVEN skupine ustanovljene v ZDA

2. Jana Žel:

- Članica CEN/TC 275/WG 11 genetsko modificirani organizmi.
- Članica upravnega odbora Evropske mreže laboratorijev, ki določajo GSO (ENGL- European Network of GMO laboratories) sedež v ISPRI.
- Članica delovne skupine za merilno negotovost pri ENGL. (trenutno ni aktivnosti)
- Članica delovne skupine za verifikacijo metod pri ENGL.
- Food analytical methods – članica uredniškega odbora.

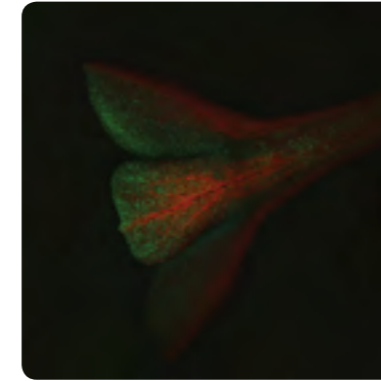
Avtofluorescenca ksilema v koreniki *Convalaria* sp.
Autofluorescence of xylem in Convalaria sp. root.

(Foto | Photo: David Dobnik)



Avtofluorescenca ksilema v koreniki *Convalaria* sp.
Autofluorescence of xylem in Convalaria sp. root.

(Foto | Photo: David Dobnik)



3. Kristina Gruden

- Članica Programskega odbora Plant genomics konferenc
- Associate editor pri BMC Plant Biology
- Associate editor pri reviji Frontiers in Physiology
- Članica Evropske bioinformatične in infrastrukturne mreže – Elixir

4. Marina Dermastia:

- članica UO COST FA0807

5. Maruša Pompe Novak:

- Predstavnica slovenskih institucij v European Plant Science Organization (EPSO)

6. Tanja Dreo:

- Imenovana predstavnica Slovenije v EPPO (European and Mediterranean Plant Protection Organization), Panel on Bacteriology
- Predstavnica NIBa v EFSA (European Food Safety Authority)
- Članica iniciativnega odbora za ustanovitev Evropskega združenja za fitobakteriologijo (European Association of Phytobacteriology).

7. Mojca Milavec:

- imenovana predstavnica Republike Slovenije v CCQM, BAWG (Consultative Committee for Amount of Substance – Metrology in Chemistry, Working Group on Bioanalysis)

8. Nataša Mehle

- Članica International working groups on vegetable viruses (IWGVV)
- Članica International Society for Horticultural Science (ISHS)
- Imenovana predstavnica Slovenije v EPPO (European and Mediterranean Plant Protection Organization), Panel on virology and phytoplasmology

Druga dela / *Other activities*

1. Maja Ravnikar:

- Članica konzorcija Centra za funkcijsko genomiko in biočipe. (CFGBC)
- Članica strokovnega sveta Centra odličnosti za biosenzoriko, instrumentacijo in procesno kontrolo – COBIK
- Članica senata Univerze Nova gorica.
- Članica Znanstvenega sveta ARRS za biotehniške vede
- Članica Strokovne skupine za zdravstveno varstvo rastlin v sadjarstvu, vinogradništvu in hmeljarstvu na MKO.
- Članica projektne skupine za pripravo dokumentacije za vzpostavitev informacijskega sistema FitoLab
- Predavateljica strokovnega izpita s področja zdravstvenega varstva rastlin za fitosanitarne in gozdarske inšpektorje
- Predstavnica SLO v odboru zunanjih strokovnjakov (External Advisory Board-EAB) mednarodne iniciative Era SYSBIO
- Članica delovne skupine za obravnavo EU zakonskih predlogov s področja zdravja rastlin
- Članica delovne skupine za obravnavo EU zakon.predlogov s področja rastlinskega razmnoževalnega materiala

2. Jana Žel:

- Članica znanstvenega odbora za namerno sproščanje GSO v okolje in dajanje izdelkov na trg.
- Članica Tehničnega odbora Referenčni materiali pri Uradu za standardizacijo.
- Članica Tehničnega odbora Kmetijski pridelki in živila pri Uradu za standardizacijo.
- ARRS –predstavnica za rastlinsko biotehnologijo v Svetu za biotehniko

3. Marina Dermastia:

- Članica znanstvenega odbora za delo z GSO v zaprtih sistemih.
- Članica in zastopnica NIB v Programskem svetu doktorskega študija Biomedicina, UL.
- Članica in zastopnica NIB v Programskem svetu doktorskega študija Bioznanosti, UL.
- Članica delovne skupine za pripravo doktorskega študija Biosenzorji na MPŠ.
- Koordinatorica pedagoškega dela na MPŠ.
- Članica Upravnega odbora Društva za rastlinsko fiziologijo Slovenije.
- Članica uredniškega odbora National Geographic Slovenija

4. Kristina Gruden:

- Članica znanstvenega odbora za delo z GSO v zaprtih sistemih.
- Predsednica upravnega odbora Centra za funkcijsko genomiko in bio-čipe (CFGBC).
- Članica kompetenčnega centra BRIN

5. Mojca Milavec:

- Namestnica članice znanstvenega odbora za namerno sproščanje GSO v okolje in dajanje izdelkov na trg

6. Maruša Pompe Novak

- Članica znanstvenega odbora za delo z GSO v zaprtih sistemih (2007 – 2010).
- Članica senata Visoke šole za vinogradništvo in vinarstvo.
- Nacionalna koordinatorica mednarodnega Dneva očarljivih rastlin pod okriljem EPSO.

7. Tanja Dreo

- Članica Strokovne skupine za zdravstveno varstvo rastlin RS
- Članica upravnega odbora Društva za varstvo rastlin Slovenije

8. Špela Baebler

- Namestnica članice upravnega odbora Centra za funkcijsko genomiko in bio-čipe

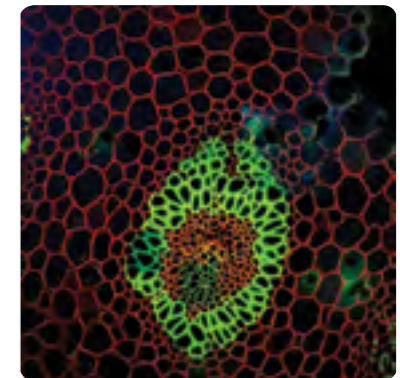


Delo v laboratoriju.
Working in the laboratory.

(Foto | Photo: FITO)

Avtofluorescenca ksilema v koreniki *Convalaria* sp.
Autofluorescence of xylem in Convalaria sp. root.

(Foto | Photo: David Dobnik)



Sodelujoče organizacije Cooperating Institutions

Domače / National

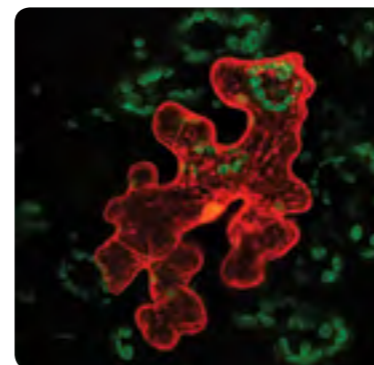
- ARRS – Agencija za raziskovalno dejavnost RS
- Ministrstvo za kmetijstvo in okolje
- Ministrstvo za kmetijstvo in okolje, Uprava RS za varno hrano, veterinarstvo in varstvo rastlin
- Ministrstvo za obrambo, Uprava RS za zaščito in reševanje
- Ministrstvo za izobraževanje, znanost in šport, MIZŠ
- Ministrstvo za gospodarski razvoj in tehnologijo, Urad RS za meroslovje,
- Kmetijsko gozdarski zavod Nova Gorica
- Kmetijsko gozdarski zavod Novo mesto
- Zavod za zdravstveno varstvo Maribor
- Ekonomska fakulteta, UL
- Fakulteta za elektrotehniko, UL
- Fakulteta za računalništvo in informatiko, UL
- Biotehniška fakulteta Oddelek za biologijo, UL
- Biotehniška fakulteta, Oddelek za živilstvo, UL
- Biotehniška fakulteta, Oddelek za agronomijo, UL
- Fakulteta za znanosti o okolju, Univerza v Novi Gorici
- Visoka šola za vinogradništvo in vinarstvo, Univerza v Novi Gorici
- Medicinska fakulteta, Univerza Maribor
- Inštitut Jožef Stefan
- Kemijski inštitut
- Kmetijski inštitut Slovenije
- Inštitut za hmeljarstvo in pivovarstvo Slovenije
- LEK Sandoz d.d.
- KRKA d.d.
- Bia Separations d.o.o.
- BIA d.o.o.
- Omega d.o.o.,
- EDUCCELL podjetje za celično biologijo d.o.o. Ljubljana
- Centralna čistilna naprava Domžale Kamnik
- BioSistemika d.o.o.
- COBIK – Center odličnosti za biosenzoriko, instrumentacijo in procesno kontrolo
- Instrumentation Technologies d.d.,
- Cosylab d.d.
- Zavod za biotehnoške inovacije – KC BRIN
- MEDIS podjetje za proizvodnjo in trženje d.o.o.
- ACIES BIO, biotehnoške raziskave in razvoj, d.o.o.
- MLEKARNA CELEIA d.o.o.
- CLINRES d.o.p.
- LEK VETERINA d.o.o.
- VITIVA, d.d.

Tuje / International

- Plant Research International, Wageningen, Nizozemska
- FERA – The Food and environment research Agency, Sand Hutton, Velika Britanija
- Mercier Frères S.A.R.L., Francija
- Weingut S.A. PRÜM, Nemčija
- Cantine d'Alfonso Del Sordo SRL, Italija
- Forsite Diagnostics LTD, Velika Britanija
- Sediag SAS, Francija
- Centre de recerca i investigació de Catalunya S.A, Španija
- Food and Standard Agency, Velika Britanija
- INRA, Francija
- Crop Research Institute, Prague, Republika Češka
- University of Zagreb, Faculty of Science, Department of Biology, Hrvaška
- INRA-Agrocampus Le Rheu Cedex, Francija
- Institute of Biochemistry and Biophysics, Polish Academy of Sciences, Varšava, Poljska
- Institute for reference materials and measurements, Belgija
- Universität Wien, Department Molecular Systems Biology, Avstrija
- National Bureau of Plant Genetic Resources, New Delhi, Indija
- Chemonics International Inc., Washington, USA
- Centre wallon de Recherches agronomiques (CRA-W), Belgija
- Own Equity of the Institute for Agriculture and Fisheries Research (EV ILVO), Belgija
- Scientific Institute of Public Health (IPH), Belgija
- Novel Foods Additives & Supplements Division, Food Standard Agency, Velika Britanija
- Norwegian Veterinary Institute Department of Bacteriology Food and GMO, Norway

Uredniški odbori / Editors

- BMC Plant Biology. Gruden, Kristina (članica uredniškega odbora 2011-). London: BioMed Central. ISSN 1471-2229. <http://www.biomedcentral.com/bmcpantbiol/>.
- Frontiers in physiology. Gruden, Kristina (članica uredniškega odbora 2012-).
- Food analytical methods. Žel, Jana (članica uredniškega odbora 2008-). New York: Springer, 2008-. ISSN 1936-9751
- National Geographic. Dermastia, Marina (članica uredniškega odbora 2006-). Ljubljana: Rokus, 2006-. ISSN 1854-4851
- Phytopathogenic mollicutes. Mehle, Nataša (članica uredniškega odbora 2011-). New Delhi: Indian.Journals.com, 2011



Krompirjeva celica, kot jo vidimo s konfokalnim mikroskopom.

Potato cell as seen with the confocal microscope.

(Foto | Photo: David Dobnik)

Nagrade in priznanja Awards

- Maja Ravnikar je prejela nagrado Miroslava Zeia za izjemne dosežke na področju dejavnosti Nacionalnega inštituta za biologijo za leto 2013.

Pedagoška dejavnost in mentorstva Teaching and Mentorship

Dodiplomski študij / Graduate Studies

Izr. prof. dr. Jana Žel, mentorica, dr. David Dobnik, somentor

- JAMNIK, Maja. Vpliv krompirjevega virusa Y na različne divje sorodnike krompirja : magistrsko delo : magistrski študij - 2. stopnja = The effect of potato virus Y on different wild relatives of potato : M. Sc. Thesis : Master Study Programmes. Ljubljana: [M. Jamnik], 2013. XI, 72 f., [9] f. pril., ilustr. [COBISS.SI-ID 2922063]

Izr. prof. dr. Kristina Gruden, mentorica/somentorica

- KMETIČ, Mirjam. Preverjanje medproteinske interakcije med proteini kinazami MKK6 in MAPK4, MAPK6, MAPK12 ter MAPK13 pri krompirju : diplomsko delo. Ljubljana: [M. Kmetič], 2013. VII, 35 f., ilustr. [COBISS.SI-ID 36998405]
- MOHORIČ, Klavdija. Analiza zaporedij in kloniranje nekaterih potencialnih signalizacijskih genov za funkcijske analize v rastlinah : diplomsko delo. Ljubljana: [K. Mohorič], 2013. XII, 103 f., ilustr. [COBISS.SI-ID 36817413]
- GUČEK, Tanja. Določitev tarč kinaze WIPK v krompirju : diplomsko delo. Ljubljana: [T. Guček], 2013. XIV, 79 f., ilustr. [COBISS.SI-ID 36921861]
- SVALINA, Miha. Razvoj podatkovne baze za poskuse z DNA-mikromrežami : diplomsko delo. Ljubljana: [M. Svalina], 2013. 55 str., graf. prikazi. <http://eprints.fri.uni-lj.si/2044>.

Predavanja in seminarji Lectures and Seminars

- DOBNIK, David, LAZAR, Ana, ŽEL, Jana, RAVNIKAR, Maja, MORISSET, Dany, TUŠEK-ŽNIDARIČ, Magda, GUTIERREZ-AGUIRRE, Ion. Proizvodnja cepiv rastlinskega izvora : oddaja Ugriznimo znanost, RTV SLO 1, 4. apr. 2013.
- Delavnica: Določanje in identifikacija gensko spremenjenih organizmov (GSO) – posvečena praznovanju 10. obletnice uveljavitve Kartagenskega protokola o biološki varnosti, organizatorja: Nacionalni inštitut za biologijo in Ministrstvo za okolje in prostor 23.oktobra 2013. V okviru delavnice so imeli sodelavci NIB (Jana Žel, Mojca Milavec, David Dobnik) več predavanj.

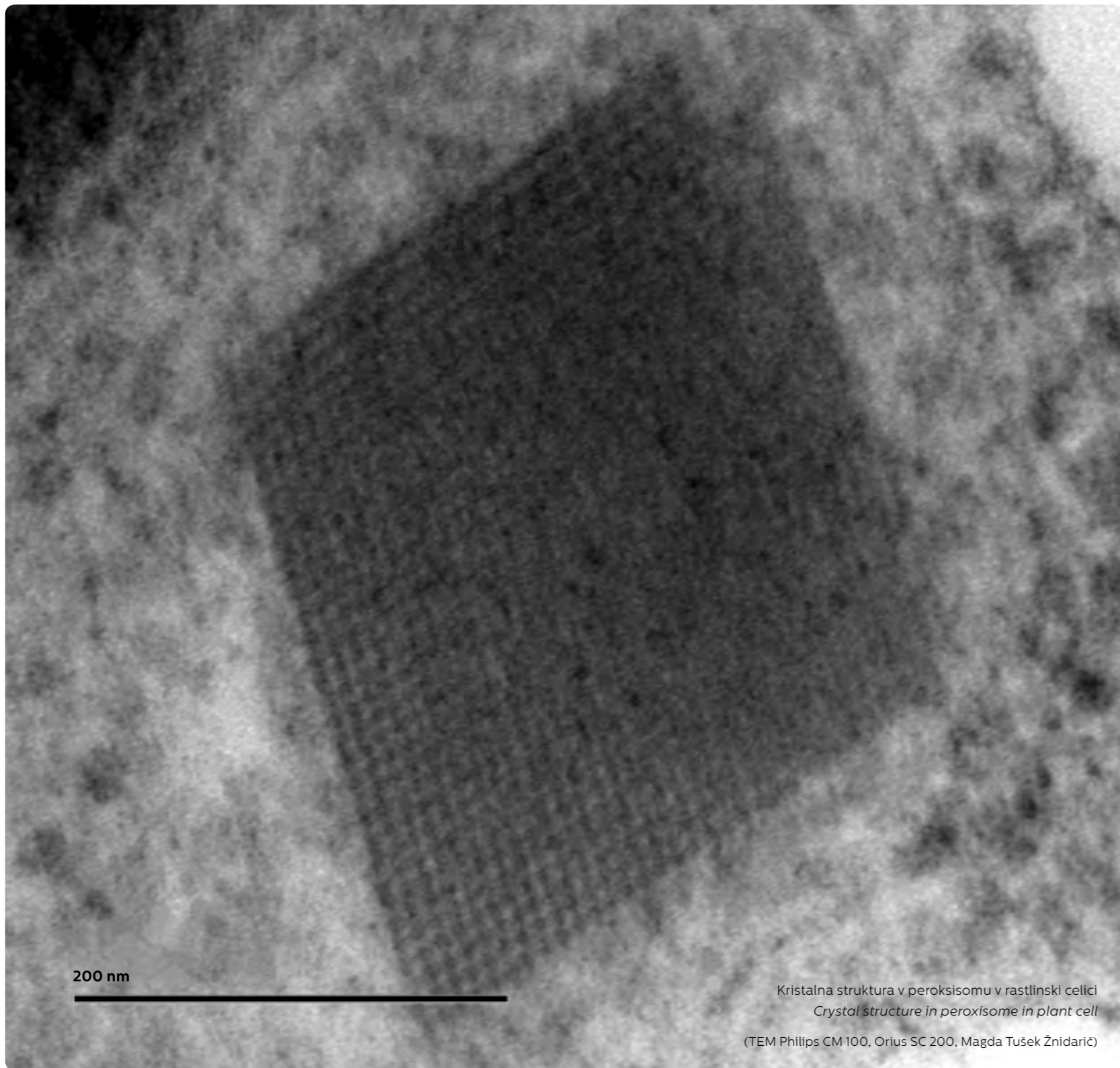
Doc. dr. Maruša Pompe Novak, mentorica

- KOBLAR, Katja. Analiza prisotnosti RNA, plaščnega proteina in virusnih delcev krompirjevega virusa Y v okuženih rastlinah tobaka ter razmerja med njimi : diplomsko delo. Nova Gorica: [K. Koblar], 2013. IX, 42 str., ilustr. <http://www.ung.si/~library/diplome/OKO-LJE/132Koblar.pdf>. [COBISS.SI-ID 2879739]
- GNEZDA, Maja. Raziskave časovne in prostorske porazdelitve obrambnih procesov krompirja po okužbi s krompirjevim virusom Y pri genotipih Rywal in Rywal NahG : diplomsko delo. Nova Gorica: [M. Gnezda], 2013. IX f., 47 str., ilustr. <http://www.ung.si/~library/diplome/OKOLJE/123Gnezda.pdf>. [COBISS.SI-ID 2741243]
- ŠVIGELJ, Maja. Raziskave vpliva časa okužbe rastlin krompirja s krompirjevim virusom Y na potek bolezni : diplomsko delo. Nova Gorica: [M. Švigelj], 2013. IX, 46, [8] str., ilustr. <http://www.ung.si/~library/diplome/OKOLJE/133Svigelj.pdf>. [COBISS.SI-ID 2879995] kategorija: SU (S) točke: 1

Doktorska dela / Doctoral Theses

Izr. prof. dr. Kristina Gruden, mentorica/somentorica

- MAHNIČ, Mitja. Uporaba genomike in proteomike pri analizi dejavnikov nastanka neklasičnih inkluzijskih teles v bakteriji Escherichia coli : doktorska disertacija = Genomics and proteomics tools for identification of factors that influence the formation of "unclassical" inclusion bodies in Escherichia coli : doctoral dissertation. Ljubljana: [M. Mahnič], 2013. XV, 124 f., ilustr. 1 CD. [COBISS.SI-ID 781687]



200 nm

Kristalna struktura v peroksisomu v rastlinski celici
Crystal structure in peroxisome in plant cell
 (TEM Philips CM100, Orius SC 200, Magda Tušek Žnidarič)

6.0

0105 - 003

INFRASTRUKTURNI CENTER PLANTA *Infrastructural Centre Planta*

Vodja / *Head*

- doc. dr. **Maruša Pompe Novak**, univ.dipl.biol., znanstvena sodelavka

Namestnik vodje / *Assistant Leader*

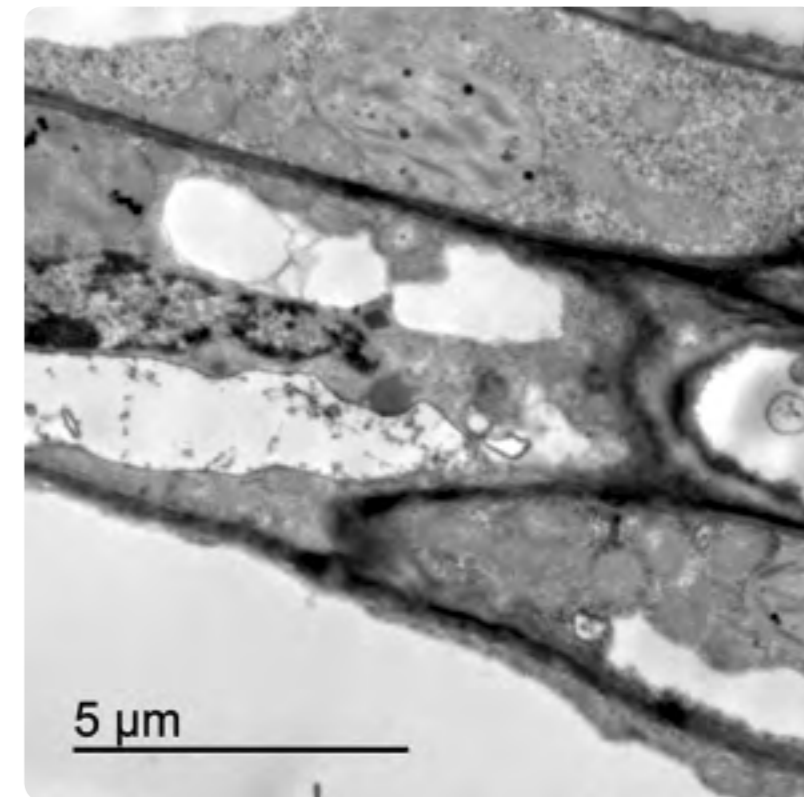
- dr. **Marjana Camloh**, univ.dipl. biol., strokovna svetnica z doktoratom

Strokovni vodja / *Research Leader*

- izr. prof. dr. **Maja Ravnikar**, univ.dipl.biol., znanstvena svetnica

Naslov / *Address*

Nacionalni inštitut za biologijo / National Institute of Biology
 Večna pot 111, SI-1000 Ljubljana
 Tel.: + 386 (0)59 232 800, + 386 (0)59 232 803 · Fax: + 386 1 257 38 47
 E-mail: marusa.pompe.novak@nib.si, marjana.camloh@nib.si,
 maja.ravnikar@nib.si
 URL: www.nib.si



5 μm

Celice s peroksisomom (povečan na prejšnji sliki) v listu krompirja
Cells with peroxisome (magnified on the previous picture) in potato leaf

(TEM Philips CM100, Bioscan 792, Magda Tušek Žnidarič)

RAZISKOVALNA DEJAVNOST

Infrastrukturni center Planta (IC Planta) je eden od dveh programsko in organizacijsko zaključenih infrastrukturnih centrov, ki sestavljata infrastrukturni program Nacionalnega inštituta za biologijo (IP NIB). IC Planta deluje v okviru Oddelka za biotehnologijo in sistemsko biologijo Nacionalnega inštituta za biologijo.

