Final Project Evaluation Report

Your Details	
Full Name	Milica Jaćimović
Project Title	Black bullhead (*Ameiurus melas*) in Ponjavica Nature Park: biological characteristics, effects on native ichthyofauna, mass removal and experimental rearing
Application ID	24690 - 1
Grant Amount	£4965
Email Address	mpucar@imsi.rs
Date of this Report	25/11/2019

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Establishment of zero-point state of the fish stock in Ponjavica Nature Park				This activity took place at the very beginning of the project during June and July 2018 and was fully realised.
Selective removal of the black bullhead specimens in Ponjavica Nature Park				This activity was fully implemented in three localities. However, we did not have the capacity, nor the permit, to do the mass removal on the entire water surface of the Ponjavica Nature Park.
Laboratory analyzes for a certain amount of fished out black bullhead specimens at the Institute for multidisciplinary research				This activity has been fully and successfully realised.
Experimental rearing at the Centre for Fisheries and Applied Hydrobiology "Mali Dunav" of the ODPF "Radmilovac" Faculty of Agriculture (CEFAH)				This activity has been fully and successfully realised.
Laboratory analyzes of black bullhead specimens at CEFAH				This activity has been fully and successfully realised.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

This project showed that ichthyological research must have greater support from the local fisheries service (in this case nature protection guards). We had very limited time and money resources and were not allowed to participate in mass removals, but only in experimental selective removal that is very limited. By law, scientific institutions are not allowed to engage in mass removals, but only the official users of the fishing area.

Therefore, we selected three localities (at the beginning, middle and end of the stream) and arranged three rows in each locality (on the left and right banks and in the middle of the stream) with five fyke-nets in each row. Which means we had 45 fyke-nets in total, which is certainly a lot. However, much better results would be scored if the guards were out on the water throwing nets themselves. Even though we kept telling them what their obligations were, leaving our fyke-nets to be in their offices (so that they could apply mass removal in our withdrawal), they never

organised themselves to put it into action. It should be noted that they were very helpful during the field research and that without their help the realisation of the project would be very difficult. However, apart from working with us, they did little else.

Therefore, we decided to change the plan of our activities. Just to remind you that our original plan was to remove black bullhead specimens only during the first season (from August to October 2018) and then to monitor changes occurring as the result of previous activity during the second season (from April to October 2019). However, we realised that 3 months of selective removal was not enough time to see concrete results within the fish community. Therefore, we extended the selective removal of the black bullhead specimens from April to September 2019. In October 2019, we repeated the fieldwork procedure from the beginning of the project to determine the newly established state of the fish community.

Also, our plan was to present this idea and the results to the members of the Association of Ponjavica Nature Park Lovers (NGO), the Director of Natural Resources (JKP Zelenilo Pančevo) and the local fishing community. However, it turns out that most members of the Association no longer live near the Ponjavica Nature Park, they were busy with their duties, and we realised that the association exists only on paper. They were not really interested in organising seminars, workshops and round tables, which would help in the education of people and encourage their active approach to protecting this natural resource. Public utility company (JKP Zelenilo Pančevo), which is responsible for the Ponjavica Nature Park, did not invest in what was their obligation, let alone participate in additional activities. Last but not least, we did not have any support from the local fishing community because of their mutual conflicts. In other words, we have done our best to meet all the objectives of the project regardless of all the difficulties.

During the course of experiment total mortality in all treatments was observed between day 30 and day 60 of rearing in mesocosm. Although mortality occurred unexpectedly, this fact is one of the most important deliverables from the project and is proof that mesocosm is not suitable system for rearing of black bullhead.

3. Briefly describe the three most important outcomes of your project.

- Selective removal has proven to be extremely effective, as in 9 months a total of 20.145 black bullhead specimens (483.599,00g) were fished out in only three localities (from August to October 2018 – 4.254 specimens (145.459,00g) and from April to September 2019 – 15.891 specimens (338.140,00g)).

- When it comes to the impact of selective removal on indigenous ichthyofauna, very interesting results were obtained. The abundance of Eurasian perch (*Perca fluviatilis*) increased three times, the roach (*Rutilus rutilus*) twice and the rudd (*Scardinius erythrophthalmus*) eight. When it comes to non-indigenous species, the abundances of Prussian carp (*Carassius auratus*) and pumpkinseed (*Lepomis gibbosus*) remained unchanged, while the abundance of Amur sleeper (*Pseudorasbora parva*) increased 34 times.

- In addition to field research, laboratory analyses were also conducted for 1.291 black bullhead specimens and the data on their food, resources allocation, general state and reproductive potential were obtained.

- We have also expanded this ichthyological research by including colleagues from the Chair of Algology, Mycology and Lichenology of the Faculty of Biology, who sampled water to obtain qualitative and quantitative data on phytoplankton. Phytoplankton sampling was performed during each filed work. At the same time, using the multiparameter sonde we got the following data: water temperature, pH value, conductivity, TDS, DO (luminescence time based optical sensor), DO saturation and Chlorophyll *a*.

- A total of 621 black bullhead specimens were transported to CEFAH. The results of experimental rearing have shown that in the cage breeding system the mass yield has increased three times when the specimens were fed by commercial-extrudate food and four times when the specimens were fed by Omega-3 food. In the recirculating aquaculture system (RAS) the mass yield has increased twice, regardless of the type of food.

- This project networked three institutions: The Institute for Multidisciplinary Research, Faculty of Biology University of Belgrade (Chair of Algology, Mycology and Lichenology and Chair of Animal Ecology and Zoogeography) and Faculty of Agriculture, University of Belgrade. Seven students from the Faculty of Biology participated in this project, both in field and laboratory research. Also, four students from the Faculty of Agriculture worked on experimental rearing of black bullhead specimens.

- Results of this research were presented within Educational and Scientific Programme of the Serbian Broadcasting Corporation (Radio Television of Serbia, RTS). In this way, the Rufford Foundation received huge publicity.

4. Briefly describe the involvement of local communities and how they have benefitted from the project.

During the field research we had the opportunity to meet a lot of local fishermen, explaining the purpose of our work. We have met with their approval and encouragement.

5. Are there any plans to continue this work?

Our results confirm that fisheries management measures are very complex and can have both positive and negative effects on the ecosystem. Filed work activities must be more comprehensive and should include other non-indigenous species that have a negative impact on native ichthyofauna. Therefore, research should continue, taking into account existing results.

Also, this project showed that scientific research must have greater support from the local fisheries service. To obtain better results, the removal must be more extensive and cover the surface of the entire lake ecosystem. Therefore, we selected

Markovačko lake as the new site for the fieldwork. The Markovačko Lake Fisheries Service has been successfully carrying out mass removal of black bullhead specimens for many years and it is believed that they would be of great help in the implementation of the project. This type of research is long-term and has to be continuous in order to produce results, so it would be extremely tempting to look at how the structure of the fish community in an ecosystem is changing in which mass removal is more effective.

As mentioned earlier, in addition to field research, laboratory analyses were also conducted for a certain amount of fished out specimens and the data on their population dynamic were obtained. From a scientific point of view, it will be very interesting to compare results from Ponjavica Nature Park and Markovačko lake, both from the field and laboratory.

Experimental rearing at CEFAH provided very interesting and encouraging results. When it comes to further test the commercial breeding potential, the project will aim at new commercial technologies, with different food combinations, to produce the final product, that is, fish of consumable size. Experimental rearing should provide more detailed data about the best rearing system, about the yields achieved in different rearing systems, the fish quality and the cost-effectiveness of rearing.

6. How do you plan to share the results of your work with others?

- In May 2018 Dr Milica Jaćimović held two lectures at the Faculty of Biology of the University of Belgrade, within the Science Fair. On that occasion, Milica presented the project, to all students, as well as those who later joined the project.