IC Planta služi kot podpora raziskovalni dejavnosti, državnim organom, podjetjem in pedagoški dejavnosti. IC Planta zagotavlja sodelovanje med raziskovalci različnih raziskovalnih programov, projektov in institucij, kakor tudi povezovanje raziskovalcev z uporabniki raziskav iz vrst drugih proračunskih uporabnikov in industrije ter stik pedagoškega procesa z raziskovalno dejavnostjo.

Na segmentu presevne elektronske mikroskopije je IC Planta izredno močno povezan s Katedro za zoologijo Oddelka za biologijo Biotehniške fakultete Univerze v Ljubljani, katere predstojnica je prof. dr. Jasna Štrus.

Veliko infrastrukturno opremo IC Planta sestavljajo:

- presevni elektronski mikroskop (Philips CM100) s CCD kamero
- kriomikrotom (Leica EM FC6) in mikrotom (Leica)
- aparatura za PCR v realnem času (ABI 7900)
- aparatura za PCR v realnem času (ABI 7900HT Fast)
- aparatura za PCR v realnem času (Roche Light Cycler 480)
- prenosna aparatura za PCR v realnem času (Cepheid Smart Cycler)
- robot za pipetiranje (PerkinElmer MultiProbe II)
- komore za gojenje rastlin in tkivnih kultur (Kambič)
- komore za ločeno gojenje rastlin (Kambič)
- karantenski rastlinjak ter
- karantenski rastlinjak s podtlakom.

Vsa velika infrastrukturna oprema IC Planta je tehnološko izjemno zahtevna. Visoka tehnološka zahtevnost opreme zahteva skrbno, redno in strokovno vzdrževanje, zato ima vsak kos opreme svojega



Rastlinska bakterija z bički
Plant bacteria

(TEM Philips CM100, Bioscan 792, Magda Tušek Žnidarič)

Rastlinski bakteriji z bički
Plant bacteria

(TEM Philips CM100, Bioscan 792, Magda Tušek Žnidarič)



RESEARCH ACTIVITY

The Infrastructural Centre Planta (IC Planta) is one of two program and organization integrated infrastructural centers that forms the Infrastructural program of the National Institute of Biology (ID NIB). IC Planta is a part of the Department of Biotechnology and Systems Biology at the National Institute of Biology.

IC Planta's equipment supports research activities, bodies of ministries, enterprises and educational activities. IC Planta ensures collaboration between researchers of different research programs, projects and institutions. It facilitates connections of researchers with the users of this research that are other budget users and various industries, as well as it facilitates connections between research activities and educational processes.

In the segment of electron microscopy IC Planta is very tightly connected to Chair of Zoology at Department of Biology at Biotechnical Faculty at University of Ljubljana, led by Prof. Dr. Jasna Štrus.

The large infrastructural equipment of IC Planta consists of:

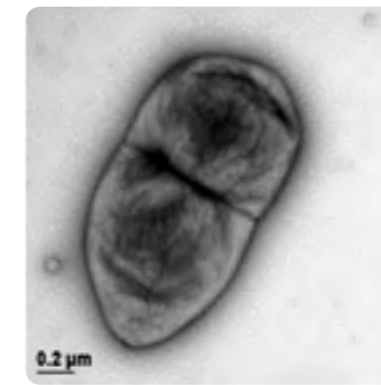
- Transmission electron microscope (Philips CM100) with CCD camera
- Cryo-ultramicrotome (Leica EM FC6) and ultramicrotome (Leica)
- Real-time PCR instrument (ABI 7900)
- Real-time PCR instrument (ABI 7900HT Fast)
- Real-time PCR instrument (Roche Light Cycler 480)
- Portable real-time PCR instrument (Cepheid Smart Cycler)
- Robot for pipetting (PerkinElmer MultiProbe II)
- Growth chambers for plant and tissue culture breeding (Kambič)
- Plant growth chambers for separate breeding (Kambič)
- Quarantine greenhouse, and
- Quarantine greenhouse with negative pressure.

All large equipment of IC Planta is technologically exceptional. High technological pretentiousness of the equipment demands careful, regular and professional maintenance of the equipment, therefore each piece of equipment has its caretaker and his substitutes that take care of regular maintenance

skrbnika in namestnike skrbnika, ki skrbijo za redno vzdrževanje in brezhibno delovanje opreme. Opremo IC Planta upravljajo in vzdržujejo visoko kvalificirani kadri, saj stalno skrbimo za ustrezno izobraževanje zaposlenih. Moderna in dobro vzdrževana raziskovalna oprema IC Planta (v skladu s standardom ISO/IEC 17025) tako omogoča izvajanje konkurenčnih raziskav v naravoslovju. Zelo pomembna je tudi kvalitetna in dobro vzdrževana dodatna oprema, nujno potrebna za delovanje velike infrastrukturne opreme, kateri tudi posvečamo potrebno skrb in jo stalno posodabljam.

Preko IC Planta je potekal nakup velike raziskovalne opreme z združevanjem sredstev več virov in institucij, oprema pa se hkrati uporablja tudi za manjše raziskovalne programe, projekte in zunanje uporabnike, ki nimajo možnosti nabave in vzdrževanja tako drage opreme. Zaradi tako široke možnosti uporabe je raziskovalna oprema IC Planta polno izkoriščena, kar je predpogoj za dobro izrabo vseh vloženih sredstev.

IC Planta s skrbnim razmislekom in usklajevanjem pri nabavah opreme skrbi za to, da se velika infrastrukturna oprema v Sloveniji brez potrebe ne podvaja, da pa se hkrati smiselno dopolnjuje. Zato se IC Planta povezuje tudi v infrastrukturna omrežja, kar uporabnikom omogoča uporabo opreme različnih infrastrukturnih programov v različnih fazah raziskav in aplikacij, pri čemer oprema IC Planta zavzema pomembno mesto. Na področju molekularne biologije se IC Planta preko Oddelka za biotehnologijo in sistemsko biologijo Nacionalnega inštituta za biologijo povezuje z drugimi centri: Centrom za funkcijsko genomiko in biočipe s sedežem na Medicinski fakulteti Univerze v Ljubljani, Centrom za površinsko plazmonsko resonanco s sedežem na Oddelku za biologijo Biotehniške fakultete Univerze v Ljubljani in Centrom za proizvodnjo in strukturo proteinov s sedežem na Inštitutu Jožef Stefan ter dejavno deluje v slovenski tehnološki mreži Rastline za prihodnost.

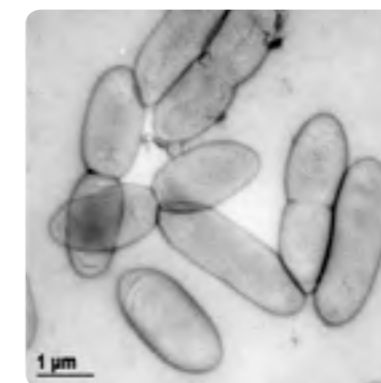


Rastlinska bakterija
Plant bacteria

(TEM Philips CM100, Bioscan 792, Magda Tušek Žnidarič)

Rastlinske bakterije
Plant bacteria

(TEM Philips CM100, Bioscan 792, Magda Tušek Žnidarič)



and faultless working of the equipment. IC Planta's equipment is managed and kept by highly skilled workers as we facilitate adequate permanent education of the employees. IC Planta has modern and well treated research equipment (in accordance with the ISO/IEC 17025 system) which is an essential condition for competitive research performance in the life sciences. For the proper functioning of large equipment of IC Planta, quality and well maintained supplementary equipment, which is essential for working of large infrastructural equipment, is very important. Therefore special care and permanent modernization is devoted also to the supplementary equipment.

At IC Planta, large infrastructural equipment has been purchased by merging funds from different sources and institutions. Large equipment is also used by small research programs, research projects and other users that cannot purchase and keep such expensive equipment themselves. Such a broad spectrum of usage assures maximal exploitation of the equipment and consequently a good yield of all invested funds.

With careful consideration and reconciliation before purchase of new equipment, IC Planta takes care that large infrastructural equipment is not senseless duplicated in Slovenia but that it is being reasonably complemented. Therefore through its equipment, IC Planta is joining the laboratory networks, what enables for its users the usage of the equipment of different infrastructural programs in the different stages of researches and applications, where IC Planta's equipment takes an important place. In the field of molecular biology through the Department of Biotechnology and Systems Biology, IC Planta is connected with other centers: the Center for Functional Genomics and Bio-Chips with the seat at Medical Faculty of the University of Ljubljana, the Infrastructural Centre for Surface Plasmon Resonance with the seat at Biotechnical Faculty at the University of Ljubljana and the Centre for protein production and structure with the seat at Jožef Stefan Institute. Besides, IC Planta takes an active role in Slovenian technological network Plants for the Future.

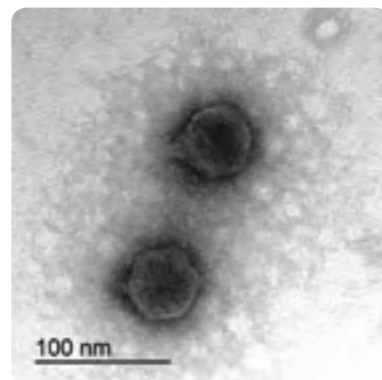
GLAVNI DOSEŽKI V LETU 2013

Najpomembnejša pridobitev IC Planta v letu 2013 je bila nadgraditev presevnega elektronskega mikroskopa z novo CCD kamero Orius SC200 (Gatan), ki ima izjemno visoko ločljivost (4M točk). Nova CCD kamera tako omogoča opazovanje posameznih makromolekul in natančne analize struktur (npr. površine virusov), kar prej ni bilo možno. Nova CCD kamera Orius SC200 (Gatan) je na mikroskop nameščena s spodnje strani, kar omogoča, da je na mikroskopu s strani ostala nameščena tudi stara CCD kamera BioScan 792 (Gatan), ki sicer ne zadošča več sedanjim raziskovalnim merilom glede ločljivosti pri visokih povečavah, ima pa izjemno široko vidno polje. Tako mikroskop z obema CCD kamerama omogoča veliko funkcionalnost pri delu, ki z eno samo kamero ne bi bila mogoča. Za to, da je mogoča uporaba obeh kamer, pa je bila potrebna tudi nadgradnja programske opreme in računalnika, na katerega je programska oprema nameščena.

SODELOVANJE Z RAZLIČNIMI UPORABNIKI

V letu 2013 je veliko infrastrukturno opremo IC Planta uporabljalo 73 različnih uporabnikov, od tega 64% iz lastne raziskovalne organizacije (RO) in 36% iz drugih RO. Tematike raziskav in analiz, za katere se uporablja oprema IC Planta, so bile izjemno raznolike, kar je razvidno tudi iz seznama uporabnikov.

Infrastrukturna oprema IC Planta se je v letu 2013 uporabljala za izvajanje raziskovalne dejavnosti različnih raziskovalnih skupin iz 13 različnih RO. Uporabljala se je za izvajanje 3 raziskovalnih programov, ki jih je financirala Agencija za raziskovalno dejavnost Republike Slovenije, od tega 2 iz lastne RO in 1 iz druge RO, za izvajanje 13 raziskovalnih projektov, ki jih je financirala Agencija za raziskovalno dejavnost Republike Slovenije, od tega 5 iz lastne RO in 8 iz drugih RO, za izobraževanje 22 mladih raziskovalcev, od



Bakteriofag
Bacteriophage

(TEM Philips CM 100, Orius SC 200,
Magda Tušek Žnidarič)

IMPORTANT ACHIEVEMENTS IN 2013

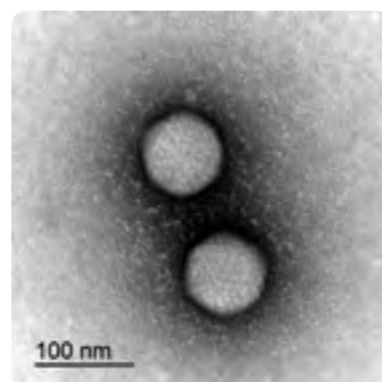
In the year 2013, transmission electron microscope was upgraded with new CCD camera Orius CS200 (Gatan) with very high resolution (4M pixels). New CCD camera enables investigations of single macromolecules and precise structure analyses (e.g. surface of viruses). New CCD camera Orius CS200 is installed on bottom side of the TEM what enables simultaneous installation with old CDD camera BioScan 792 (Gatan). Old CDD camera does not meet the up-to-date research requirements of resolution at high magnification but has very wide angle. The microscope with both cameras enables investigation of samples from different points of view what would not be able with only one camera. The usage of both cameras was enabled by upgrading the software and the hardware.

COLLABORATION WITH VARIOUS USERS

In the year 2013, 73 different users used IC Planta's large infrastructural equipment, 64% of these from our own research organization (RO) and 36% from other ROs. Subjects of research and analyses, carried out by Centre Planta's equipment, were extremely diverse, which is evident in the list of users.

In the year 2013, IC Planta's infrastructural equipment was used for the research activity of different research groups from 13 different ROs. It was used for performance of 3 research programs financed by the Slovenian Research Agency (2 from our own RO and 1 from another RO), for the performance of 13 research projects financed by the Slovenian Research Agency (5 from our own RO and 8 from other ROs), for the training of 22 young researchers (12 from our own RO and 10 from and other RO), and for 6 international research projects, among them 2 EU 7th framework projects.

In the year 2013, IC Planta's infrastructural equipment was used for 7 projects that have served to support



Humani adenovirus
Human adenovirus

(TEM Philips CM 100, Orius SC 200,
Magda Tušek Žnidarič)

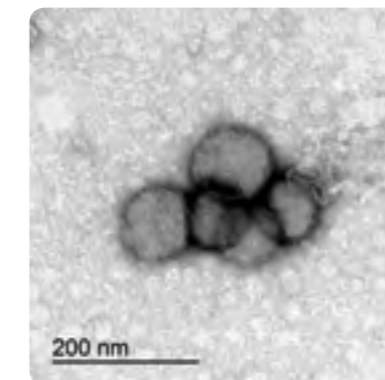
tega 12 iz lastne RO in 10 iz drugih RO, ter za izvajanje 6 mednarodnih raziskovalnih projektov, od tega 2 EU projekta 7. okvirnega programa.

Infrastrukturna oprema IC Planta se je v letu 2013 uporabljala za izvajanje 7 projektov za podporo državnih in drugih vladnih organov za izvajanje javne službe drugim resorjem. Uporabljala se je kot podpora za delovanje MKO preko strokovne naloge na področju varstva rastlin. Infrastrukturna oprema IC Planta je služila tudi v podporo MORS in MIRS.

Oprema IC Planta se je v letu 2013 uporabljala za izvajanje 12 aplikativnih projektov za gospodarska podjetja, kar je predstavljalo direktno podporo industriji, okoljevarstvu in kmetijstvu z razvijanjem novih tehnologij in izvajanjem visoko specializiranih analiz na osnovi dobre laboratorijske prakse. Oprema IC Planta je služila za podporo tehnološkemu razvoju na področju rastlinske, živalske, farmacevtske, medicinske, mikrobne in prehranske biotehnologije ter za razvoj metod in za izvajanje specializiranih analiz v diagnostiki rastlinskih patogenih bakterij, virusov in fitoplazem ter gensko spremenjenih rastlin in rastlinskih proizvodov.

Infrastrukturna oprema IC Planta se je v letu 2013 uporabljala kot podpora za izvajanje 10 predmetov 2 univerz.

Raziskave in analize, pri katerih se je v letu 2013 uporabljala infrastrukturna oprema IC Planta, še posebno raziskave in analize v zvezi z GSO, so pomembno prispevale k povečevanju kvalitete življenja, ozaveščenju o okoljski problematiki in s svojo odmevnostjo k oblikovanju javnega mnenja.



Virus pegavosti in uvelosti paradižnika
Tomato spotted wilt virus, TSWV

(TEM Philips CM 100, Orius SC 200,
Magda Tušek Žnidarič)

different bodies of ministries and the performance of public service. In the frame of the annual Expert projects in the field of plant health protection, the equipment was used for the support of the activities of Ministry of Agriculture and Environment. IC Planta's infrastructural equipment was also used to support the Ministry of Defence and the Metrology Institute of the Republic of Slovenia.

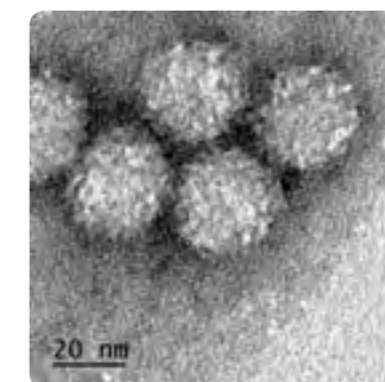
In 2013, IC Planta's infrastructural equipment was used for 12 applied projects which were ordered by economical enterprises what directly support the industry, environmental protection and agriculture with the development of new technologies and performance of highly specialized analyses on the basis of good laboratory practice. IC Planta's equipment supported technological progress in the fields of plant, animal, pharmaceutical, medical microbial and food biotechnology, and development of methods for specialized analyses in diagnostics of plant pathogenic bacteria, viruses and phytoplasmas and genetically modified plants and plant products.

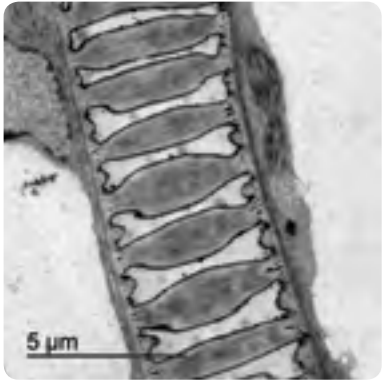
IC Planta's infrastructural equipment was used to support the performance of 10 subjects at 2 universities in 2011.