- On January 15, 2019, Dr Milica Jaćimović gave a lecture about our project to the students of the master's degree programme (Master of Academic Studies, Level II) at the Faculty of Biology (Institute of Zoology), University of Belgrade, within the course: "Field and laboratory practicum".

- Throughout the project we were accompanied by a team of Serbian Broadcasting Corporation (Radio Television of Serbia, RTS). They documented our activities during filed work in Ponjavica Nature Park, laboratory work at the institute for multidisciplinary research and experimental rearing at CEFAH. They were broadcasting television report about our project many times. Also, they uploaded this report on the official YouTube RTS channel and on the platform RTS Planet. The editor-in-chief of the Department of Ecology (Educational and Scientific Programme) of RTS, Jelena Jovanović - Radović, will in the coming period produce a documentary film which will be shown at international and domestic festivals.

- Two students from the Faculty of Biology (Vojislav Sokolović and Đorđe Gajić), who worked very hard during the field and laboratory research, presented the results of our project at "The Congress of Biology Students - Simplast '19 ", with 219 participants.

- During the course of the experiment approximately 4000 primary school children visited CEFAH, while senior pupils (around 1500 of them) were familiarized with the experiment.

- The plan is also to publish several scientific papers in international journals about: 1) the impact of selective removal of the black bullhead specimens on native and non-native fish species, 2) the relationship between seasonal dynamics of phytoplankton and the fish community, 3) experimental rearing of black bullhead and 4) comprehensive management plan for selective removal of black bullhead and opportunities for self-sustaining commercial farming in Serbia

7. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?

We used the Rufford Foundation grant throughout the entire project. Although we had some unplanned costs during the preparation (barrels and plastic trough, t-shirts, lead rope) and the fieldwork research itself (fuel for the boat of nature protection guards, the bread we used as bait, plastic bags) we were able to fully realise all the goals of the project, due to smaller fees intended for colleagues and lower fuel consumption.

Rufford Foundation grant is used for all experimental costs: **m**aterial for the installation of different rearing systems and supplies (material for preparation of mesocosmos systems; material for the setting of small cages; material and work for creating an access path to mesocosmos and cages; material for rearing black bullhead specimens in tanks); concentrated fish feed for black bullhead; electric energy used for the operation of wells pumps for water supply and operation of aerators in tanks of RAS.

8. Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Fees for the participants	1440	1274	-166	This difference was due to colleagues working for smaller daily fees
Jeep fuel	835	506	-329	This difference was used to buy fuel for the boat of Nature Protection Guards

Fyke-nets	190	193	+3	We were able to find cheaper fyke-nets and instead of 19 (that were planned) we bought 25 for the same budget
Waterproof cord (length 60 m)	67	67		
Plastic tubes (6 pieces)	115	115		
Impregnated pillars (24 pieces)	107	107		
Waterproof cord (length 60 m)	67	67		
Inverted wooden poles (24 pieces)	104	104		
Concrete weights (holders) on the coast for the access path to mesocosmos and small cage systems (material and workmanship)	149	135	-14	This item cost slightly less than the planned amount
Chain for access hanging path (30 m)	118	118		
Integrated treads for accessing a hanging path (length of about 15 meters)	447	453	+6	This item cost slightly more than the planned amount
Aerator pump - water tank compressors in tanks (6 pieces)	335	335		
Transportation costs	157	172	+15	Due to the fuel price increase this item cost a little more
Concentrated fish feed for black bullhead (200kg)	271	271		
Electric energy used for the operation of wells pumps for water supply and operation of aerators in tanks (period July-December)	563	551	+12	Less electricity was consumed than planned
Fuel for the boat of Nature Protection Guards		215	+215	In the original planning, this item was not even included because we thought that the Fisheries Service would finance the fuel itself
The bread we used as bait		93	+93	In the original planning, this item was not even included

Barrels and plastic trough		17	+17	In the original planning, this item was not even included
T-Shirts		108	+108	In the original planning, this item was not even included
Lead rope		10	+10	In the original planning, this item was not even included
Plastic bags		23	+23	In the original planning, this item was not even included
Total spent	**4965**	**4934**		
Grant received	**5000**	**4934**	**-66**	

9. Looking ahead, what do you feel are the important next steps?

- To organise a small conference with all project participants in mid-December (on December 18, 2019), where all the results will be presented.
- To start with the new fieldwork activities in Markovačko lake together with laboratory analyses so that the results can be compared between two different localities, with different ecological characteristics and differently organised fisheries services.
- To continue with experimental rearing at CEFAH and to test the new commercial technologies, with different food combinations.
- The plan is to officially include colleagues from the Chair of Algology, Mycology and Lichenology of the Faculty of Biology to continue exploring how the qualitative and quantitative composition of phytoplankton affects the composition of the fish community, and how these dynamics change over the seasons.
- To publish scientific papers about this project.
- The plan is for student Anđela Đorđevic to write a master thesis on growth, age and age structure of black bullhead population in Ponjavica Nature Park.
- The plan is for student Sanja Zdravković to write her bachelor thesis (diploma) on the topic of brown bullhead culture in different rearing systems.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, we used the Rufford Foundation logo during presentations of our work, as well as during the recording of reports for RTS.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Dr. Milica Jaćimović (Project Leader)

Prof. Dr. Zoran Marković (Team Member - responsible for experimental rearing of black bullhead)

Prof. Dr. Aleksandar Hegediš (Team Member - advisory role)

Prof. Dr. Jasmina Krpo - Ćetković (Team Member - advisory role)

Prof. Dr. Gordana Subakov - Simić (Team Member - advisory role)

Dr. Božidar Rašković (Team Member - responsible for laboratory analyzes of black bullhead specimens at CEFAH)

Dr. Marko Stanković (Team Member - assistance during experimental rearing of black bullhead

Dr. Marija Smederevac-Lalić (Team Member - assistance during field activities at Ponjavica Nature Park and laboratory analyzes at the Institute for Multidisciplinary Research)

Dr. Gorčin Cvijanović (Team Member - assistance during field activities at Ponjavica Nature Park and laboratory analyzes at the Institute for Multidisciplinary Research)

Dušan Nikolić (Team Member - assistance during field activities at Ponjavica Nature Park and laboratory analyzes at the Institute for Multidisciplinary Research)

Dr. Stefan Skorić (Team Member - assistance during field activities at Ponjavica Nature Park and laboratory analyzes at the Institute for Multidisciplinary Research)

Dr. Željka Višnjić-Jeftić (Team Member - assistance during field activities at Ponjavica Nature Park and laboratory analyzes at the Institute for Multidisciplinary Research)

Dr. Dragana Predojević (Team Member - phytoplankton sampling and data analysis)

Dr. Ivana Trbojević (Team Member - phytoplankton sampling and data analysis)

Anđela Đorđević (Team Member, student of the Faculty of Biology University of Belgrade)

Vojislav Sokolović (Team Member, student of the Faculty of Biology University of Belgrade)

Đorđe Gajić (Team Member, student of the Faculty of Biology University of Belgrade)

Teodora Radović (Team Member, student of the Faculty of Biology University of Belgrade)

Anđela Đinovski (Team Member, student of the Faculty of Biology University of Belgrade)

Jovana Vasić (Team Member, student of the Faculty of Biology University of Belgrade)

David Filipović (Team Member, student of the Faculty of Biology University of Belgrade)

Dalibor Vukojević (Team Member, PHD student of the Faculty of Agriculture, University of Belgrade)