Research and analyses that have used IC Planta's infrastructural equipment in the year 2013, especially that in connection with GMOs, importantly contributed to the increase of the quality of life, to awareness of various environmental issues and because of its wide response, also to the creation of public opinion.

Virus grmičavosti in zakrnelosti
paradižnika
Tomato bushy stunt virus, TBSV

(TEM Philips CM 100, Orius SC 200,
Magda Tušek Žnidarič)





Celica ksilema v steblu paradižnika
Xylem cell in tomato stem

(TEM Philips CM 100, Orius SC 200,
Magda Tušek Žnidarič)

Raziskovalni projekti, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije, ki so v letu 2013 uporabljali veliko infrastrukturno opremo IC Planta

Research Projects Financed by Slovenian Research Agency, that were using IC Planta large equipment and facilities in 2013

1. Kompromisi obrambe in razvoja v večtrofični interakciji med krompirjem in dvema glavnima škodljivcema / *Growth and defense trade-offs in multitrophic interaction between potato and its two major pests*, (J4-4165), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Kristina Gruden
2. Funkcijska genomika interakcije med krompirjem in PVY / *Functional genomics of potato – PVY interaction*, (J1-4268), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Jana Žel
3. Dvojna narava matičnih celic v raku in njihova uporaba v zdravljenju / *Dual nature of stem cells in cancer and their application in therapy*, (J1-4247), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Tamara Lah Turnšek
4. Biološka raznovrstnost virusa PVY in njen vpliv na obrambni odgovor rastlin krompirja / *Biological variability of potato virus Y and its influence on potato defense response*, (L1-2278), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Maja Ravnikar
5. Razvoj enostavne in hitre metode za določanje rastlinskih povzročiteljev bolezni na terenu / *Developing simple, rapid and on-site methods for plant pathogens detection*, (L1-3642), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Dany Morisset
6. Asimetrija celičnih procesov v odpadanju listov in cvetov paradižnika / *Asymmetry of cellular processes in abscission of leaves and flowers of tomato*, (J1-5444), Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, nosilec projekta / *principal investigator* Aleš Kladnik, odgovoren za NIB / *responsible for NIB part* Marina Dermastia

Raziskovalni programi, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije, ki so v letu 2013 uporabljali veliko infrastrukturno opremo IC Planta

Research Programs Financed by Slovenian Research Agency, that were using IC Planta large equipment and facilities in 2013

1. Rastlinska fiziologija in biotehnologija / *Plant physiology and biotechnology*, (P4-0165), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Maja Ravnikar
2. Ekotoksikologija, toksikološka genomika in karcinogeneza, (P1-0245), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Tamara Lah Turnšek
3. Zoološke in speleobiološke raziskave / *Investigations in zoology and speleobiology*, (P1-0184), Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, nosilec projekta / *principal investigator* Boris Sket

7. Apoptotično delovanje alkilpiridinijevih spojin na celice pljučnega adenokarcinoma / *Apoptotic effects of alkylpyridinium compounds on lung adenocarcinoma cells*, (J1-4044), Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, nosilec projekta / *principal investigator* Tom Turk, odgovoren za NIB / *responsible for NIB part* Metka Filipič
8. Ekologija socialnih interakcij pri bakteriji *Bacillus subtilis* / *Ecology of social interactions in Bacillus subtilis*, (J4-3631), Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, nosilec projekta / *principal investigator* Ines Mandić Mulec, odgovoren za NIB / *responsible for NIB part* Tanja Dreo
9. Spremembe lipidnih membran pri bolezni / *Molecular Description of Lipid Membrane Changes in Disease*, (J1-4305), Kemijski inštitut / *National Institute of Chemistry*, nosilec projekta / *principal investigator* Gregor Anderluh
10. Vloga okolja in gostitelja pri pojavu in razvoju okužbe s *Clostridium difficile* / *The role of environmental and host factors in development of Clostridium difficile infection*, (J3-4298), Zavod za zdravstveno varstvo Maribor / *Institute of Public Health Maribor*, nosilec projekta / *principal investigator* Maja Rupnik, odgovoren za NIB / *responsible for NIB part* Tanja Dreo
11. Inovativni proizvodni sistemi za cepiva in regenerativno medicino, / *Innovative production systems for vaccines and regenerative medicine*, (L4-4277), Bia Separations / *Bia Separations*, nosilec projekta / *principal investigator* Aleš Podgornik, odgovoren za NIB / *responsible for NIB part* Dany Morisset
12. Razvoj novih tehnologij za odstranjevanje patogenih mikrobov in toksinov iz različnih vodnih virov / *Development of new technologies for the removal of pathogenic agents and toxins from different water sources*, (L2-4314), Bia Separations / *Bia Separations*, nosilec projekta / *principal investigator* Aleš Štrancar, odgovoren za NIB / *responsible for NIB part* Ion Gutierrez
13. Razvoj novih tehnologij za detekcijo, kvantifikacijo in vrednotenje bakteriofagov / *Development of novel technologies for detection, quantification and characterisation of bacteriophages*, (L7-5534), Center odličnosti za biosenzoriko, instrumentacijo in procesno kontrolo / *Center of Excellence for Biosensors, Instrumentation and process Control*, nosilec projekta / *principal investigator* Aleš Štrancar, odgovoren za NIB / *responsible for NIB part* Tanja Dreo

Mednarodni raziskovalni projekti, ki so v letu 2013 uporabljali veliko infrastrukturno opremo IC Planta

International Research Projects, that were using IC Planta large equipment and facilities in 2013

1. Stroškovno učinkovito ročna naprava za hitro odkrivanje *Flavescence dorée* fitoplazem v vinski trti / *Cost-Effective Hand-Held Device For Rapid In-Field Detection of Flavescence dorée Phytoplasma in Grapevines*, (EU projekt 262032), *The Secretary of State for Environment, Food and Rural Affairs acting through Food and Environment Research Agency*, nosilec projekta / *principal investigator* Adrian Belton, Mike Wray, odgovoren za NIB / *responsible for NIB part* Maja Ravnikar
2. Učinki citostatikov v okolju in identifikacija biomarkerjev za izboljšanje ocene tveganja v okolju / *Fate and effects of cytostatic pharmaceuticals in the environment and the identification of biomarkers for and improved risk assessment on environmental exposure-CytoThreat*, (EU projekt 265264), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Metka Filipič
3. Razvoj metod za določanje karantenskih škodljivih organizmov za uporabo v nacionalnih programih in inšpekcijskih službah / *Developing quarantine pest detection methods for use by national plant protection organizations (NPPO) and inspection services*, (EU projekt 245047), *Food and environment research organisation (FERA)*, nosilec projekta / *principal investigator* Neil Boonham, odgovoren za NIB / *responsible for NIB part* Maja Ravnikar
4. Metrology for monitoring infectious diseases, antimicrobial resistant and harmful micro-organisms / *Metrology for monitoring infectious diseases, antimicrobial resistant and harmful micro-organisms*, (JRP-h01 INFECT-MET), LGC limited, nosilec projekta / *principal investigator* Carole Foy, odgovoren za NIB / *responsible for NIB part* Mojca Milavec
5. Tarčno precizna biokontrola in pospeševanje v ekoloških poljedelskih sistemih / *Targeted precision biocontrol and pollination enhancement in organic cropping system*, (ERA NET), Nacionalni inštitut za biologijo / *National Institute of Biology*, nosilec projekta / *principal investigator* Andrej Čokl
6. INTERREG CBI34 Slovenija-Italija

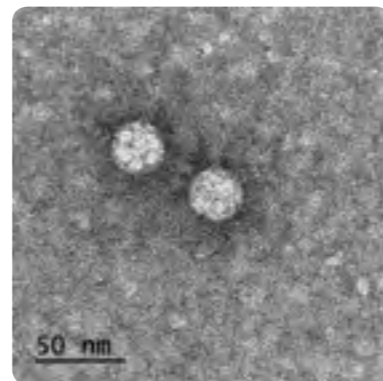
Ciljni raziskovalni projekti, ki so v letu 2013 uporabljali veliko infrastrukturo opremo IC Planta / *Targer Research Projects, that were using IC Planta large equipment and facilities in 2013*

1. Reševanje problematike ustaljenih karantenskih bolezni sadnih vrst *Prunus spp.* Za ohranitev pridelave / *Solving problems of quarantine diseases for protection of stone fruit (Prunus spp.) production, (V4-1102), Kmetijski inštitut Slovenije / Agricultural institute of Slovenia, nosilec projekta / principal investigator Irena Mavrič, odgovoren za NIB / responsible for NIB part Marina Dermastia*

Razvojni projekti, ki so v letu 2013 uporabljali veliko infrastrukturno opremo IC Planta / *Development Projects, that were using IC Planta large equipment and facilities in 2013*

1. Pogodba s področja molekularne biologije z Lek / *Contract in the field of molecular biology with Lek, (5-057/2003 R002/03), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Kristina Gruden*
2. Pogodba za analize s TEM z BiaSeparations / *Contract for Analyses by Electronic Microscopy with BiaSeparations, (802/2006), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Magda Tušek Žnidarič*
3. Pogodba za analize s qPCR z BiaSeparations / *Contract for Analyses by qPCR with BiaSeparations, (1145/2007), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Maja Ravnikar*
4. Določanje gensko spremenjenih organizmov za Inštitut za kontrolo in certifikacijo v kmetijstvu in gozdarstvu (IKCK) / *Detection of genetically modified organisms for IKCK, (1-6/5-2007), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Jana Žel*
5. Pogodba s CRL Ispra / *Contract with CRL Ispra, (1981/2006), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Jana Žel*
6. Posamezna naročila IRMM / *Separate orders from IRMM on Stability, Copy No., Homogeneity, Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Jana Žel*

Virus rumenega mozaika repe
Turnip yellow mosaic virus, TYMV
(TEM Philips CM 100, Orius SC 200,
Magda Tušek Žnidarič)

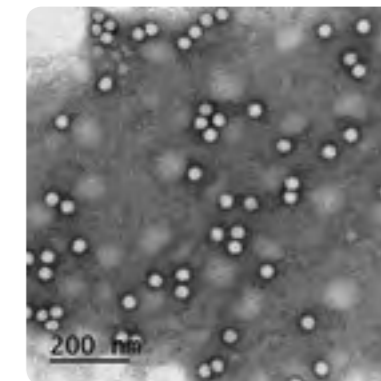


7. Kompetenčni center za biološki razvoj in inovacije / *Center of Competence for the biological development and innovations, (3211-10-000466), Zavod za biotehnoške inovacije, nosilec projekta / principal investigator Matejka Štemplej, odgovoren za NIB / responsible for NIB part Kristina Gruden*
8. Center odličnosti za biosenzoriko, instrumentacijo in procesno kontrolo / *Center of Excellence for Biosensors, Instrumentation and Process Control, (COBIK), Univerza v Ljubljani, Ekonomska fakulteta / University of Ljubljana, Faculty of Economics, nosilec projekta / principal investigator Rebeka Koncilja, odgovoren za NIB / responsible for NIB part Maja Ravnikar*
9. Bioinstrumentacijski laboratorij Centra odličnosti za biosenzoriko, instrumentacijo in procesno kontrolo / *Bioinstrumentation Laboratory of Center of Excellence for Biosensors, Instrumentation and Process Control, (COBIK-BILAB), Univerza v Ljubljani, Ekonomska fakulteta / University of Ljubljana, Faculty of Economics, nosilec projekta / principal investigator Rebeka Koncilja, odgovoren za NIB / responsible for NIB part Maja Ravnikar*
10. Sodelovanje na področju izobraževanja in tečajev z Biosistemika / *Cooperation on workshops with Biosistemika, Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Maja Ravnikar*
11. GSO analize za Norveški veterinarski inštitut / *GMO analytical services for Norwegian Veterinary Institute, (2012-082), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Jana Žel*
12. Pogodba s področja uporabe EM z Medicinsko fakulteto Univerze v Ljubljani / *Contract in the field of EM with Medical Faculty at University of Ljubljana, Univerza v Ljubljani, Biotehniška fakulteta / University of Ljubljana, Biotechnical Faculty, nosilec projekta / principal investigator Jasna Šturs*

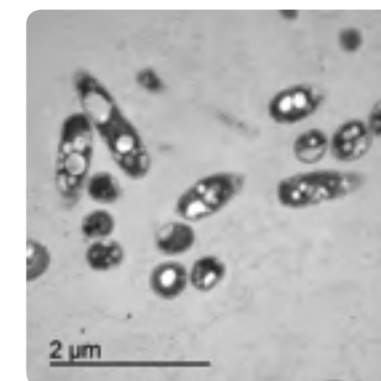
Projekti, katerih naročniki so državni ali drugi vladni organi ali resorji, ki so v letu 2013 uporabljali veliko infrastrukturno opremo IC Planta / *Projects for bodies of ministries, that were using IC Planta large equipment and facilities in 2013*

1. Strokovne naloge s področja zdravstvenega varstva rastlin za FURS / *Expert projects in plant health protection field for FURS, (2321-09-210045), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Maja Ravnikar*
2. Razna naročila s področja diagnostike vzorcev / *Different orders in the field of diagnostic samples, Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Maja Ravnikar*
3. Določanje gensko spremenjenih organizmov v živilih in krmi za IR-SKGGH MKGP / *Testing of GMOs in food and feed for IR-SKGGH MKGP, (2311-11-000101), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Jana Žel*
4. Referenčni laboratorij za MOP / *Reference Laboratory for MOP, (2511-07-200132), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Jana Žel*
5. Sofinanciranje organizacijskih, materialnih in kadrovskih priprav v Nacionalnem inštitutu za biologijo, za strokovno svetovanje in ukrepanje v primeru napada z orožji ali sredstvi za množično uičevanje ter s klasičnimi sredstvi za MORS / *Cofinancing of preparations regarding the organizational schemes, equipment, and personnel (ali pa human resources) at the National Institute of Biology for the purposes of advising and action in case of an attack by weapons of mass destruction and by classical means for MORS, (4300-102/2007-1), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Maja Ravnikar*
6. Opravljanje dejavnosti in izpolnjevanje obveznosti nosilca nacionalnega etalona enote za množino snovi/hrana rastlinskega izvora za MIRS / *Activities and performance as the holder of national etalon unit for amount of substance / food of plant origin for MIRS, (6401-18/2008/67), Nacionalni inštitut za biologijo / National Institute of Biology, nosilec projekta / principal investigator Marjana Camloh*

Virus rumenega mozaika repe
Turnip yellow mosaic virus, TYMV
(TEM Philips CM 100, Orius SC 200,
Magda Tušek Žnidarič)



Ultrastruktura rastlinske bakterije
Ultrastructure of plant bacteria
(TEM Philips CM100, Bioscan 792, Magda
Tušek Žnidarič)

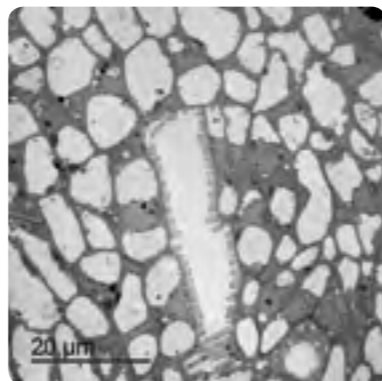


Mladi raziskovalci, ki so v letu 2013 uporabljali veliko infrastrukturno opremo IC Planta / *Young researchers, that were using IC Planta large equipment and facilities in 2013*

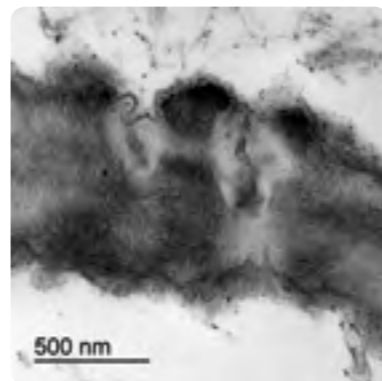
1. Mladi raziskovalec Jana Erjavec / *Young researcher Jana Erjavec*, Nacionalni inštitut za biologijo / *National Institute of Biology*, mentor / *mentor* Maja Ravnikar
2. Mladi raziskovalec Ida Istinič / *Young researcher Ida Istinič*, Nacionalni inštitut za biologijo / *National Institute of Biology*, mentor / *mentor* Jana Žel
3. Mladi raziskovalec Nina Prezelj / *Young researcher Nina Prezelj*, Nacionalni inštitut za biologijo / *National Institute of Biology*, mentor / *mentor* Marina Dermastia
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8. Mladi raziskovalec Marko Chersicola / *Young researcher Marko Chersicola*, Nacionalni inštitut za biologijo / *National Institute of Biology*, mentor / *mentor* Kristina Gruden
9. Mladi raziskovalec Denis Kutnjak / *Young researcher Denis Kutnjak*, Nacionalni inštitut za biologijo / *National Institute of Biology*, mentor / *mentor* Maja Ravnikar
10. Mladi raziskovalec Jernej Pavšič / *Young researcher Jernej Pavšič*, Nacionalni inštitut za biologijo / *National Institute of Biology*, mentor / *mentor* Jana Žel
11. Mladi raziskovalec Marko Pezdir / *Young researcher Marko Pezdir*, Nacionalni inštitut za biologijo / *National Institute of Biology*, mentor / *mentor* Metka Filipič
12. Mladi raziskovalec Urška Tajnšek / *Young researcher Urška Tajnšek*, Nacionalni inštitut za biologijo / *National Institute of Biology*

Celice stebela paradižnika s sitastimi ploščami v floemu (povečanimi na naslednji sliki)
Tomato stem cells with sieve plates in phloem (magnified on the next picture)

(TEM Philips CM100, Bioscan 792, Magda Tušek Žnidarič)



13. Mladi raziskovalec Miloš Vittori / *Young researcher Miloš Vittori*, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, mentor / *mentor* Jasna Štrus
14. Mladi raziskovalec Polona Mrak / *Young researcher Polona Mrak*, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, mentor / *mentor* Nada Žnidaršič
15. Mladi raziskovalec Katja Ota / *Young researcher Katja Ota*, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, mentor / *mentor* Peter Maček
16. Mladi raziskovalec Eva Kovačec / *Young researcher Eva Kovačec*, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, mentor / *mentor* Marjana Regvar
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18. Mladi raziskovalec Ajda Taler Verčič / *Young researcher Ajda Taler Verčič*, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, mentor / *mentor* Eva Žerovnik
19. Mladi raziskovalec Mira Polajner / *Young researcher Mira Polajner*, Institut Jožef Stefan / *Institute Jožef Stefan*, mentor / *mentor* Eva Žerovnik
20. Mladi raziskovalec iz gospodarstva Anastazija Jež Krebelj / *Young researcher Anastazija Jež Krebelj*, Razvojno raziskovalna agencija Severne Primorske / *Developmental research agency of Severna Primorska*, mentor / *mentor* Maruša Pompe Novak
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22. Mladi raziskovalec iz gospodarstva Monika Primon / *Young researcher Monika Primon*, BIA, mentor / *mentor* Irena Zajc

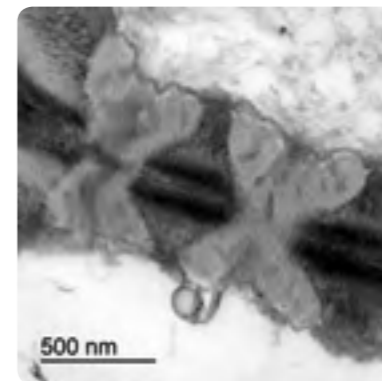


Sitasta plošča floema paradižnika
Sieve plate in tomato phloem

(TEM Philips CM 100, Orius SC 200, Magda Tušek Žnidarič)

Pedagoški procesi, ki so v letu 2013 uporabljali veliko infrastrukturno opremo IC Planta / *Educational activities, that were using IC Planta large equipment and facilities in 2013*

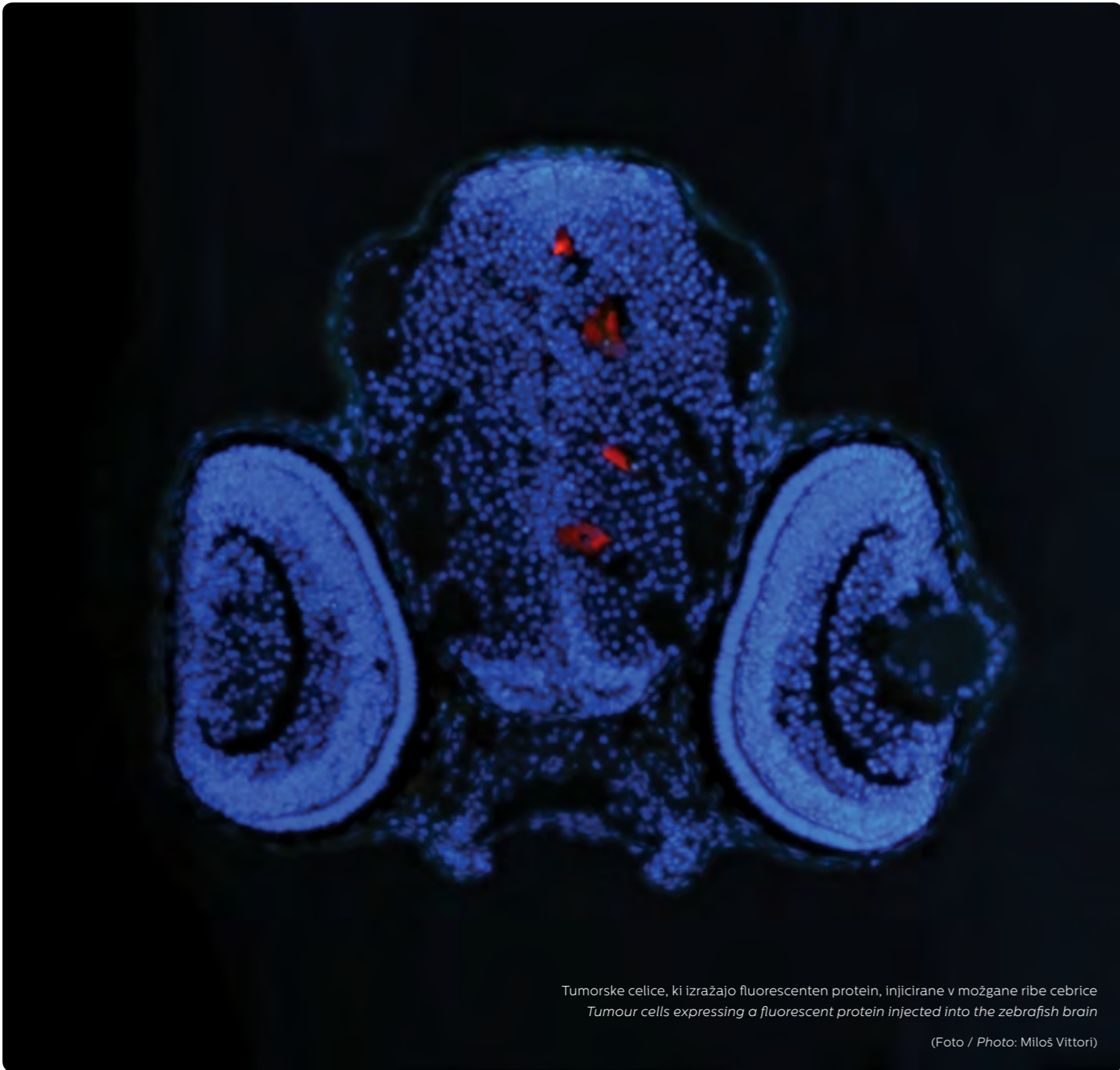
1. Individualno delo pri temeljnem predmetu Dinamičnost celične arhitekture na doktorskem študiju Bioznanosti, področje Znanosti o celici, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, nosilec / *lecturer* Jasna Štrus
2. Individualno delo pri izbirnem predmetu Mikroskopija in analiza slike bioloških vzorcev na doktorskem študiju Bioznanosti, področje Znanosti o celici, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, nosilec / *lecturer* Rok Kostanjšek, Jasna Štrus
3. Vaje pri predmetu Biologija celice in histologija na BSc študiju Biologije, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, nosilec / *lecturer* Jasna Štrus, Rok Kostanjšek
4. Vaje pri predmetu Biologija na BSc Biotehnologija, Univerza v Ljubljani, Biotehniška fakulteta / *University of Ljubljana, Biotechnical Faculty*, nosilec / *lecturer* Jasna Štrus



Sitasta plošča floema krompirja
Sieve plate in potato phloem

(TEM Philips CM 100, Orius SC 200, Magda Tušek Žnidarič)

5. Vaje pri predmetu Splošna Biologija na BSc študiju Biokemije, Univerza v Ljubljani, Fakulteta za kemijo in kemijsko tehnologijo / *University of Ljubljana, Faculty of Chemistry and Chemical Technology*, nosilec / *lecturer* Jasna Štrus
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Tumorske celice, ki izražajo fluorescenten protein, injicirane v možgane ribe cebrice
Tumour cells expressing a fluorescent protein injected into the zebrafish brain

(Foto / Photo: Miloš Vittori)

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ODDELEK ZA GENETSKO TOKSIKOLOGIJO IN BIOLOGIJO RAKA – GEN

Department of Genetic Toxicology and Cancer Biology – GEN

Vodja / Head:

· izr. prof. dr. **Metka Filipič**, univ. dipl. ing. živilske tehnol., znanstvena svetnica

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9. dr. **Miloš Vittori**, asistent z doktoratom
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2. **Barbara Breznik**, mag. farm.
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3. **Karmen Stanič**, koordinatorka področij

*delovno razmerje prenehalo v letu 2013 / employment ended in 2013

RAZISKOVALNA DEJAVNOST

Raziskave GEN potekajo na treh med seboj povezanih področjih: genski toksikologiji, biologiji raka in ekotoksikologiji.

Na področju ekotoksikologije proučujemo fitoplanktonske združbe. Raziskave niso povezane le z ekologijo cianobakterij, temveč tudi širše z ekologijo alg. Proučujemo dejavnike odgovorne za produkcijo cianobakterijskih toksinov in vlogo teh toksinov pri vzdrževanju ravnovesja v vodnih ekosistemih. Na osnovi razumevanja teh procesov razvijamo nove metodologije za napovedovanje in karakterizacijo cianobakterijskih cvetov in metode za njihovo preprečevanje.

V okviru genske toksikologije in toksikogenomike so naše raziskave pretežno usmerjene v raziskave molekularnih mehanizmov genotoksičnega delovanja antropogenih (npr. pesticidi, kovine, nanodelci, ostanki zdravil, heterociklični amini...) in naravnih (npr. cianobakterijski toksini) onesnažil ter njihove vplive na zdravje ljudi in okolje. Proučujemo tudi mehanizme zaščitnega delovanja naravnih snovi (npr. ksantohumol, eterična olja) proti raku. Pridobljena nova spoznanja doprinašajo k razvoju ustreznih ukrepov za preprečevanje in zmanjševanje vpliva genotoksičnih onesnaževal okolja na zdravje ljudi in druge organizme v okolju.

Vsi ti dejavniki lahko povzročijo raka. Temeljne raziskave na področju biologije raka so usmerjene v proučevanje mehanizmov razvoja raka, predvsem v proučevanje vloge proteolitičnih sistemov. Poleg tumorskih in tumorskih matičnih celic, je za rast in razvoj tumorjev pomembno tudi mikrookolje, ki ga sestavljajo t. i. stromalne celice, med katerimi najdemo vrste tkivnih oz. mezenhimske matične celice. Namen raziskovanja interakcije celic tumorja s celicami mikrookolja je prenos izsledkov temeljnih raziskav v klinično uporabo za razvoj novih diagnostičnih in prognostičnih pokazateljev razvoja raka, razvoj terapevtskih inhibitorjev proteaz ter za razvoj novih možnosti za klinično uporabo matičnih celic v regenerativni medicini in za zdravljenje raka.

Žaba v cianobakterijskem cvetu.
Frog in cyanobacterial bloom.

(Foto | Photo: Dr. Tina Eleršek)



Raziskovalni program: P1-0245. » Ekotoksikologija, toksikološka genomika in karcinogeneza«

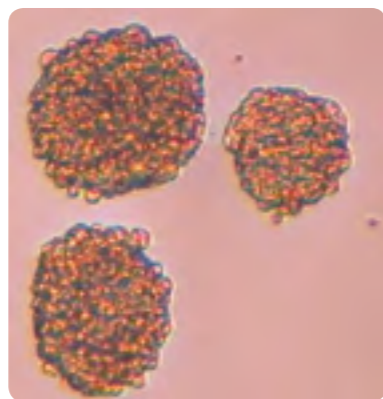
Vodja: prof. dr. Tamara Lah Turnšek

- Na področju **EKOTOKSIKOLOGIJE** smo proučevali množično pojavljanje cianobakterij v površinskih vodnih telesih, kakor tudi njihov razkroj, ki predstavlja grožnjo za zdravje okolja in drugih živih bitij. Težavo predstavlja že sama biomasa v vodnem okolju, dodatno grožnjo pa sposobnost cianobakterij za tvorbo neobičajnih, smrtonosnih biološko aktivnih snovi. Razumevanje pojavnih oblik in zaščitnih mehanizmov cianobakterij ter ekološke in biološke vloge cikličnih cianopeptidov, ki jih te proizvajajo, lahko pojasni tako tvorbo kot propad masovnega pojavljanja cianobakterijskih cvetenj. Za ugotavljanje uspešnosti posegov v vodno okolje, moramo poleg trenutnega stanja vodnega telesa ovrednotiti še učinke našega posredovanja na cvetenje cianobakterij. Zato ker tradicionalni monitoring fitoplanktona ni sposoben podati realne slike vodnega telesa, smo v povezavi s **podjetjem Arhel d.o.o.** izdelali robotizirano plovilo, ki je sposobno opraviti takšno nalogo in učinkovati na cianobakterijsko populacijo (soavtor dr. **Bojan Sedmak** Patent št. 23987). Za ovrednotenje povzročenih poškodb smo vpeljali imunokemijske metode in postopke barvanja nekaterih cianobakterijskih elementov, s katerimi lahko napovemo usodo tretirane populacije. Znanje pridobljeno v okviru tega programa smo uporabili pri prijavi projekta **EU Life Stop CyanoBloom**.

Glioblastomske matične celice rastejo v kulturi v obliki 3D skupkov, imenovanih sferoidi (40x povečava).

Glioblastoma stem cells grown in culture in the form of 3D aggregates, called spheroids (40x magnification).

(Foto | Photo: Dr. Neža Podergajs)



RESEARCH ACTIVITY

Our research is conducted in three interrelated fields: genetic toxicology, cancer biology and ecotoxicology.

In the field of ecotoxicology we study the phytoplankton communities. Research does not cover only the ecology of cyanobacteria, but also the broader ecology of algae. We explore the factors responsible for the production of cyanobacterial toxins and the role of these toxins in the maintenance of balance in aquatic ecosystems. Based on the understanding of these processes we develop new methodologies for prediction and characterization of cyanobacterial blooms and methods for their prevention.

In the field of genetic toxicology and toxicogenomic our research is predominantly focused on the understanding the molecular mechanisms of genotoxicity of anthropogenic (i.e. heterocyclic aromatic amines, metals, residues of pharmaceuticals, nanomaterials) and natural (i.e. cyanobacterial toxins) pollutants and their potential effects on human health and environment. We are also investigating the cancer preventive effects of natural substances and the respective mechanisms of action (i.e. xanthohumol, eteric oils). This new knowledge contributes to the development of preventive and protective measures for reducing the impact of genotoxic environmental contaminants on humans and other organisms.

All these agents can cause cancer. The basic research in the field of cancer biology is focused on the mechanisms of cancer development and proteolysis' enzymes involvement. Besides the tumour and tumour stem cells, the tumour microenvironment also plays a crucial role in tumour progression. It contains the population of so-called stromal cells consisting of various tissue mesenchymal stem cells. The aim of the interaction studies, focused on cross-talk between tumour cells and microenvironment, is the translation of those results into clinical applications for the development of new diagnostic and prognostic markers of cancer progression, development of therapeutic protease inhibitors, and development of stem cells based therapeutics for cancer treatment and regenerative medicine.



Robotizirano plovilo za zanavljanje in omejevanje toksičnih cianobakterij.
Robotic vessel for the detection and limitation of toxic cyanobacteria.

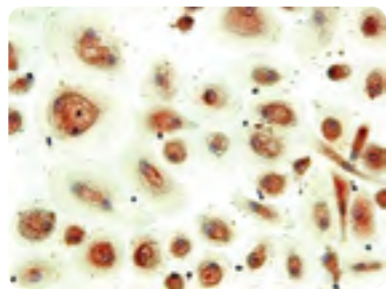
(Foto | Photo: A. Kump)

Research programme: P1-0245. “Ecotoxicology, Toxicogenomic and Carcinogenesis”

Principal investigator: Prof. Dr. Tamara Lah Turnšek

- In the field of **ECOTOXICOLOGY**, we studied mass occurrence of cyanobacteria in surface water bodies, as well as their degradation, which poses a threat to the health of the environment and other living beings. The problem presents excessive biomass in the aquatic environment, and ability of cyanobacteria to form unusual, deadly biological agents. Understanding the manifestations and protective mechanisms of cyanobacteria and ecological and biological role of cyclic cyanopeptides that they produce may explain both, the formation and collapse of massive occurrence of cyanobacterial bloom. Traditional monitoring of phytoplankton is able to provide a realistic picture of the body of water, but the added value is to complement traditional monitoring with contemporary knowledge. To determine the effectiveness of interventions in the aquatic environment, we, in conjunction with the **company Arhel Ltd.** developed robotic vessel capable of carrying out such a task and effect on cyanobacterial population (co-author Dr. **Bojan Sedmak** Pat. 23987). To evaluate the damage caused, we introduced immunochemical methods and processes of dyeing some cyanobacterial elements, which can predict the fate of the treated population. Knowledge acquired through this program is used in the frame of the **EU project Life - Stop CyanoBloom**.
- In the field of **GENETIC TOXICOLOGY** and **TOXICOGENOMIC** we have focused our research in the identification of genotoxic agents (naturally occurring and anthropogenic), with the aim to explore their mode of action and to determine, which biological pathways are affected by the exposure to the studied environmental pollutants and their complex mixtures at environmentally relevant low concentrations. The latter is particularly important as complex mixtures may exhibit completely different effects compared to single compound, being additive, synergistic or potentiating.
- The studies of the potential effects of the residues of cytostatic drugs on environment and human

- Na področju GENESKE TOKSIKOLOGIJE in TOKSIKOGENOMIKE smo raziskave usmerili v proučevanje in identifikacijo genotoksičnih dejavnikov (naravnih in antropogenih), pri čemer raziskujemo načine delovanja in ugotavljamo, katere biološke poti so prizadete pri izpostavljenosti raziskovanim snovem in njihovim zmesem pri koncentracijah značilnih za okolje. Slednje je posebno pomembno, saj lahko kompleksne zmesi povzročijo drugačne učinke kot posamezne snovi, ki so lahko aditivni, sinergistični ali pa antagonistični.
- Raziskave potencialnih vplivov ostankov citostatikov na okolje in zdravje ljudi, ki potekajo v okviru 7. OP CYTOTHREAT so pokazale, da eden največ uporabljenih citostatikov: 5-fluorouracil pri kronični, več generacijski izpostavljenosti povzroči pri ribah cebricah tvorbo mikro jeder že pri koncentraciji 10 ng/L, ki je relevantna za izpostavljenost v okolju. Raziskave učinkov kompleksnih zmesi citostatikov pa so pokazale sinergistično delovanje. Pri testiranju z algami in cianobakterijami, kot tudi pri *in vitro* testiranju z jetrnimi celicami rib cebric, smo učinke zaznali pri koncentracijah, ki so bile zaznane v odpadnih vodah. To so novi izsledki, ki jih bo v bodoče potrebno upoštevati pri ocenjevanju tveganj za okolje in zdravje ljudi, zaradi ostankov citostatikov.
- Pomembna skupina okoljskih onesnažila so cianobakterijski toksini. Cilindrispermopsin (CYN) se v površinskih kopenskih vodah vse pogosteje pojavlja, vendar pa je njegova genotoksičnost in potencialna karcinogenost v primerjavi z mikro-cistinami slabo raziskana. Naše raziskave njegovega genotoksičnega potenciala in mehanizmov karcinogenega delovanja kažejo, da je za zdravje ljudi in okolje verjetno bolj nevaren kot mikro-cistini. Relevanten je tudi v Sloveniji, saj smo v sodelo-



Osteoklasti obarvani s protitelosom za katepsin-K in raztopino hematoksilina (200x povečava).

Osteoclasts stained with anti-cathepsin K antibody and hematoxylin solution (200x magnification).

(Foto | Photo: Urška Verbovšek)

Glioblastomske celice, ki izražajo fluorescentni protein dsRed, v možganih zarodka ribe cebrice (*Danio rerio*).

*Glioblastoma cells expressing fluorescent protein DsRed, in the brain of the zebrafish embryo (*Danio rerio*).*

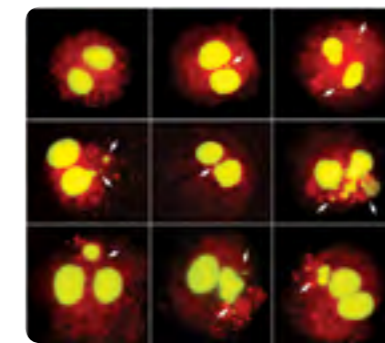
(Foto | Photo: Dr. Miloš Vittori)

vanju s skupino prof. Sandre Azevedo iz Zvezne Univerze Rio de Janeiro prvič zaznali ta toksin tudi v slovenskih jezerih. Raziskovali smo tudi genotoksični potencial nodularina (NOD), ki ga najdemo v brakinčnih priobalnih vodah. NOD je induciral poškodbo DNA prek povzročanja oksidativnega stresa in ima glede genotoksične aktivnosti manjši potencial kot MCLR in CYN.

- V okviru raziskav mehanizmov genotoksičnega delovanja heterocikličnih aminov (HCA) smo pokazali, da HCA zavirajo apoptozo, kar pomeni povečano verjetnost nastanka mutacij in tveganja za nastanek raka. Ugotovili smo tudi, da imajo ekstrakti pečenega mesa, za katere je značilno, da vsebujejo zmes različnih HCA, večjo genotoksično aktivnost kot čisti HCA. Ti izsledki potrjujejo karcinogeni potencial HCA in kažejo, da je lahko ocena tveganja za zdravje ljudi pri uživanju pečenega mesa na osnovi toksikoloških podatkov za čiste HCA podcenjena.
- Naše raziskave škodljivih učinkov odpadnih vod, ki vsebujejo motilce hormonskega sistema kot so bisfenol A in njegovi analogi, bromirani zaviralci gorenja, ftalati in podobne snovi, so pokazale, da ta onesnažila poleg motenja hormonskega sistema povzročajo tudi genotoksične učinke.
- Potrdili smo učinkovitost našega celičnega biosenzorskega sistema za hitro in enostavno določanje genotoksičnosti, ki temelji na stabilno transfeciranih celicah človeškega hepatoma (HepG2) s plazmidom, ki izraža rdeči fluorescentni protein pod kontrolo promotorja gena CDKN1A (protein p21), ki se značilno odziva na poškodbe DNA. Rezultati so pokazali visoko občutljivost in specifičnost sistema, ki je sedaj pripravljen za uporabo na področjih kot je presejalno testiranje genotoksičnosti novih učinkovin, kozmetike, pesticidov itd. kot tudi za monitoring okolja.
- Na področju BIOLOGIJE RAKA smo se osredotočili na vlogo lizosomskih katepsinov in njihovih inhibitorjev pri napredovanju glioblastoma (GBM) v invaziji, angiogenezi in apoptozi, ki jo prožijo kemoterapevtiki. Odziv GBM na dejavnike mikrookolja smo ovrednotili na različnih »omskih« nivojih, ter v *in vitro* celičnih & *in vivo* živalskih modelih.

health that are conducted in the frame of the FP7 project CYTOTHREAT showed that one of the most used cytostatics, 5-fluorouracil at chronic, multi-generation exposure of zebrafish causes micronuclei formation at concentration of 10 ng/L that is relevant for environmental exposure. The studies of complex mixtures of cytostatics showed synergistic effects. In testing with algae, cyanobacteria and zebrafish liver cell line the effects were detected at concentrations that were detected in municipal and hospital wastewaters. These are new data that should be in the future considered in the environmental and human health risk assessment of residues of cytostatics.

- One group of naturally occurring contaminants are cyanobacterial toxins. Cyndrospermopsin (CYN) is increasingly found in surface freshwaters, however its genotoxicity and potential carcinogenicity is compared to microcystins not well explored. Our studies of its genotoxic potential and mechanisms of potential carcinogenesis indicate the CYN may represent higher threat for human health and environment than microcystins. CYN is relevant also for Slovenia as in collaboration with the group of prof. Sandra M.F.O. Azevedo from the Federal University of Rio de Janeiro, we have for the first time detected this toxin also in Slovenian lakes. We have studied also genotoxic potential of nodularin (NOD), which can be found in brackish estuarine environments. The results indicate that NOD induced DNA damage predominantly via oxidative stress and is regarding genotoxicity less potent than MCLR and CYN.
- In the frame of the studies of the genotoxicity of heterocyclic aromatic amines (HCA) we showed that HCA suppress apoptosis, which means increased probability for mutation fixations and risk for cancer initiation. We also found that grilled meat extracts that contain mixtures of HCA exert higher genotoxic potential than pure HCA. These results confirm carcinogenic potential of HCA and indicate that the risk assessment for human health due to the consumption of grilled meat based on toxicological data for pure HCA might be underestimated.
- Our investigations of the adverse effects of waste waters with an emphasis on hormone disrupters, such as bisfenol A and its analogues, brominated



Slike HepG2 celic, ki predstavljajo dvojedrne celice z mikrojedrom, nukleoplazmatskim mostičkom oziroma brstom.