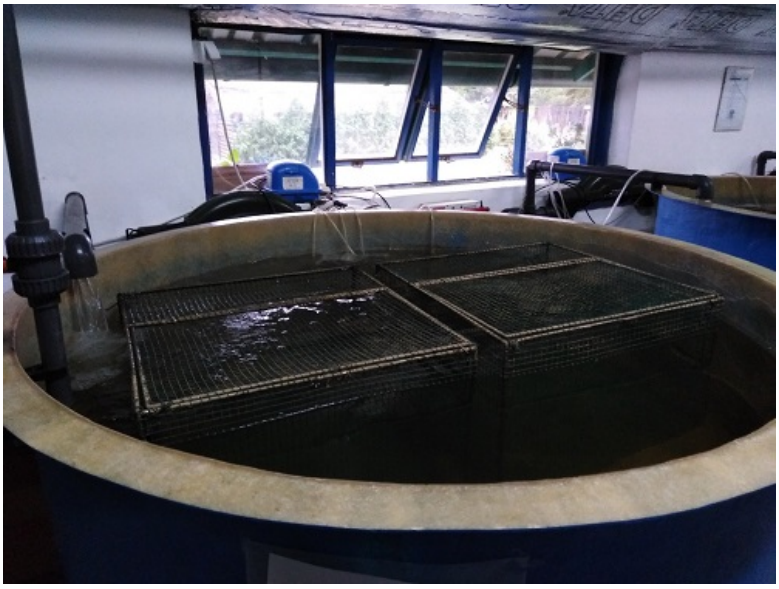
Sanja Zdravković (Team Member, student of the Faculty of Agriculture, University of Belgrade)

Vukosav Golubović (Team Member, PHD student of the Faculty of Agriculture, University of Belgrade)

Stefan Marjanović (Team Member, PHD student of the Faculty of Agriculture, University of Belgrade)