Images of HepG2 cells representing binucleated cell, micronucleus, nucleoplasmic bridge and nuclear bud.

(Foto | Photo: Dr. Bojana Žegura)

flame retardants, phthalates and similar substances showed that these compounds in addition to endocrine disruption induce also genotoxic effects.

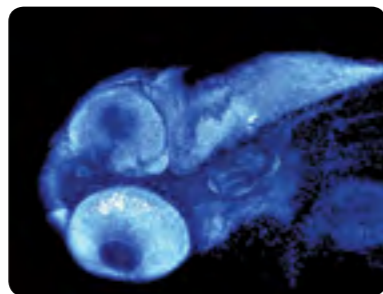
- We have validated the performance of our previously developed cell-based biosensor system for rapid and simple detection of genotoxic substances that is based on stable transfection of human hepatoma HepG2 cells with a plasmid that encodes the red fluorescent protein DsRed2 under the control of the CDKN1A promoter. The results showed high sensitivity and specificity of the system that is now ready for the application in the fields such as genotoxicity screening of new pharmaceutical compounds, cosmetics, pesticides etc. as well as for environmental monitoring.
- In the field of CANCER BIOLOGY our research is focused on defining the role of lysosomal cathepsins and their inhibitors in glioblastoma (GBM) progression: invasion, angiogenesis and apoptosis triggered by chemotherapeutics. The GBM response on certain factors of the microenvironment was evaluated at different "omics" levels using *in vitro* and *in vivo* animal models.
- Within our studies we investigated the processes involving lysosomal proteases-cathepsins (Cats). Those represent prognostic markers and potential anti-tumour targets for inhibitors. Brain tumours – glioblastoma (GBM), which is the subject of our research, are namely highly invasive and resistant to chemotherapy. In both involved processes: invasion and apoptosis, thus increased activity of proteases is expected. In the year 2013 we completed the study on possible use of cytostatics such as Ar-



Ribe cebrice (*Danio rerio*). Zebrafish (*Danio rerio*).

(Foto | Photo: Dr. Miloš Vittori)

- V okviru naši raziskav smo proučevali procese, v katerih sodelujejo lizosomalne proteaze – katepsini (Cats). Ti so tako prognostični markerji, kakor tudi potencialne protitumorske tarče inhibitorjev. Možganski tumorji – glioblastomi, ki so predmet naših raziskav, so namreč izredno invazivni in odporni na kemoterapijo. V obeh procesih invaziji in apoptozi zato predvidevamo povišano delovanje proteaz. Tako smo npr. letos zaključili študijo možne uporabe citostatika, kot je arzen, v kombinaciji z inhibicijo CatL v GBM, kjer smo uspeli dokazati povečano odmiranje tumorskih celic. Uporabili smo inhibitor CatL, ki smo ga sintetizirali v sodelovanju s skupino v CEA, Francija (prof. Vincent Dive). Pri zdravljenju bi bilo tako možno z inhibicijo izražanja genov CatL doseči isti učinek ob uporabi nižje doze arsena v obliki zdravila Trisenox (As_2O_3).



Prosojnost zarodka ribe cebrice omogoča neposredno opazovanje osrednjega živčevja.

The transparency of the zebrafish embryo enables direct observation of the central nervous system.

(Foto | Photo: Dr. Miloš Vittori)

- Poslužili smo se tudi pristopa sistemske biologije. S transkriptomskih pristopom smo identificirali set proteoliznih encimov, ki so povišani tako v tumorskem tkivu kot v kulturi celic GBM, kot so npr. U87MG, in ugotovili, da so celice precej različne od tkiv. V tumorjih se je najbolj zvišalo izražanje encima katepsin K, ki je lizosomalna proteaza, s kakršnimi se ukvarjamo že vrsto let, a temu encimu ne mi, niti drugi raziskovalci doslej nismo posvečali pozornosti. Njegova vloga v tem tumorju torej ostaja uganka. Odkritje je pomembno s stališča odkrivanja novih biomarkerjev za napredovanje tega tumorja.

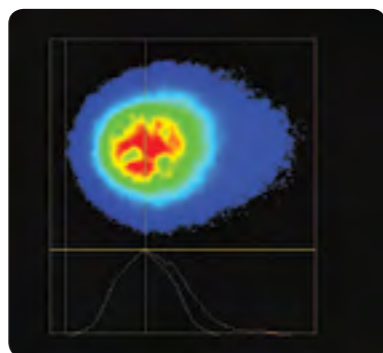
- Novi biomarkerji so še posebej dobrodošli, če jih lahko določamo v krvi, zato temu posvečamo še posebno pozornost. S protitelesi na mikromrežah smo uspeli identificirati kar nekaj povišano izraženih proteinov v serumu GBM bolnikov, ki jih bomo podrobneje raziskali v prihodnosti. V podobni raziskavi smo v sodelovanju z UKC Maribor (prof. Tadej Strojnik) ugotovili povišano hitrost sedimentacije (eritrocitov – ESR) in količino C reaktivnega proteina (CRP) v krvi bolnikov z GBM, kar sicer bolj kaže na povišan sistemski protitumorski imunski odziv, kakor na sproščanje tumorskih biomarkerjev.

- V okviru raziskav interakcij med rakavimi in mezenhimijskimi matičnimi celicami v gliomih smo v sodelovanju z Univerzo v Potsdamu (prof. Joachim

Slika kometa prikazuje poškodovano DNA.

The image of a comet represents damaged DNA.

(Foto | Photo: Dr. Bojana Žegura)



Selbig) izvedli analizo dekonvolucije transkriptomskih podatkov direktnih sokultur celic U87 in MSC, ki je omogočila identifikacijo kandidatnih genov, katerih izražanje je izključno odvisno od medceličnega stika. Obenem smo v sodelovanju s prof. Massimom Domenici (Italija) preskušali podobne interakcije z MSC opremljenimi s TRAIL ligandom, ki se veže na celice GBM preko receptorjev FADD, s čimer povzroči njihovo smrt.

- Začeli smo tudi poskuse na živalih, na ribah cebricah, ki smo jih uvedli kot alternativni model za proučevanje lastnosti in možnega zdravljenja GBM. S preliminarnimi raziskavami, kjer smo tumorske celice bodisi vbrizgali v rumenjako vrečko zarodkov, ali pa jih implantirali v glavo zarodkov rib cebric, nam je uspelo optimizirati pogoje za obetavne raziskave v prihodnosti.

GLAVNI DOSEŽKI V LETU 2013

Koordinatorstvo EU projekta CYTOTHREAT

V letu 2013 se je nadaljevalo izvajanje raziskovalnega projekta 7. Okvirnega programa CYTOTHREAT (Fate and effects of cytostatic pharmaceuticals in the environment and the identification of biomarkers for and improved risk assessment on environmental exposure, Collaborative project), ki ga koordinira izr. prof. Metka Filipič, NIB. Pomembni dosežki so razvoj in validacija novih analitskih metod za detekcijo citostatikov in njihovih produktov razgradnje, potrditev prisotnosti v vzorcih odpadnih in površinskih vod, ter ekotoksikološki podatki o učinkih izbranih citostatikov na vodne organizme različnih trofičnih ravni pri kronični, več generacijski izpostavljenosti.

senite combined with CatL inhibition in GBM cells, where increased GBM cell death was noted. We used also the CatL inhibitor that was synthesized in close collaboration with the group from CEA, France (prof. Vincent Dive). At cancer treatment same effect could thus be obtained by CatL inhibition and the use of lower dosage of arsenite in the form of Trisenox cure (As_2O_3).

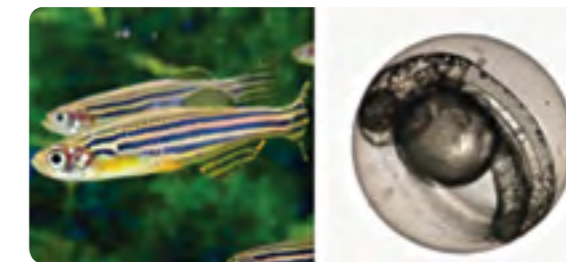
- *In our studies we used also the Systems biology approach. With transcriptomics, a set of proteolytic enzymes was identified. Those were shown to be increased in tumour cells ie. U87MG and in tissues when compared to normal counterparts and vary between in vitro cell and in vivo tissue samples as well. In tumours the enhanced expression of cathepsin K was noted. This is a lysosomal proteases, a many we have been studying for years, yet so far as others have not paid attention to it. The role of CatK in GBM thus remains unsolved, yet the CatK appears very important for the identification of biomarkers involved in GBM progression.*

- *New biomarkers appear even more useful, when they could be detected in blood, which also became our focus. With antibody microarrays we managed to identify some proteins present at increased amounts in the sera of GBM patients, which shall be investigated in detail in future. In similar study when cooperating with UKC Maribor (prof. Tadej Strojnik) we identified increased sedimentation rate (of erythrocytes – ESR) and the amount of C-reactive protein (CRP) in the blood of GBM patients. Latter is more pointing towards the increased systemic anti-tumour immune response, than on tumour biomarkers release.*

- *Within our studies to the interactions among tumour cells and mesenchymal stem cells in gliomas, the deconvolution analysis of the transcriptomic data of direct U87 and MSC cocultures has been performed in cooperation with the University of Potsdam (prof. Joachim Selbig). This enabled us to identify the candidate genes, whose expression is direct cell-cell contact dependent. In parallel we have been testing the interactions between MSC modified for TRAIL ligand expression and GBM cells. This was done in cooperation with Massimo Domenici (Italy). Namely, TRAIL ligand selectively binds to GBM cells and induces their death.*

Cebriča (Danio rerio) in njen zarodek. The zebrafish (Danio rerio) and its embryo.

(Foto | Photo: Dr. Miloš Vittori)



- *We have also initiated the experiments with animal model –zebra fish embryos, that was established as alternative for characterisation and therapy of GBM. Our preliminary research, in which we either injected tumour cells into the yolk sac or implanted them into the head of zebrafish embryos, enabled us to optimize the procedures for promising future research.*

IMPORTANT ACHIEVEMENTS IN 2013

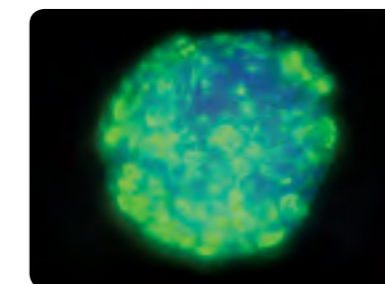
Coordination of the EU project CYTOTHREAT

In 2013 we continued with the FP7 project CYTOTHREAT (Fate and Effects of Cytostatic Pharmaceuticals in the Environment and the Identification of Biomarkers for and Improved Risk Assessment on Environmental Exposure, Collaborative Project), coordinated by Dr. Metka Filipič. The most important achievements are development and validation of new analytical methods for detection of cytostatics and their transformation products, Confirmation of their presence in environmental samples, and ecotoxicological data on the adverse effects of selected cytostatics to aquatic organisms from different trophic levels after chronic, multi generation exposure.

Sferoid glioblastomskih matičnih celic, kjer je z zeleno fluorescenco označen nestin, označevalec matičnih celic (100x povečava).

Glioblastoma stem cells derived spheroid, where a stem cell marker nestin is labeled with green fluorescence (100x magnification).

(Foto | Photo: Dr. Neža Podergajs)



Vodenje in koordinacija INTERREG Projekta Slovenija - Italija

Nadaljuje se izvajanje projekta GLIOMA (Določanje novih biomarkerjev možganskih tumorjev – gliomov za diagnozo in kot nove tarče zdravljenja), ki ga koordinira prof. Tamara Lah Turnšek. Projekt poteka v okviru Programa čezmejnega sodelovanja Slovenija – Italija 2007–2013- INTERREG, njegov cilj pa je povezati raziskave s klinično uporabo za celovit in enoten način zdravljenja bolnikov z gliomi v med-obmejni regiji v okviru mreže institucij, ki ga sestavljajo bolnišnice in raziskovalna središča, ki se ukvarjajo z raziskavami in uvajanjem biotehnologije na področju onkologije ter z zdravljenjem raka. V okviru te mreže potekajo stalna srečanja, npr. 22. decembra 2013 na Univerzi v Udinih, je bilo organizirano s strani Nacionalnega inštituta za biologijo in Univerze v Udinih. Sicer zelo strokovno srečanje se je zaključilo s poljudno predstavitvijo rezultatov projekta, ki jo je pripravila dr. Daniella Cesselli. Rezultati projekta bodo uporabni za oblikovanje nove diagnostike nastanka in spremljanja razvoja bolezni in napovedovanje odziva na zdravljenje. Novi biomarkerji bodo lahko uporabni tudi kot nove tarče zdravljenja in bodo omogočali načrtovanje individualiziranega zdravljenja onkoloških bolnikov.

Patent

Na urad za intelektualno lastnino RS je bil podeljen patent sodelavcu naše skupine dr. Bojanu Sedmaku, ki opisuje originalen pristop k preprečevanju masovnega pojavljanja škodljivih cianobakterij in je nastal v okviru sodelovanja z Biotehniško fakulteto in podjetjem Archel, d.o.o..

(LEŠTAN, Domen, SEDMAK, Bojan, LAKOVIČ, Gorazd. *Preprečevanje masovnega pojavljanja škodljivih cianobakterij* : patent št. 23987 (A), 2013-08-30. Ljubljana: Urad RS za intelektualno lastnino, 2013. 5 str.)

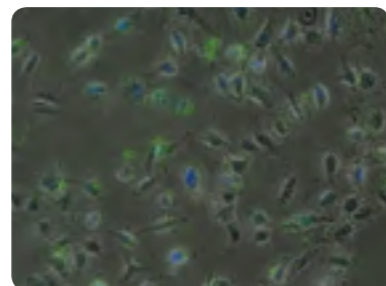


Gojenje cianobakterij v laboratoriju.
Growing of cyanobacteria in laboratory.

(Foto | Photo: Dr. Tina Eleršek)

Celice A549 označene z aptamerami (zelena fluorescenca).
A549 cells labeled with aptamers (green fluorescence).

(Foto | Photo: Mateja Delač)



SODELOVANJE Z RAZLIČNIMI UPORABNIKI

Uporabnost naših raziskav in povezave z gospodarstvom

V okviru sodelovanja s podjetjem BIA d.o.o. v Ljubljani se pri nas izobražuje doktorska študentka na področju biologije raka.

Uspešno sodelujemo s podjetjem Inštitut za ekološki inženiring iz Maribora, ki se ukvarja z razvojem in projektiranjem čistilnih naprav, sistemov za pripravo pitne vode, odlagališči odpadkov ter presojo vplivov na okolje. Pri nas se na področju ekotoksikologije izobražujeta dva pri njih zaposlena doktorska študenta.

V okviru Kompetenčnega centra Brin sodelujemo s firmo Vitiva doo, pri svetovanju za pripravo registracijske dokumentacije in testiranju genotoksičnosti njihovih aditivov.

V okviru Centra Odličnosti COBIK sodelujemo na področju priprave oz. testiranja aptamer za določevanje cirkulirajočih tumorskih celic.

Za potrebe naročnikov iz gospodarstva smo izvajali ekotoksikološka testiranja (toksikološki test na zardkih rib cebric) odpadnih vod in genotoksikološka testiranja (bakterijski test povratnih mutacij, *in vitro* indukcija mikrojedr in poškodb DNA) novih substanc in proizvodov.

Poseben pomen naših dejavnosti za državo in politiko

Za potrebe Ministrstva za okolje in prostor RS in Agencije za Okolje izvajamo redni letni monitorin ekološke kakovosti celinskih voda za dva biološka elementa: fitoplankton in fitobentos. Pridobili smo mednarodni certifikat za določanje in kvantifikacijo fitoplanktonskih vrst.

Za Upravo za zaščito in reševanje pri Ministrstvu za

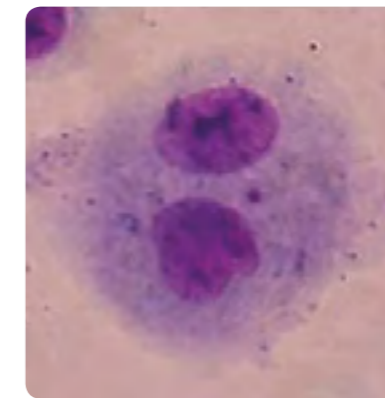
Coordination of the Slovenia-Italy INTEREG project GLIOMA

The implementation of the project GLIOMA (Determination of New Brain Tumour Biomarkers – Gliomas for Diagnosis and as New Therapeutic Targets) coordinated by Dr. Tamara Lah Turnšek is continuing. The project is part of the Slovenian – Italian overboard collaboration program 2007–2013. Its goal is to link clinically useful research aiming at systemic and unanimous treatment of GBM patients in the cross-border region with direct clinical users. This could be achieved within the network of institutions, consisting of hospitals and research centres that are dealing with research and results translation into clinics in the field of oncology. Within this network regular meetings are coordinated and i.e. on the 22nd of December 2013 the Winter Assembly of »GLIOMA« partners was organized at University of Udine by the co-ordinator – National institute of biology and partner University of Udine. The Assembly ended with the overall project presentation, given by dr. Daniella Cesselli. The results of this project – identified novel biomarkers shall be translated into clinical diagnostics, addressing cancer development and progression, as well as predictive therapy response and development of novel therapeutic strategies. By their clinical translation, the »GLIOMA« project shall contribute to personalized medicine – establishment of patient tailored therapies in oncology.

Patent

A patent application describing a new original approach for the prevention of harmful cyanobacterial blooms has awarded at The Slovenian Intellectual Property Office (SIPO)

LEŠTAN, Domen, SEDMAK, Bojan, LAKOVIČ, Gorazd. Prevention of harmful cyanobacteria mass occurrence: Pat. 23987 (A), 2013-08-30. Ljubljana: Institute of Intellectual Property, 2013. 5 p., [Illustration.]. [CO-BISS.SI-ID 2885199]



Dvojedrna celica z mikrojedrom.
Binucleated cell with a micronucleus.

(Foto | Photo: Dr. Bojana Žegura)

Kvantifikacija živosti celic s testom MTT na ploščici s 96-luknjicami.
Quantification of cell viability with the MTT assay on 96-well plate.

(Foto | Photo: Dr. Bojana Žegura)

COLLABORATION WITH VARIOUS USERS

Our research applications of and collaboration with commercial entities

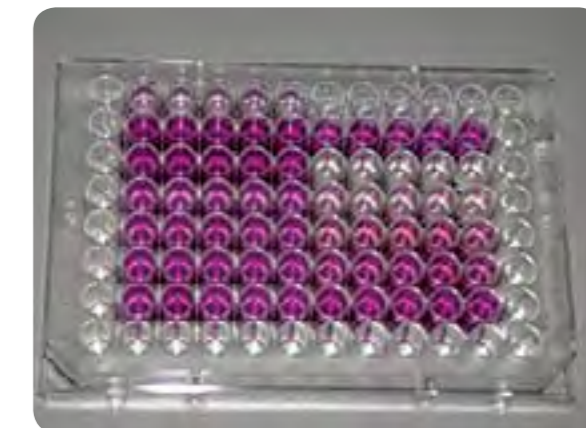
In the frame of the collaboration with the company BIA d.o.o from Ljubljana, at our department a doctoral student is educated in the field of cancer research.

We successfully collaborate with the Institute for ecologic engineering, from Maribor that develops and designs waste water treatment plants, systems for drinking water preparation, waste landfills as well as with the assessment of the environmental impacts. At our department two doctoral students employed in the Institute for ecologic engineering are educated in the field of ecotoxicology.

In the Competence Centre for Biological Research and Innovation – BRIN we are collaborating with the company Vitiva doo from Markovci that develops food additives based on natural compounds.

Within the collaboration with The Centre of Excellence COBIK we collaborate in the development and testing of aptamers for determination of circulating tumour cells.

For different clients from industry we conduct ecotoxicological testings of waste waters (zebrafish embryo



obrambo RS smo z dolgoletno pogodbo zadolženi za strokovno svetovanje in ukrepanje v primeru napada z orožji in sredstvi za množično uničevanje ter s klasičnimi terorističnimi sredstvi.