ЧУВАРПЛАНИНЕ

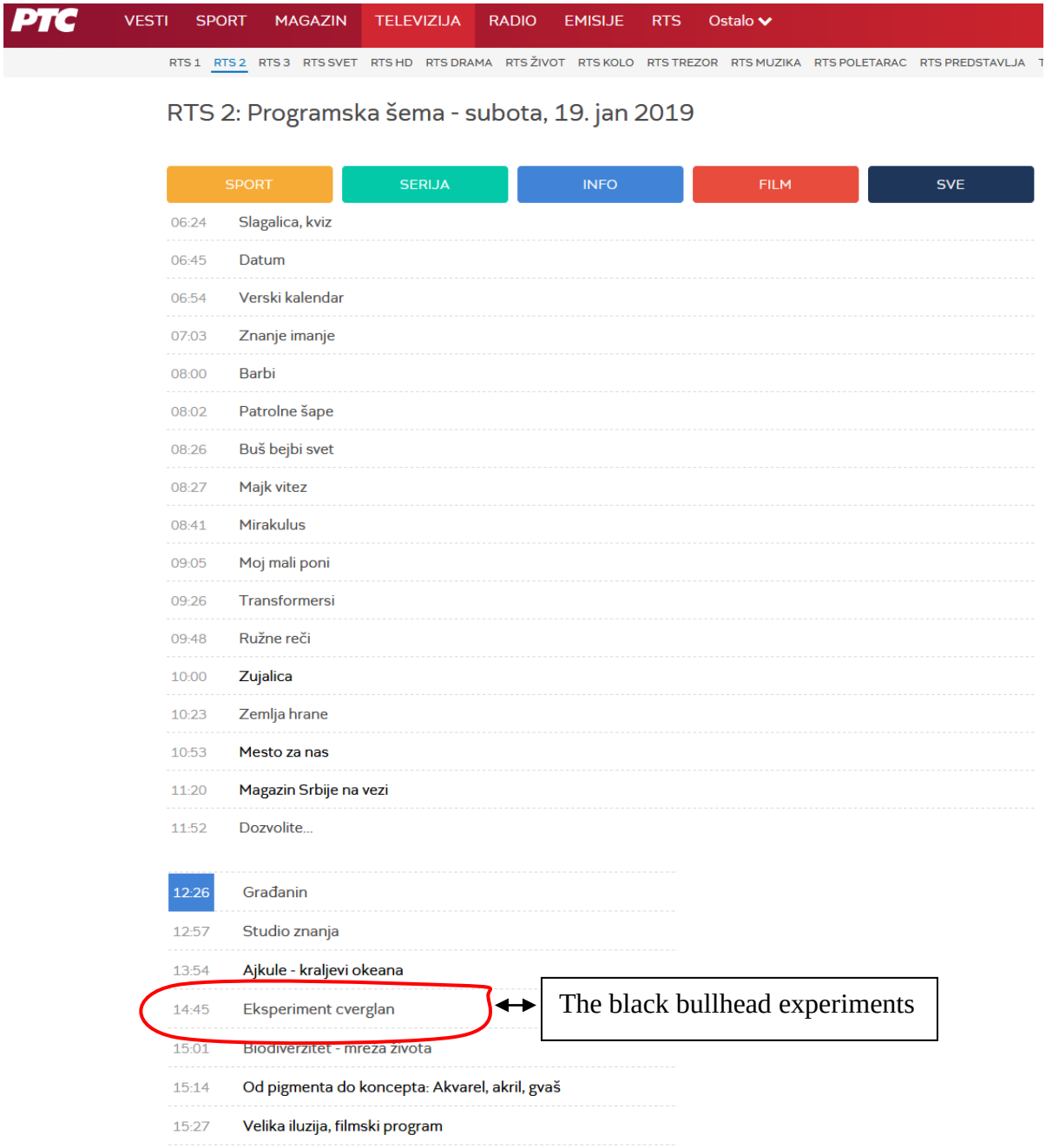

Ruffor




Zašto park prirode Ponjavica?


Finansiranje
Rufford Foundation: Rufford Small Grant
Institut za multidisciplinarna istraživanja BU


Finansiranje
Rufford Foundation: Rufford Small Grant
Institut za multidisciplinarna istraživanja BU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RTS 2: Programska šema - subota, 19. jan 2019
SPORT
SERIJA
INFO
FILM
SVE
06:24 Slagalica, kviz
06:45 Datum
06:54 Verski kalendar
07:03 Znanje imanje
08:00 Barbi
08:02 Patrolne šape
08:26 Buš bejbi svet
08:27 Majk vitez
08:41 Mirakulus
09:05 Moj mali poni
09:26 Transformersi
09:48 Ružne reči
10:00 Zujalica
10:23 Zemlja hrane
10:53 Mesto za nas
11:20 Magazin Srbije na vezi
11:52 Dozvolite...
12:26 Građanin
12:57 Studio znanja
13:54 Ajkule - kraljevi okeana
14:45 Eksperiment cverglan
15:01 Biodiverzitet - mreža života
15:14 Od pigmenta do koncepta: Akvarel, akril, gvaš
15:27 Velika iluzija, filmski program
The black bullhead experiments

Screenshot of the television report about our project which was broadcasted on Radio Television of Serbia (RTS) and uploaded on YouTube:

https://www.youtube.com/watch?v=pa5r6QXkhmc.

Istraživanja u oblasti zoologije - master

15. januar, od 10-15h Mala Sala, Biološki fakultet Univerziteta u Beogradu

izlaganja na 15-20 min, diskusija, pitanja

Teme:

10:30	Istraživanja zemljišne i pećinske faune – doc. dr Dragan Antić
11:00	Sanacioni izlov crnog američkog patuljastog soma - mogućnosti samoodrživog komercijalnog uzgoja u Srbiji - dr Milica Jaćimović, naučni saradnik u Institutu uza multidisciplinarna istraživanja (Odsek za biologiju i zaštitu kopnenih voda)
11:30	Populaciona istraživanja gmizavaca – doc. dr Ana Golubović
12:00	Akvatični insekti – doc. dr Katarina Stojanović
	pauza
13:00	naslov? – prof. dr Predrag Simonović
13:30	Ornitološka istraživanja –dr Ivana Novčič, naučni saradnik
14:00	Istraživanja Ostracoda – doc. dr Tamara Karan Žnidaršič
14:30	naslov? – prof. dr Saša Marić