RAZISKOVALNA INFRASTRUKTURA

Oddelek za gensko toksikologijo in biologijo raka ima naj sodobnejše opremljene laboratorije za celično biologijo, molekularno biologijo in biokemijo. Razpolaga z opremo za pretočno citometrijo, fluorescenčno mikroskopijo, spektrofotometrijo, kvantitativno reverzno transkripcijo in verižno reakcijo s polimerazo v realnem času (QRT-PCR) ter ima dostop do konfokalne in elektronske mikroskopije. Skupaj z visoko usposobljenim raziskovalnim kadrom zagotavlja vrhunske raziskovalne rezultate in storitve. Za komercializacijo teh storitev smo v zaključni fazi opemljanja laboratorija s potrdilom Dobre laboratorijske prakse (DLP).

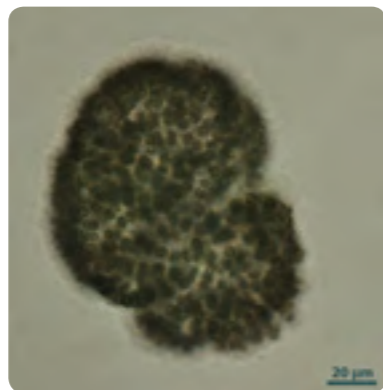
MEDNARODNO SODELOVANJE

Oddelek za gensko toksikologijo in biologijo raka je v letu 2013 sodeloval s številnimi mednarodnimi partnerji. V okviru raziskovalnega projekta 7.OP CYTOTHREAT (www.cytothreat.eu) formalno sodelujemo s partnerji iz petih evropskih držav.

V okviru INTERREG projekta GLIOMA sodelujemo s partnerji iz sosednjih pokrajin Italije.

V okviru mreže GIF -Glioma Invasion Forum sodelujemo z več partnerji EU, še posebej z Univerzo v Heidelbergu, Univerzo v Bergenu in Univerzo v Portsmouthu. Posebna sodelovanja skupnega mentorstva na doktorskem usposabljanju imamo z Amsterdam Medical Centre Univerze v Amsterdamu in s Federalno Univerzo Rio de Janeiro.

Prek ARRS bilateralnih projektov sodelujemo s partnerji iz Federalne Univerze Rio de Janeiro (prof. San-



Potencialno strupena cianobakterija *Woronichinia naegeliana* se pogosto pojavlja tudi v Sloveniji.

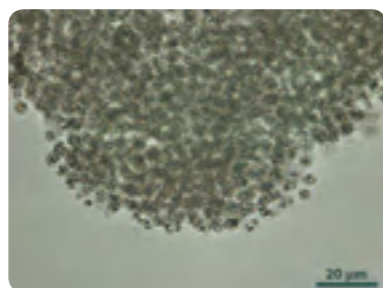
Potentially toxic cyanobacterium Woronichinia naegeliana often occurs in Slovenia.

(Foto | Photo: Dr. Tina Eleršek)

Cianobakterija *Microcystis aeruginosa*.

Cyanobacterium Microcystis aeruginosa.

(Foto | Photo: Dr. Tina Eleršek)



dra Azevedo), Brazilija na področju ekotoksikologije in biologije raka, Univerze Szent Istvan, Oddelek za akvakulture, Gödöllő; Madžarska na področju ekotoksikologije in eksperimentalne onkologije.

Posredno preko COBIK-a sodelujemo tudi z Univerzo v Sao Paulu (prof. Henig Ulrich) na projektu # BI-BR/12-14-007 s področja razvoja aptamer za celično diagnostiko napredovanja karcinomov. Drug je projekt # 402468/2012-0 Linha 2, to je štipendija za posebno gostujočega raziskovalca -Tamaro Lah Turnšek, na področju raziskav tumorskih in matičnih celic.

Sodelujemo v mednarodnem COST projektu: »Cyanobacterial blooms and toxins in water resources: Occurrence, impacts and management« - CYANOCOST (COST Action ES1105; nosilec: dr. Triantafyllos Kaloudis).

IZOBRAŽEVALNE DEJAVNOSTI IN PROMOCIJA ZNANOSTI

Sodelavci Oddelka za gensko toksikologijo in biologijo raka sodelujejo v študijskih programih Univerze v Ljubljani, Univerze v Novi Gorici, Univerze na Primorskem in Visoke šole za varstvo okolja Velenje. Kot predavatelji in mentorji smo vključeni tudi v delo Mednarodne podiplomske šole Jožef Stefan.

V popularizacijo znanosti se vključujemo prek objavljanja poljudnih člankov za dnevni tisk in poljudno-znanstvene revije, intervjujev za različne medije, razstav za splošno javnost ter poljudno znanstvenih predavanj na različnih simpozijih.

toxicity test) and genotoxicological testings of new substances and products (bacterial reverse mutation assay, in vitro micronucleus assay and comet assay).

Relevance of our activities for the state and politics

For the purposes of the Ministry for Environment and space RS and Agency of Environment we are conducting regular monitoring of the ecological quality of surface waters for phytoplankton and phytobenthos. We have obtained international certificate for determination of phytoplankton species.

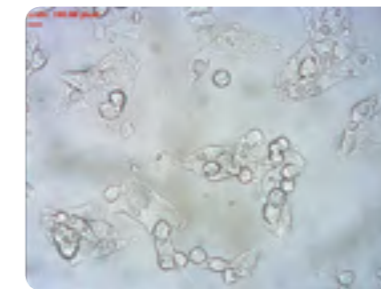
In a long-term contract with the Administration for Civil Protection and Disaster Relief of the Ministry of Defence RS we are responsible for expert advice and action in case of an attack with weapons for mass destruction or classical terroristic weapons.

RESEARCH INFRASTRUCTURE

The Department for Genetic Toxicology and Cancer Biology has the most up-to date equipped laboratories for cell biology, molecular biology and biochemistry. We have equipment for flow cytometry, fluorescent microscopy, spectrofluorometry, real time quantitative reverse transcription polymerase chain reaction (QRT-PCR) as well as access to confocal and electron microscopy. Together with highly qualified research staff we guarantee excellent research results and services.

INTERNATIONAL COLLABORATION

In 2013 the Department for Genetic Toxicology and Cancer Biology collaborated with numerous international partners. In the frame of the FP7 project CYTOTHREAT (www.cytothreat.eu) we formally collaborate with partners from five European countries.



Celična linija HepG2.
HepG2 cell line.

(Foto | Photo: Dr. Alja Štraser)

In the frame of the INTERREG project GLIOMA we collaborate with partners from Italy.

Within the network of GIF -Glioma Invasion Forum we collaborate with several partners in EU, in particular with the University of Heidelberg, University of Bergen and University of Portsmouth. Particular agreements on joint PhD studies are carried out with the Amsterdam Medical Centre, University of Amsterdam and with the Federal University of Rio de Janeiro.

Within ARRS bilateral projects we collaborate with partners at Federal University of Rio de Janeiro in Brazil in the field of ecotoxicology, with Istvan University, Department of Aquaculture, Gödöllő, Hungary in the field of ecotoxicology and experimental oncology and Columbia University, New York, USA in the field of nanotoxicology.

Collaboration in the COST Action: »Cyanobacterial blooms and toxins in water resources: Occurrence, impacts and management« - CYANOCOST (COST Action ES1105; carrier: dr. Triantafyllos Kaloudis).

Indirectly through COBIK we collaborate with the University of Sao Paulo (prof. Henning Ulrich) on the project #BI-BR/12-14-007 in the field of aptamer development for cellular diagnostics of tumour progression. Other project is #402468/2012-0 Linha 2, is a fellowship for distinguished researcher - Tamara Lah Turnšek received on the subject of tumour and stem cell research.

EDUCATIONAL ACTIVITIES AND PROMOTION OF SCIENCE

Members of the Department for Genetic Toxicology and Cancer Biology are actively involved in educational programs of the University Ljubljana, University in Nova Gorica, University of Primorska and High School for Environmental Protection, Velenje. As lectures and mentors we are also engaged in the International Graduate School Jožef Stefan.

NAJPOMEMBNEJŠE OBJAVE V 2013

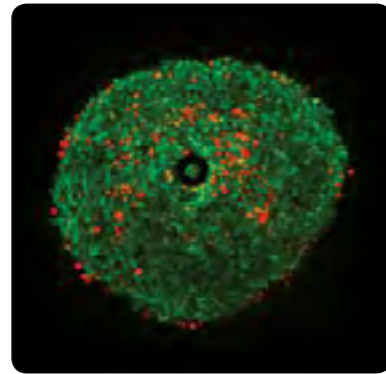
UVB sevanje predstavlja možni selektivni faktor ki favorizira cvetenje cianobakterij, ki proizvajajo mikrocin

Vsi rodovi in vrste cianobakterij, ki so sposobne uravnati svoj položaj v vodnem stolpcu, so vsaj občasno izpostavljeni višji radiaciji med njihovo vertikalno migracijo. Na vodni površini se namreč lahko pojavijo večkrat na dan. Izpostavitve UVB žarčenju povzročajo poškodbe genetskega materiala, citoskeletnih elementov, večje hitrosti usedanja in posledično tudi celično smrt. Rezultati kažejo, da ima lahko povečana sončna radiacija v zmernem pasu največji učinek na cvetenje cianobakterij med oblikovanjem cveta v spomladanskem času in zgodaj poleti. UVB žarčenje v tem obdobju bi lahko vplivalo na sestavo cianobakterijskega cveta v prid sojem, ki so sposobni tvoriti mikrocin. DING, Yi, SONG, Lirong, SEDMAK, Bojan. UVB radiation as a potential selective factor favoring microcystin producing bloom forming cyanobacteria. *PLoS one*, ISSN 1932-6203, 2013, vol. 8, issue 973919. <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0073919>.

Ali je cianobakterijski toksin cilindrospermopsin nevarnejši od mikrocinov

V tej raziskavi je pri HepG2 celicah CYN povzročil dvoveržne prelome DNA, morfološke spremembe in ustavitve celičnega cikla kar dodatno dokazuje genotoksično in potencialno karcinogeno delovanje tega toksina. Skupaj z našimi predhodnimi raziskavami ti rezultati kažejo, da je genotoksična aktivnost in potencialna karcinogenost cilindrospermopsina večja od aktivnosti mikrocinov, kar bo treba upoštevati pri oceni tveganja za zdravje ljudi.

ŠTRASER, Alja, FILIPIČ, Metka, NOVAK, Matjaž, ŽE-GURA, Bojana. Double strand breaks and cell-cycle arrest induced by the cyanobacterial toxin cylindrospermopsin in HepG2 cells. *Marine drugs*, ISSN 1660-3397, 2013, vol. 11, no. 8, str. 3077-3090. <http://www.mdpi.com/1660-3397/11/8/3077>



Kvantifikacija živih in mrtvih celic pri sferoidih celic U87, z znanim številom celic.

Quantification of live and dead cells in U87 derived spheroid, with a known number of cells.

(Foto | Photo: Dr. Monika Primon)

Utišanje katepsina L lahko poveča učinkovitost terapije z arsenom trioksidom v možganskih tumorjih.

Navkljub novim metodam zdravljenja, ostaja glioblastom multiforme najbolj agresivna oblika možganskega raka z najkrajšim preživetjem. Arsenit (As_2O_3) se že uporablja v zdravljenju akutne promielocitne levkemije, njegov učinek na te tumorje ni dobro poznan. S testi metabolne aktivnosti in preživetja smo dokazali, da dolgodobno utišanje katepsina L znatno povečamo citotoksičnost arsenita v sferoidih možganskih tumorskih celic (U87) najverjetneje tako, da zniža prag občutljivosti na apoptozo. Te rezultate je možno prenesti v klinično uporabo, kjer bi z inhibicijo katepsina L lahko znatno zmanjšali odmerek strupenega arsenita za isti citotoksičen učinek na možganski tumor.

PRIMON, Monika, HUSZTHY, Peter C., MOTALN, Helena, TALASILA, Krishna M., TORKAR, Ana, BJERKVIG, Rolf, LAH TURNŠEK, Tamara. Cathepsin L silencing enhances arsenic trioxide mediated *in vitro* cytotoxicity and apoptosis in glioblastoma U87MG spheroids. *Experimental cell research*, ISSN 0014-4827, 2013, vol. 319, iss. 17, str. 2637-2648.

MAIN PUBLICATIONS IN 2013

UVB radiation as a potential selective factor favoring microcystin producing bloom forming cyanobacteria.

All buoyant genera and species of cyanobacteria are at least periodically exposed to higher irradiation during their vertical migration to the surface that usually occurs several times a day. UVB exposure causes damage to the genetic material, cytoskeletal elements, higher sedimentation rates and consequent cell death. Our results suggest that increased solar radiation in temperate latitudes have strongest effect during cyanobacterial bloom formation in spring and early summer. UVB radiation in this period may significantly influence strain composition of cyanobacterial blooms in favor of microcystin producers.

DING, Yi, SONG, Lirong, SEDMAK, Bojan. UVB radiation as a potential selective factor favoring microcystin producing bloom forming cyanobacteria. *PLoS one*, ISSN 1932-6203, 2013, vol. 8, issue 9, str. e73919. <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0073919>, doi:10.1371/journal.pone.0073919. [COBISS.SI-ID 2888271]

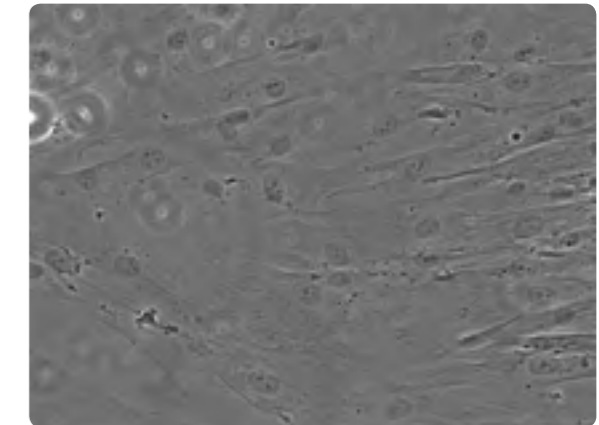
Is the cyanobacterial toxin cylindrospermopsin more dangerous than microcystins

In the present study in HepG2 cells CYN induced formation of DNA double strand breaks (DSBs), morphological changes and cell cycle arrest. The results provide new evidence that CYN is a direct acting genotoxin and a potential carcinogen. Together with our previous studies these results also indicate that genotoxicity and potential carcinogenicity of CYN is higher from that of microcystins, which needs to be considered in the human health risk assessment.

ŠTRASER, Alja, FILIPIČ, Metka, NOVAK, Matjaž, ŽE-GURA, Bojana. Double strand breaks and cell-cycle arrest induced by the cyanobacterial toxin cylindrospermopsin in HepG2 cells. *Marine drugs*, ISSN 1660-3397, 2013, vol. 11, no. 8, str. 3077-3090.

Mezenhimske matične celice iz kostnega mozga (200x povečava).
Bone marrow mesenchymal stem cells (200x magnification).

(Foto | Photo: Barbara Breznik)



Cathepsin L silencing could enhance the efficiency of Arsenite therapy in GBM patients

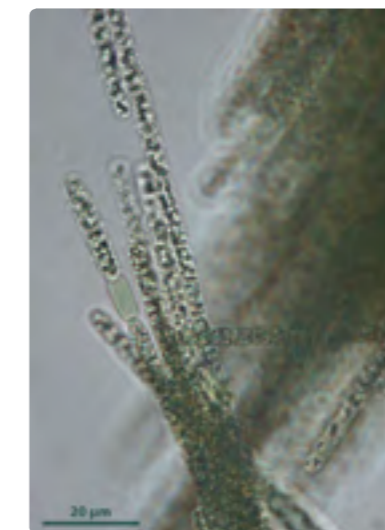
Despite improved treatment options, glioblastoma multiforme remains the most aggressive brain tumour with the shortest survival. Arsenite (As_2O_3) is already being used in the treatment of acute promyelocytic leukaemia, yet its effects on brain tumours have not been evaluated in detail. Using metabolic and cell viability assays, we demonstrated that long term CatL silencing significantly increased arsenite cytotoxicity in U87MG spheroids, possibly via increasing the apoptotic threshold in the cells. The results have significant translational impact, since stable CatL silencing would enable the application of lower systemic doses of arsenite to achieve the desired cytotoxic effects on glioblastoma *in vivo*.

PRIMON, Monika, HUSZTHY, Peter C., MOTALN, Helena, TALASILA, Krishna M., TORKAR, Ana, BJERKVIG, Rolf, LAH TURNŠEK, Tamara. Cathepsin L silencing enhances arsenic trioxide mediated *in vitro* cytotoxicity and apoptosis in glioblastoma U87MG spheroids. *Experimental cell research*, 2013, vol. 319, iss. 17, str. 2637-2648.

Potencialno strupena cianobakterija *Aphanizomenon flos-aque* se pogosto pojavlja tudi v Sloveniji.

Potentially toxic cyanobacterium *Aphanizomenon flos-aque* often occurs in Slovenia.

(Foto | Photo: Dr. Tina Eleršek)



Raziskovalni program, ki ga financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Program Financed by Slovenian Research Agency*

- Ekotoksikologija, toksikološka genomika in karcinogeneza/ Eco-toxicology, Toxicogenomic and Carcinogenesis (P1-0245), vodja programa / *the research programme leader* prof. dr. Tamara Lah Turnšek

Raziskovalni projekti, ki jih financira Javna agencija za raziskovalno dejavnost Republike Slovenije *Research Projects Financed by Slovenian Research Agency*

- Dvojna narava matičnih celic v raku in njihova uporaba v zdravljenju / *Dual Nature of Stem Cells in Cancer and Their Application in Therapy* (J1-4247), nosilka projekta/*principal investigator* prof. dr. Tamara Lah Turnšek.
- Hipoksična neaktivnost: implikacije za odpoved srca, pljučno insuficienco in prekomerno težo / *Hypoxic Inactivity: Implications for Heart Failure, Respiratory Insufficiency and Obesity* (L3-4328), (NIB – prof. dr. Tamara Lah Turnšek), pridruženi / *joint partners*.
- Strupene kovine in organokovinske spojine v kopenskem okolju / *Toxic Metals and Organometallic Compounds in the Terrestrial Environment* (J1-4140), (NIB – prof. dr. Metka Filipič), pridruženi / *joint partners*.
- Apoptotično delovanje alkilpiridinijevih spojin na celice pljučnega adenokarcinoma / *Apoptotic Effects of Alkylpyridinium Compounds on Lung Adenocarcinoma Cells* (J1-4044), (NIB – prof. dr. Metka Filipič), pridruženi / *joint partners*.
- Priprava in validacija terapevtskih plazmidov brez selekcije gena za antibiotično rezistenco za gensko terapijo raka z inducibilnimi in tkivno specifičnimi promotorji / *Preparation and Validation of Therapeutic Plasmids without Selection Gene for Antibiotic Resistance for Cancer Gene Therapy Using Inducible and Tissue-Specific Promoters* (J3-4259), (NIB – prof. dr. Metka Filipič), pridruženi / *joint partners*.

Mednarodni raziskovalni projekti *International Research Projects*

- EU projekt 265264, CytoThreat, Učinki citostatikov v okolju in identifikacija biomarkerjev za izboljšanje ocene tveganja v okolju / *Fate and Effects of Cytostatic Pharmaceuticals in the Environment and the Identification of Biomarkers for and Improved Risk Assessment on Environmental Exposure-CytoThreat*, koordinator / *coordinator* NIB, prof. dr. Metka Filipič.
- Mednarodni projekt (INTERREG) GLIOMA, Določanje novih biomarkerjev možganskih tumorjev – gliomov za diagnozo in kot nove tarče zdravljenja/ *Determination of New Brain Tumor Biomarkers – Gliomas for Diagnosis and as new Therapeutic Targets*, koordinator / *coordinator* NIB, prof. dr. Tamara Lah Turnšek
- COST Action ES1105: »Cyanobacterial blooms and toxins in water resources: Occurrence, impacts and management« - CYANOCOST (coordinator dr.Triantafyllos Kaloudis; članici uparvnega odbora/ members of management committee: doc. dr. Bojana Žegura, dr. Tina Eleršek).

- Mikrovalovna kataliza in kemijska karcinogeneza/*Microwave Catalysis and Chemical Carcinogenesis* (J1-5448), (NIB – prof. dr. Metka Filipič), pridruženi / *joint partners*.
- Ostanke zdravilnih učinkovin in sredstev za osebno nego v okolju: prisotnost, viri, čiščenje in učinki/*Pharmaceutical and personal care product residues in the environment: Occurrence, sources, treatment and effects* (L1-5457) (NIB – prof. dr. Metka Filipič), pridruženi / *joint partners*.
- Razvoj in aplikacije novih metod semantičnega rudarjenja podatkov v znanostih o življenju/ *Development and applications of new semantic data mining methods in life sciences* (J1-5478) (NIB – dr. Helena Motaln), pridruženi / *joint partners*.
- Nadzorovanje škodljivega cvetenja cianobakterij v sladkovodnih telesih/*Control of harmful cyanobacteria bloom in fresh-water bodies* (L1-5456) (NIB – prof. dr. Bojan Sedmak), pridruženi / *joint partners*.