1. **Laboratorijski rad - 30 poena** uraditi detaljno ZADATKE i SATNICU RADA

Dan 1 – Uzorak iz prirode, trijaža, preparat u zbirci, zbirka

Po grupama organizovati zadatke (po taksonima i nivoima detaljnosti)

1. Ponašanje životinja – Ivana Novčić 11-12:30
    a. Metode proučavanja ponašanja životinja (nevezano za takson) uvod u terenski zadatak, mali lab-zadatak – na životinji (beskičmenjaku) ili na video-klipu; 2 časa u sali po 45min
    b. Laboratorija na otvorenom: Etogram ptica stanarica (patke, labudovi...), Dunavski kej, npr. 14-16 ili drugi termin po dogovoru; terenski zadatak trajanja oko 2h

Dan 2 – Preparat za istraživanje, eksperimenti u laboratoriji i-ili kontrolisanim uslovima

Po grupama organizovati zadatke (po taksonima i nivoima detaljnosti)

1. Disekcije i pravljenje mikroskopskih preparata, protokoli rada 2 časa po 45min
– anatomija i morfologija kičmenjaka i beskičmenjaka?
– izolacija crevnog trakta radi trijaže crevnog sadržaja ribe – Vera Nikolić
– bris kože ribe, pregled kože na ektoparazite – Vera Nikolić
1. Trijaža nepoznatog materijala (za svakoga prikladan izbor, uključujući crevni trakt), izdvajanje i etiketiranje (trijaža živog materijala?) 2 časa po 45min – Katarina, Anđeljko, Tamara – okvirno od 9-10:30
2. totopreparati i/ili posebni delovi (disekcija) - 2 časa 9-10:30 **Katarina**, Anđeljko, Tamara
2. Fotografisanje i merenje (softveri za fotografisanje i merenje sa fotografija, staker...) – 2 časa po 45min, 11-12:30 Anđeljko, Tamara
3. Karakteri za identifikaciju, primeri ključeva, korišćenje ključeva na konkretnom preparatu - 2 časa po 45min, 13-14:30 Katarina, Anđeljko, Tamara

Dan 3 – Prikazivanje i obrada podataka

1. Pripremanje materijala (tkiva) za biohemijska, molekualrna i fiziološka istraživanja (i druge specifične procedure) preparovanja pojedinih delova tela/tkiva/organa/izolacija pojedinih delova/otrova? 1 čas 45min – Saša Marić, Ljilja, Anđeljko, neko sa razvića, MArgareta? 2 časa 9-10:30 ili više
2. Baze podataka;11-12:30
    – katalogiziranje zbirke, databaza disekcija, merenja...fotografija...
    – kartiranje (UTM) i druge metode; Ljiljana Tomović?

2. Statističke analize; 2 časa, 13-14:30 Ljiljana Tomović? primarni predlog - izbaciti

3. Terenski rad - 35 poena

uraditi detaljno PRAKTIČNI ZADACI i SATNICA RADA

1. Metode uzorkovanja
   - Terenski protokoli
   - Kopnena fauna:
     - **BESKIČMENJACI**
     - **AMPHIBIA?**
     - **REPTILIA**
     - **AVES –** posmatranje i identifikacija ptica, upotreba terenskih vodiča za prepoznavanje vrsta prema morfologiji i oglašavanju – nastavnici: Ivana Novčić;
     - **MAMMALIA**
   - Vodena fauna:
     - plankton
     - bentos
     - mala vodena tela, potočne vode...
     - beskičmenjaci? Ribe, Vodozemci?
   - Pećinska fauna? ako idemo u Petnicu

2. Manipulacija živim materijalom na terenu i u labu – napomene za transport i druge uslove rada sa živim materijalom/dozvole za rad!?

Gajenje u laboratoriji – pravljenje i priprema aparature za gajenje i održavanje kulture, aparatura za eksperimente sa živim životinjama ?

OVO SU SAMO PREDLOZI ŠTA SVE MOŽE DA SE RADI; A NE MORA