Bilateralni raziskovalni projekti *Bilateral Research Projects*

- BI-BR/11-13-004: Prenos in izvedba metod za monitoring produkcije toksinov in razkroja cianobakterijskih cvetenj na vzorce iz tropskega okolja /*Transfer and Implementation of Methods for Toxin Production and Cyanobacterial Bloom Degradation Monitoring in Samples from Tropical Environment*, nosilec projekta/*principal investigator* prof. dr. Bojan Sedmak.

Razvojni projekti *Development Projects*

- MOP, Spremljanje ekološkega stanja jezer v letu 2013/*Monitoring of the Ecological Status of Lakes in 2013*, dr. Tina Eleršek
- MOP, Spremljanje ekološkega stanja površinskih vodotokov v letu 2013/ *Monitoring of the Ecological Status of Rivers in 2013*, dr. Gorazd Kosi
- MORS, Strokovno svetovanje in ukrepanje v primeru napada z orožji ali sredstvi za množično učenje ter s klasičnimi sredstvi./ *Expert Advising and Action in Case of an Attack by Weapons of Mass Destruction and by Classical Means.*, NIB, FITO in GEN dr. Bojan Sedmak, dr. Marina Dermastia.

Drugi raziskovalni projekti *Other Research Projects*

- KC BRIN, Kompetenčni center za biološki razvoj in inovacije / *Center of Competence for the Biological Development and Innovations*.

Organizacija znanstvenih in strokovnih srečanj *Organization of Scientific and Professional Meeting*

- The 8th EORTC PathoBiology Group Annual Meeting, April 18-20, 2013, Portorož, Slovenia.
- The 7th Conference on Experimental and Translational Oncology, April 20-24, 2013, Portorož, Slovenia.
- The 6th international summer school – ISS 2013 – part Modern approaches to research and treatment of cancer A, April 24-28, 2013, Marine Biology Station Piran, Piran, Slovenia.

Obiski in študijska izpolnjevanja na tujih raziskovalnih inštitucijah *Visits and Scientific Studies at Institutions Abroad*

- Urška Verbovšek, University of Udine, Italy (pri dr. Daniella Cesselli), 07/2013 – izvedba skupnih raziskav
- Neža Podergajs – University of Bergen, Department of Biomedicine, Norway, na Oddelku za Biomedicino (pri prof. Rolf Bjerkvig), 10/2013 – izvedba skupnih raziskav
- Tamara Lah Turnšek je v obdobju med julijem in oktobrom 2013 obiskala več institucij v Braziliji:
 - Zvezno univerzo Rio de Janeiro (UFRJ) s skupino **Prof Vivalda Moura Netta** s področju raka in matičnih celic oz razvojne biologije.
 - Na *Univerzi Sao Paulo* je imela *vabljen predavanje pri prof Ulrichu Henningu na Departamento de Bioquimica Instituto de Quimica Universidade de Sao Paulo, s katerim je povezana preko bilateralnega aplikativnega projekta na razvoju novih metod izolacije in detekcije matičnih celic.*
 - Na *Zvezni Univerzi Sao Paulo* je obiskala *Medicinsko Fakulteto, prof Mario Luizo Olivo, s katero sodeluje na področju proteaznih inhibitorjev.*

Obiski iz tujine *Visitors from Abroad*

- Prof. Ulrich Henning, University of Sao Paulo – obisk z namenom skupnega razvoja aptamer 04/2013
- Dr. Helen Fillmore, University of Portsmouth – obisk z namenom skupnega raziskovalnega dela na področju transkriptomike in proteolize 7/2013
- Prof. dr. Ron van Noorden in dr. Nadja Atai Univerza Amsterdam sta nas obiskala z namenom skupnega mentorstva in raziskovalnega dela na področju proteoliznih encimov, 11/2013
- prof. Sandra M.F.O. Azevedo from the Federal University of Rio de Janeiro, Carlos Chagas Filho Institute of Biophysics, Rio de Janeiro je NIB obiskala v okviru bilateralnega slovensko brazilskega projekta BI-BR/11-13-004: Prenos in izvedba metod za monitoring produkcije toksinov in razkroja cianobakterijskih cvetenj na vzorce iz tropskega okolja

Članstva v odborih mednarodnih organizacij, delovnih teles, ekspertnih skupinah / *Membership of International Boards and Expert Groups*

- FILIPIČ Metka: Članica programskega odbora Okolje (vključno s klimatskimi spremembami) 7. Okvirnega programa EU
- FILIPIČ Metka: Članica znanstvenega odbora za proizvode za zaščito rastlin pri Evropski agenciji za varno hrano (EFSA).
- ŽEGURA Bojana: predstavnica Slovenije v svetu Evropske zveze za mutagenozo okolja=European Environmental Mutagen Society
- ELERŠEK Tina: predstavnica Slovenije za fitobentos v okviru Okvirne vodne direktive – 3. faza interkalibracije

Članstva v odborih slovenskih organizacij, delovnih teles, ekspertnih skupin / *Membership of Slovenian Boards and Expert Groups*

- LAH TURNŠEK Tamara: KORIS- Koordinacija raziskovalnih institutov
- LAH TURNŠEK Tamara: Komisija za uveljavitev vloge žensk v znanosti pri MVZT – predsednica
- FILIPIČ Metka: članica znanstvenega odbora za namerno sproščanje GSO v okolje in dajanje izdelkov na trg vladi RS
- ŽEGURA Bojana: članica znanstvenega odbora za delo z GSO v zaprtem sistemu pri vladi RS

Sodelujoče organizacije *Cooperating Institutions*

Domače / *National*

- ARRS – Agencija za raziskovalno dejavnost RS
- Ministrstvo za okolje in prostor
- Ministrstvo za obrambo, Uprava RS za zaščito in reševanje
- Biotehniška fakulteta, Univerza v Ljubljani
- Fakulteta za farmacijo, Univerza v Ljubljani
- Veterinarska fakulteta, Univerza v Ljubljani
- Inštitut Jožef Stefan
- Onkološki inštitut, Ljubljana
- Univerza na Primorskem
- Univerza v Novi Gorici
- Educell doo
- Klinični oddelek za nevrokirurgijo UKC,
- BIA d.o.o.
- Bia Separations
- Vitiva, d.d.
- RR & CO. RAZISKAJE RAZVOJ IN PRENOS ZNANJA d.o.o.
- Inštitut za ekološki inženiring d.o.o.

Tuje / *International*

- Komisariat za atomsko energijo – Commissariat a l'Energie Atomique (CEA) – Oddelek za molekularni inženiring proteinov
- Institut for Biomedisin, University of Bergen, Norway;
- Inštitut za medicinska istraživanja, Zagreb, Hrvatska
- Szent Istvan University, Department of Aquaculture Gödöllő, Hungary
- Medical University of Vienna, Institute of Cancer Research, Austria
- Dipartimento Scienze della Vita of The Second University of Naples, Caserta, Italy
- Spanish Council for Scientific Research, Institute of Environmental Assessment and Water Research (IDAEA), Barcelona, Spain
- Institut za multidisciplinarna istraživanja Beograd, Srbija
- Institute of Technical Sciences of Serbian Academy of Sciences and Art, Belgrade, Srbija
- Federal University of Rio de Janeiro, Carlos Chagas Filho Institute of Biophysics, Rio de Janeiro Brazil

Uredniški odbori / *Editors*

- ISRN Toxicology (Print). FILIPIČ, Metka (član uredniškega odbora 2011-). Cairo: Hindawi Publishing Corporation. ISSN 2090-6188.
- Pathology oncology research LAH, Tamara,. (član uredniškega odbora 1997-). Budapest: Tud. Kiadó. ISSN 1219-4956.
- Radiology and oncology. FILIPIČ, Metka, LAH TURNŠEK, Tamara (član uredniškega odbora 2007-). Ljubljana: Slovenian Medical Society – Section of Radiology; [Zagreb]: Croatian Medical Association – Croatian Society of Radiology, 1992-.
- Raziskovalec. LAH, Tamara (član uredniškega odbora 1993-). Ljubljana: Ministrstvo za znanost in tehnologijo Republike Slovenije, 1971-2000. ISSN 0351-0727.
- Review of hydrobiology. KOSI, Gorazd (član uredniškega odbora 2008-). Ankara: Yincilik Egitim Hizmetleri, 2008-.
- 7th Conference on Experimental and Translational Oncology, Portorož, Slovenia, April, 20-24, 2013, SERŠA, Gregor (urednik), KOS, Janko (urednik), LAH TURNŠEK, Tamara (urednik), ČEMAŽAR, Maja (urednik), FILIPIČ, Metka (urednik), KRANJČ, Simona (urednik), MARKELC, Boštjan (urednik). Book of abstracts. Ljubljana: Association of Radiology and Oncology, 2013. 216 str. ISBN 978-961-91302-4-7.



Udeleženci rednega letnega sestanka projekta Glioma v Vidmu, decembra 2013.
Participants of the regular annual meeting of the Glioma project in Udine, December 2013.

(Foto | Photo: Dr. Neža Podergajs)

Predavanja in seminarji Lectures and Seminars

- FILIPČIČ, Metka Environmental occurrence and potential adverse effects of the residues of cytostatic drugs to aquatic organisms, International UNESCO conference »Emerging Pollutants in Water«, July, 9 – 11, 2013, Belgrade, Serbia.
- FILIPČIČ, Metka. Environmental occurrence and potential adverse effects of the residues of cytostatic drugs. V: 7th Conference on Experimental and Translational Oncology, Portorož, Slovenia, April, 20–24, 2013.
- FILIPČIČ, Metka, Potential adverse effects of the residues of cytostatic drugs in aquatic environment. International conference Pharmaceutical products in the environment: is there a problem? : June 3 – 4, 2013, Nîmes, France.
- FILIPČIČ, Metka, The occurrence of the residues of cytostatic drugs in the environment : is there a problem? 11th International Conference on Environmental Mutagens, Foz do Iguassu, PR, Brazil 3–8 November 2013.
- ŽEGURA, Bojana. Genotoxic potential of cylindrospermopsin : Universidade Federal do Rio de Janeiro, Centro de Ciências da Saúde, Instituto de Biofísica Carlos Chagas Filho, Rio de Janeiro, November, 11, 2013. Rio de Janeiro, 2013.
- ŽEGURA, Bojana. *Okoljski dejavniki in nastanek in razvoj rakavih obolenj : predavanje na: Noč raziskovalcev, Ljubljana (Nacionalni inštitut za biologijo), 27. september 2013.* Ljubljana, 2013.
- LAH TURNŠEK, Tamara. Introduction to the ISS Piran 2013 Part A : cancer – the emperor of all maladies. *Modern approaches to research and treatment of cancer: the 6th international summer school – ISS 2013 – part A, April 24–28, 2013, Marine Biology Station Piran, Piran, Slovenia.*
- LAH TURNŠEK, Tamara. Stem cell interactions in tumours. Modern approaches to research and treatment of cancer: the 6th international summer school – ISS 2013 – part A, April 24–28, 2013, Marine Biology Station Piran, Piran, Slovenia.
- LAH TURNŠEK, Tamara. Advances topics in tumor biology : Instituto de Química, Universidade de São Paulo, October 1–18, 2013. São Paulo, 2013.

- LAH TURNŠEK, Tamara. Biological characteristics of tumour cells : signalling pathways : predavanje na University of Sao Paulo–USP, 10. 10. 2013, Sao Paulo. Sao Paulo, 2013.
- LAH TURNŠEK, Tamara. Cancer as a disease : types of cancer, epidemiology and prevention : predavanje na University of Sao Paulo–USP, 1. 10. 2013, Sao Paulo. Sao Paulo, 2013.
- LAH TURNŠEK, Tamara. Carcinogenesis and carcinogens : viral carcinogenesis, oncogenes and tumour suppressor genes : predavanje na University of Sao Paulo–USP, 5. 10. 2013, Sao Paulo. Sao Paulo, 2013.
- LAH TURNŠEK, Tamara. Department of genetic toxicology and cancer biology : predavanje na Slovenskem znanstvenem inštitutu, Dunaj, 16. maj 2013. Dunaj, 2013.
- LAH TURNŠEK, Tamara. Metastasis, angiogenesis and antiangiogenic therapies : predavanje na University of Sao Paulo–USP, 25. 10. 2013, Sao Paulo. Sao Paulo, 2013.
- LAH TURNŠEK, Tamara. Origin of cancer cells : predavanje na University of Sao Paulo–USP, 15. 10. 2013, Sao Paulo. Sao Paulo, 2013.
- LAH TURNŠEK, Tamara. Tumour progression : growth characteristics and steps of progression : predavanje na University of Sao Paulo–USP, 20. 10. 2013, Sao Paulo. Sao Paulo, 2013.
- MOTALN, Helena. Harnessing systems biology approaches to study direct MSC and glioma (stem) cell interactions. V: 7th Conference on Experimental and Translational Oncology, Portorož, Slovenia, April, 20–24, 2013.
- MOTALN, Helena. Dual role of stem cells in cancer : inflammation. Modern approaches to research and treatment of cancer : the 6th international summer school – ISS 2013 – part A, April 24–28, 2013, Marine Biology Station Piran, Piran, Slovenia
- PODERGAJS, Neža. Transmembrane protein CD9 is a potential selective stem cell marker of glioblastoma stem-like cells: 8th EORTC PathoBiology Group Annual Meeting, April 18–20, 2013, Portorož, Slovenia
- TORKAR, Ana. Novel activity based probes for selective detection of cathepsin L: 8th EORTC PathoBiology Group Annual Meeting, April 18–20, 2013, Portorož, Slovenia

Pedagoška dejavnost in mentorstva Teaching and Mentorship

Diplomska dela / Graduate Theses

Tamara Lah Turnšek mentorica

- GORIČAN, Tjaša. Ovrednotenje adhezije mezenhimskih matičnih celic in glioblastomskih celic na proteine zunajceličnega matriksa : diplomsko delo. Ljubljana
- ZOTTEL, Alja. Ovrednotenje vpliva citostatikov (TMZ in STS) na glioblastomske matične celice z utišanim genom CD9 : diplomsko delo. Ljubljana.

Magistrska dela (Bolonski študijski program) / Master Theses (Bologna study programme)

Jana Nunič somentorica

- VANOVŠEK, Andreja. Citotoksični in genotoksični učinki izbranih citostatikov na človeške jetrne celice *in vitro* : magistrsko delo : magistrski študij – 2. stopnja = Cytotoxic and genotoxic effects of chosen cytostatics on human liver cells *in vitro* : M. Sc. Thesis : Master Study Programmes. Ljubljana
- BAJREKTAREVIČ, Džeja. Ugotavljanje genotoksičnega vpliva izbranih citostatikov na bakterije, človeške in ribje jetrne celice : magistrsko delo = Determination of genotoxic effects of selected cytostatics on bacteria and human and Zebrafish liver cells : M. Sc. Thesis, (Biotehniška fakulteta, Oddelek za živilstvo, Ljubljana, Magistrsko delo magistrskega študija – 2. stopnja Mikrobiologija, Ljubljana

Magistrska dela / Master Theses

Tamara Lah Turnšek mentorica, Helena Motaln somentorica

- OBREZ, Mateja. Proteolytic enzymes products in *in vitro* co-cultures of glioblastoma and mesenchymal stem cells : master thesis = Produkti proteoliznih encimov v *in vitro* kokulturah glioblastomskih in mezenhimskih matičnih celic : magistrsko delo

Doktorska dela / Doctoral Theses

Tamara Lah Turnšek mentorica

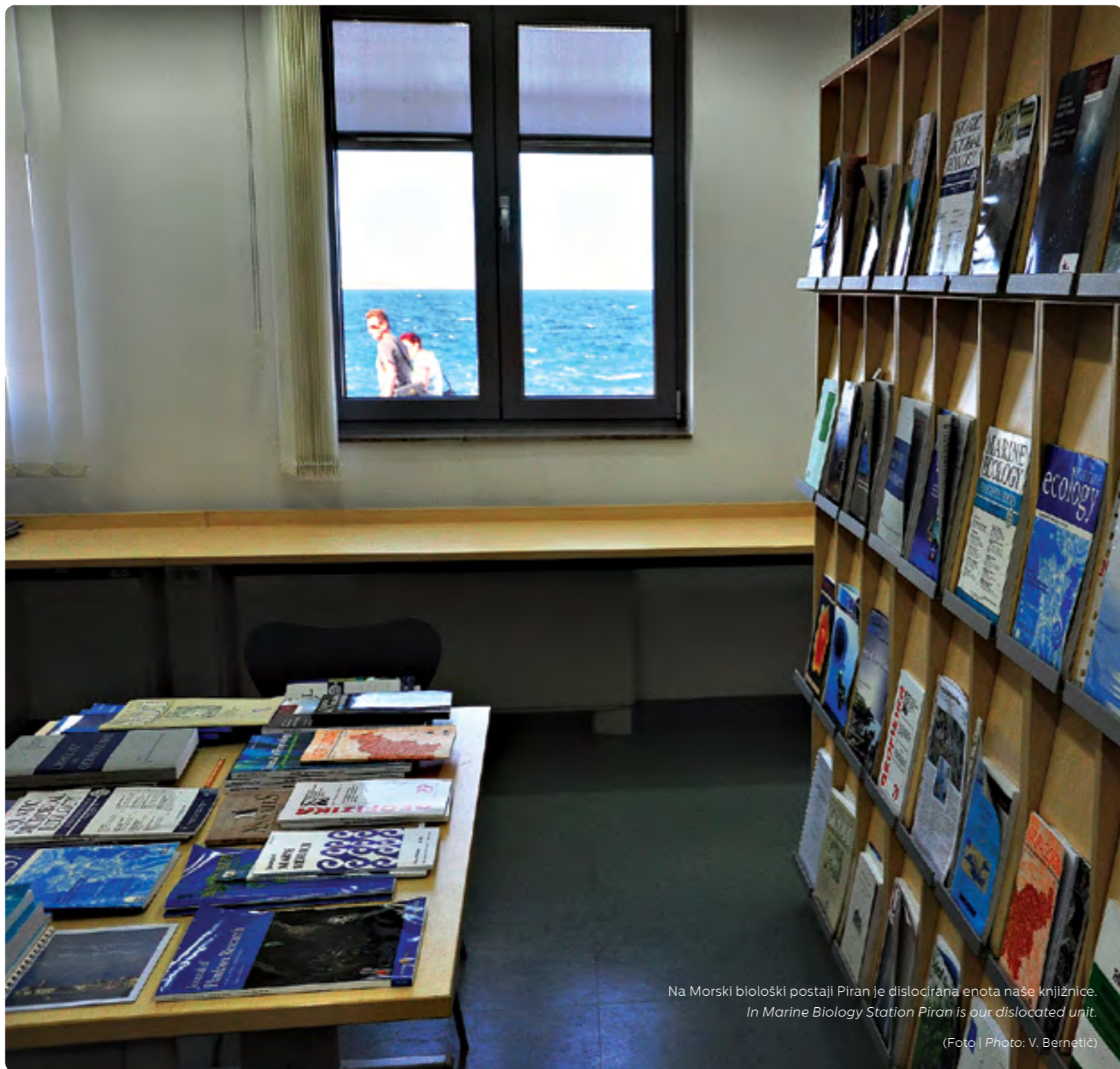
- PODERGAJS, Neža. Vloga signalnih poti EGFR in FGFR ter novih označevalcev pri glioblastomskih matičnih celicah : doktorska disertacija. Ljubljana
- TORKAR, Ana. Razvoj selektivnih inhibitorjev katepsina L = Development of selective cathepsin L inhibitors : doktorska disertacija. Ljubljana

Metka Filipič mentorica

- PEZDIRC, Marko. Mehanizmi toksičnega in genotoksičnega delovanja heterocikličnih aromatskih aminov in ekstraktov pečenega mesa v celicah človeškega hepatoma (HepG2) : doktorska disertacija = Mechanisms of the toxic and genotoxic mode of action of heterocyclic aromatic amines and grilled meat extracts in human hepatoma cell line (HepG2) : doctoral dissertation. Ljubljana

Bojana Žegura mentorica

- ŠTRASER, Alja. Genotoksično delovanje cianobakterijskih toksinov na humane celice v pogojih *in vitro*: doktorska disertacija = Genotoxic activity of cyanobacterial toxins in human cells *in vitro* : doctoral dissertation. Ljubljana



Na Morski biološki postaji Piran je dislocirana enota naše knjižnice.
In Marine Biology Station Piran is our dislocated unit.

(Foto | Photo: V. Bernetič)

8.0

BIOLOŠKA KNJIŽNICA *The Biology Library*

Vodja / Head

- **Barbara Černač**, univ. dipl. biol.

Naslov / Address

Nacionalni inštitut za biologijo / National Institute of Biology

Večna pot 111, SI-1000 Ljubljana

Tel.: + 386 (0)1 320 33 06 • Fax: + 386 (0)1 257 33 90, + 386 (0)1 241 29 80

E-mail: bioloska.knjiznica@bf.uni-lj.si

URL: www.nib.si/knjiznica

Facebook: <https://www.facebook.com/pages/Biološka-knjižnica/583732838309187?ref=stream>

Bio%C5%A1ka-knji%C5%BEnica/583732838309187?ref=stream

Sodelavci / Staff

- **Lučka Glavač**, višja knjižničarka, Biološka knjižnica - Ljubljana
- **Vlado Bernetič**, knjižničar, Biološka knjižnica - Morska biološka postaja Piran
- **Petra Writzl**, univ.dipl. bibl., prof. umet. zgod., Biološka knjižnica - Ljubljana



(Foto | Photo: B. Černač)

DEJAVNOST

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 podporni in servisna služba vključujemo v raziskovalne in pedagoške dejavnosti obeh ustanov. 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, novinarjem, prevajalcem...). Delujemo na dveh lokacijah: v Biološkem središču v Ljubljani in na Morski biološki postaji Piran na 595 m² s 67 čitalniškimi mesti.

KNJIŽNIČNA ZBIRKA

V letu 2013 smo z nakupom, kot obvezni izvod, z izmenjavo publikacij ali z donacijami pridobili 459 knjig, 101 diplomskih, magistrskih in doktorskih del, 243 letnikov revij in 31 enot neknjižnega gradiva. Pridobili smo bogato zasebno knjižnico pokojnega prof. dr. Toneta Wrabra z gradivom s področja botanike, rastlinske sistematike, fitogeografije....

Trenutno je v knjižnici skupaj 78 381 enot knjižničnega gradiva. V to številko je všteta zbirka 43 945 znanstvenih in strokovnih knjig, ki so večinoma razdeljene med uporabnike, zbirka 3 545 diplomskih, magistrskih in doktorskih del študentov Oddelka za biologijo, 2225 tekoče naročenih naslovov znanstvenih in strokovnih revij, ki jih deloma nabavljamo s finančno pomočjo Javne agencije za raziskovalno dejavnost Republike Slovenije (ARRS) ter 1 672 enot neknjižnega gradiva (zemljevidi, literatura na elektronskih medijih...).



Večina naših zbirk je v prostem pristopu.

Our library collections are mostly in open access shelving.

(Foto | Photo: B. Černač)

Prof. dr. Tone Wraber, 1938- 2010

Prof. dr. Tone Wraber, 1938- 2010

(Foto | Photo: Yerpo; Source: Wikipedia)



SISTEM COBISS IN NJEGOVI SERVISI

Polnopravni člani sistema Cobiss smo od leta 1992.

V letu 2013 smo v Biološki knjižnici nadaljevali z vnosom našega knjižničnega gradiva v COBIB.SI - Vzajemno bibliografsko-kataložno baza podatkov, kar služi potrebam gradnje knjižničnega kataloga in vodenju avtomatizirane izposoje.

V letu 2013 smo izvajali priprave na prehod v novo programsko okolje COBISS3/ Katalogizacija. Udeležili smo se potrebnega izobraževanja, se pričeli usposabljanje v testnem okolju in pridobivati licence za delo na novi programski platformi.

Zelo dobro sprejeta je spletna storitev "Moja knjižnica" (naročanje gradiva, rezerviranje gradiva, podaljšanje izposoje...), saj smo v letu 2013 zaznali več kot dvakraten porast njene uporabe.

INFORMACIJSKA, REFERALNA IN REFERENČNA DEJAVNOST

Obsežno področje našega dela je posredovanje najrazličnejših informacij našim uporabnikom: po elektronski pošti, telefonu ali v osebnem stiku dnevno sprejemamo vprašanja ter nudimo odgovore in pomoč v zvezi z našim knjižničnim gradivom, o uporabi servisov COBISS, o uporabi in načinu dostopa do elektronskih virov, o bibliografijah raziskovalcev, sistemu SICRIS...skratka o vseh področjih delovanja knjižnice. Svoje uporabnike obveščamo o novostih in jih sproti izobražujemo v samostojnem iskanju informacij po naši knjižnični zbirki in elektronskih informacijskih virih. V ta namen pripravljamo tudi zgibanke in letake za naše obiskovalce z navodili za uporabo posameznih segmentov ponudbe naše knjižnice. Zelo obiskane so tudi naše spletne strani in Facebook profil.

ACTIVITY

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. Our typical 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, journalists, translators...). The Library spreads out in two locations: in Ljubljana, The Biology Centre Building and in Piran, The Marine Biology Station on 595 m² of usable area with 67 places in reading room.

LIBRARY COLLECTION

In 2013 the increase of our library collection was 459 monographs, 101 graduation theses, M. Sc. theses and doctoral dissertations, 243 volumens of scientific and professional journals and 31 units of non-book material by purchase, publicatin exchange, donations.... . In September 2013 we gained comprehensive personal library collection of deceased Prof. Dr. Tone Wraber, botanist.

The Library holds over 78 381 scientific and professional books, graduation theses, M. Sc. theses, doctoral dissertations, scientific and professional journals and non-book matherial (maps, literature on DVDs, CD-ROMs...). Books are mainly distributed among users, but journals are archived in the Library. The purchase of serials is partially supported by Slovenian Research Agency.



Preko spletne storitve »Moja knjižnica« lahko naši uporabniki sami podaljšajo izposoje, naročijo ali rezervirajo naše gradivo...

With library web service »My library« our users can renew loan periods, order or reserve library matherials ...

(Foto | Photo: B. Černač)

Obsežno področje našega dela je posredovanje najrazličnejših informacij našim uporabnikom.

A extensive part of our work is the collection and distribution of information.

(Foto | Photo: L. Glavač)



COBISS SYSTEM AND ITS SERVICES

We have been members of the COBISS system since 1992.

In 2013 one of our main tasks was entering information about monographs, serials and non-book materials in the Slovene union bibliographic database and catalogue COBISS/ COBIB for the needs of Library catalog and computerized loan.

In 2013 we carry out preparation for transition to a new programming area-COBISS3 software system/ cataloguing. We attended education, training in a test version and obtained a licenses to work on the new software platforma.

In 2013 we observed a high increase of library web service »My library« usage : our users can renew loan periods, order or reserve library matherials ...

REFERENCE SERVICE

A extensive part of our work is the collection and distribution of information: we enable our users to ask questions and receive answers daily about all fields of our work by e-mail, telephone or in personal contact. We inform staff and students about the use and information searching in library collection and electronic information sources. For this purpose we prepare leaflets with instuctions for our users. Our web site and Facebook profile are also visited very well.

BIBLIOGRAFIJE RAZISKOVALCEV IN VREDNOTENJE RAZISKOVALNE USPEŠNOSTI

V sodelovanju z Inštitutom za biomedicinsko informatiko Medicinske fakultete Univerze v Ljubljani sproti dopolnjujemo bibliografske podatke naših raziskovalcev v nacionalni bibliografski zbirki Biomedicina slovenica in kot bibliografije raziskovalcev v sistemu Cobiss. Tako smo v letu 2013 v sistem COBISS vnesli preko 1400 bibliografskih zapisov naših raziskovalcev.

Z Osrednjim specializiranim informacijskim centrom za naravoslovje (OSIC N), Osrednjim specializiranim informacijskim centrom za biotehniko (OSIC BF) in Inštitutom informacijskih znanosti (IZUM) sodelujemo pri vrednotenju raziskovalne uspešnosti posameznikov in raziskovalnih skupin na osnovi njihovih bibliografij raziskovalcev v sistemu SICRIS.

PREGLEDOVANJE ZAKLJUČNIH DEL ŠTUDENTOV ODDELKA ZA BIOLOGIJO BIOTEHNIŠKE FAKULTETE UNIVERZE V LJUBLJANI

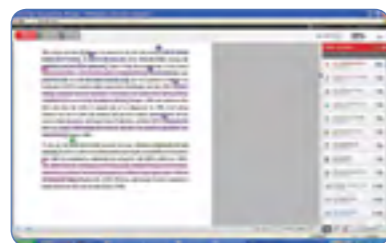
Pred zagovorom nam študenti oddajo v pregled svoje diplomsko, magistrsko ali doktorsko delo. Pri tem morajo upoštevati predpisana navodila za oblikovanje svojih del, zaključna dela 1. in 2. stopnje (diplomska in magistrska dela) pa pregledamo tudi z protiplagiatorskim programom.



V letu 2013 smo v sistem COBISS vnesli preko 1400 bibliografskih zapisov naših raziskovalcev.

In 2013 we were entering more than 1400 researchers' bibliographical records in COBISS system.

(Foto | Photo: B. Černač)



Pregled magistrskega dela s protiplagiatorskim programom

Examination of Master's Thesis with Turnitin (Academic plagiarism detector)

(Foto | Photo: B. Černač)

MEDKNJIŽNIČNA IZPOSOJA

Medknjižnična izposoja je storitev, ki uporabnikom omogoča naročanje in dostop do gradiva iz lokacijsko oddaljenih knjižnic. Naši uporabniki lahko naročajo željeno gradivo iz drugih knjižnic, te pa lahko naše knjižnično gradivo naročajo pri nas. V letu 2013 smo tako naročili ali odposlali skupaj 387 člankov, knjig in drugih dokumentov.

DIGITALNA KNJIŽNICA IN REPOZITORIJ

Skupaj z ostalimi knjižnicami Biotehniške fakultete gradimo Digitalno knjižnico Biotehniške fakultete, v kateri objavljamo diplomska, magistrska in doktorska dela naših študentov v polnem besedilu. Trenutno zbirka vsebuje 289 digitalnih dokumentov.

V letu 2013 smo z Gozdarskim inštitutom Slovenije sodelovali pri tehničnih pripravah na vzpostavitev repozitorija Nacionalnega inštituta za biologijo.

IZMENJAVA REVIJ

S številnimi slovenskimi in tujimi knjižnicami ter drugimi ustanovami sodelujemo v dolgoletni izmenjavi njihovih publikacij za reviji *Acta Biologica Slovenica* (nekdanji *Biološki vestnik*) in *Natura Sloveniae*. Seznan naših partnerjev se iz leta v leto podaljšuje. Naše revije tako trenutno pošiljamo že na 194 naslovov po vsem svetu, v Biološko knjižnico pa po tej poti tekoče prejemamo 262 različnih naslovov revij in drugih publikacij.

RESEARCHERS' BIBLIOGRAPHY AND EVALUATION OF SCIENTIFIC EFFICIENCY

In cooperation with Institute of Biomedical Informatics of the Medical Faculty, University of Ljubljana we keep the bibliography of publications of all the researchers employed in the National Institute of Biology and the Department of Biology in database Biomedicina slovenica and COBISS system. In 2013 for this purpose we were entering more than 1400 bibliographical records in COBISS system.

In cooperation with Central Specialised Information Center for Life Sciences, Ljubljana (OSIC N), Central Specialised Information Center for Biotechnical Sciences, Ljubljana (OSIC BF) and Institute of Information Science (IZUM), Maribor in the database of Slovenian Current Research Information System (SICRIS) the evaluation of scientific efficiency of individual researchers and research teams is entered.

REVIEWING THE FINAL PARTS OF STUDENTS WORK

Before defending, students of Department of Biology, Biotechnical Faculty, University of Ljubljana, bring as their thesis, master and doctoral work to review. They must take prescribe guidelines for the design part. Graduation Thesis and Master's Thesis are examined with Turnitin (Academic plagiarism detector).



Medknjižnična izposoja je storitev, ki uporabnikom omogoča naročanje in dostop do gradiva iz lokacijsko oddaljenih knjižnic.

Interlibrary loan is a service which enables ordering and access to literature from other and remote libraries.

(Foto | Photo: L. Glavač)

S številnimi slovenskimi in tujimi ustanovami sodelujemo v dolgoletni izmenjavi njihovih publikacij za reviji *Acta Biologica Slovenica* in *Natura Sloveniae*.

The Biology Library has had exchange partners in Slovenia and abroad for our serials Acta Biologica Slovenica (formerly Biološki vestnik) and Natura Sloveniae for many years.

(Foto | Photo: B. Černač)



INTERLIBRARY LOAN

Interlibrary loan is a service which enables ordering and access to literature from other and remote libraries. Our users can order materials from other libraries and those can order materials in our Library. In 2013 we were ordering or sending 387 articles, books and other documents.

DIGITAL LIBRARY AND REPOSITORY

Together with other Biotechnical faculty libraries we keep the Digital Library of Biotechnical Faculty, University of Ljubljana with full text graduation theses, M. Sc. theses and doctoral dissertations of our students. Now 289 digital documents are in the database.

In 2013 we cooperated with Slovenian Forestry Institute on technical preparation for starting Digital Repository of National Institute of Biology.

SERIALS EXCHANGE

The Library has had exchange partners in Slovenia and abroad for our serials Acta Biologica Slovenica (formerly Biološki vestnik) and Natura Sloveniae for many years. The number of our exchange partners is increasing year by year. In 2013 our serials were sending on 194 addresses all over the world. In this way we were currently receiving 262 titles of magazines and other literature.

SEZNAM ZAPOSLENIH V LETU 2013

ALIČ	ŠPELA	FITO	GORŠIČ	DUNJA	SKUPNE SLUŽBE
AMBROŽIČ	ŠPELA	EKO	GOSTINČAR	CENE	FITO
BAEBLER	ŠPELA	FITO	GREGO	MATEJA	MBP
BAJT	OLIVER	MBP	GREGORIČ	JANA	MBP
BERNETIČ	VLADIMIR	MBP	GRUDEN	KRISTINA	FITO
BERTONCELJ	IRENA	EKO	GUTIERREZ AGUIRRE	JON	FITO
BEVK	DANILO	ENTOMO	HERCOG	KLARA	GEN
BLATNIK	ALEŠ	FITO	JAKLIČ	MARTINA	EKO
BLEJEC	ANDREJ	ENTOMO	JEREBIC	ANDREJA	EKO
BORDJAN	DEJAN	EKO	KAPLA	ANDREJ	EKO
BRANCELJ	ANTON	EKO	KAVČIČ	ANDREJA	ENTOMO
BREZNIK	BARBARA	GEN	KLUN	KATJA	MBP
BRIŠAR	OLGA	SKUPNE SLUŽBE	KOGOVSŠEK	TJAŠA	MBP
CAMLOH	MARJANA	FITO	KOGOVSŠEK	POLONA	FITO
CHERSICOLA	MARKO	FITO	KOLOŠA	KATJA	GEN
COLL RIUS	ANNA	FITO	KONČAR	HELENA	SKUPNE SLUŽBE
ČEPIN	URŠKA	FITO	KORON	NEŽA	MBP
ČERMELJ	BRANKO	MBP	KOS KRAMAR	MAJA	MBP
ČERNAČ	BARBARA	SKUPNE SLUŽBE	KOSI	GORAZD	GEN
ČOKL	ANDREJ	ENTOMO	KOVAČ	NIVES	MBP
DEBELJAK	BARBARA	EKO	KUHELJ	ANKA	ENTOMO
DELAČ	MATEJA	GEN	KUTNJAK	DENIS	FITO
DEMŠAR	TINA	FITO	LAH TURNŠEK	TAMARA	SKUPNE SLUŽBE
DENAC	DAMIJAN	EKO	LAZAR	ANA	FITO
DERLINK	MAJA	ENTOMO	LENARČIČ	ROK	FITO
DERMASTIA	MARINA	FITO	LIČER	MATJAŽ	MBP
DOBNIK	DAVID	FITO	LIPEJ	LOVRENC	MBP
DOBNIK	SELMA	FITO	LIU WEI	ALLEN	EKO
DREO	TANJA	FITO	LUKAN	TJAŠA	FITO
ELERŠEK	TINA	GEN	MAKOVEC	TIHOMIR	MBP
ERJAVEC	JANA	FITO	MALAČIČ	VLADO	MBP
FAGANELI	JADRAN	MBP	MALEC	MAJA	SKUPNE SLUŽBE
FETTICH	ANJA	MBP	MALEJ	ALENKA	MBP
FILIPIČ	METKA	GEN	MATIČIČ	LIDIJA	FITO
FLANDER PUTRLE	VESNA	MBP	MAVRIČ	BORUT	MBP
FORTE	JANEZ	MBP	MEHLE	NATAŠA	FITO
FRANCÉ	JANJA	MBP	MIHEVC	ANA	FITO
GLAVAČ	LUČKA	SKUPNE SLUŽBE	MILAVEC	MOJCA	FITO
GLAVAŠ	NELI	MBP	MORI	NATAŠA	EKO

LIST OF EMPLOYEES IN 2013

MORISSET	DANY	FITO	ŠMID	IDA	FITO
MOTALN	HELENA	GEN	ŠTEBIH	DEJAN	FITO
MOZETIČ	PATRICIJA	MBP	ŠTRASER	ALJA	GEN
MRŠNIK	MARTINA	GEN	TADEJEVIČ	MARKO	MBP
NUNIČ	JANA	GEN	TALABER	IVA	MBP
OBLAK	MIRJANA	SKUPNE SLUŽBE	TINTA	TINKARA	MBP
OPALIČKI	MAJA	EKO	TOME	DAVORIN	EKO
ORLANDO BONACA	MARTINA	MBP	TOMŠIČ	ALENKA	SKUPNE SLUŽBE
PAVŠIČ	JERNEJ	FITO	TORKAR	ANA	GEN
PENŠEK CUDERMAN	DARJA	SKUPNE SLUŽBE	TURK	VALENTINA	MBP
PETEK	MARKO	FITO	TURNŠEK	NEŽA	FITO
PETELIN	BORIS	MBP	TUŠEK ŽNIDARIČ	MAGDA	FITO
PEZDIRC	MARKO	GEN	VERBOVSŠEK	URŠKA	GEN
PIRC	MANCA	FITO	VERDERBER	IRENA	SKUPNE SLUŽBE
PITACCO	VALENTINA	MBP	VIRANT DOBERLET	META	ENTOMO
PODERGAJS	NEŽA	GEN	VITTORI	MILOŠ	GEN
POLAJNAR	GAŠPER	MBP	VODOPIVEC	MARTIN	MBP
POLAJNAR	JERNEJ	ENTOMO	VREZEC	AL	EKO
POMPE NOVAK	MARUŠA	FITO	ZAJC	IRENA	GEN
POTOČNIK	FRANC	SKUPNE SLUŽBE	ZGONIK	VERA	ENTOMO
PREZELJ	NINA	FITO	ZOROVIČ	MAJA	ENTOMO
PRIJATELJ NOVAK	ŠPELA	FITO	ŽEGURA	BOJANA	GEN
RAČKI	NEJC	FITO	ŽEL	JANA	FITO
RAK	MARIJA	SKUPNE SLUŽBE	ŽUNIČ KOSI	ALENKA	ENTOMO
RAMŠAK	ANDREJA	MBP			
RAMŠAK	ŽIVA	FITO			
RASPOR DALL'OLIO	LUCIJA	MBP			
RAVNIKAR	MAJA	FITO			
RIGLER	KAROLINA	SKUPNE SLUŽBE			
ROTTER	ANA	FITO			
RUPAR	MATEVŽ	FITO			
SEDMAK	BOJAN	GEN			
SIMČIČ	TATJANA	EKO			
STANIČ	KARMEN	GEN			
STARE	TJAŠA	FITO			
STARE	KATJA	FITO			
STRITIH	NATAŠA	ENTOMO			
SVENŠEK	JELKA	SKUPNE SLUŽBE			
ŠIŠKO	MILIJAN	MBP			

LEGENDA / LEGEND

EKO	ODDELEK ZA RAZISKOVANJE SLADKOVODNIH IN KOPENSKIH EKOSISTEMOV / Department of Freshwater and Terrestrial Ecosystems Research
ENTOMO	ODDELEK ZA ENTOMOLOGIJU / Department of Entomology
FITO	ODDELEK ZA BIOTEHNOLOGIJU IN SISTEMSKO BIOLOGIJU / Department of Biotechnology and Systems Biology
GEN	ODDELEK ZA GENSKO TOKSIKOLOGIJU IN BIOLOGIJU RAKA / Department of Genetic Toxicology and Cancer Biology
KNJIŽNICA	BIOLOŠKA KNJIŽNICA / The Biology Library
MBP	MORSKA BIOLOŠKA POSTAJA PIRAN / Marine Biology Station
SKUPNE SLUŽBE	SKUPNE SLUŽBE / Corporate Services



NACIONALNI INŠTITUT ZA BIOLOGIJO
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