

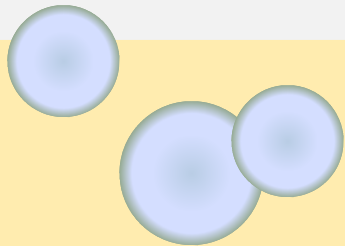


DOBROBIT ŠARANA U RECIRKULARNIM SISTEMIMA: ISKUSTVA CENTRA ZA RIBARSTVO I PRIMENJENU HIDROBIOLOGIJU POLJOPRIVREDNOG FAKULTETA UNIVERZITETA U BEOGRADU

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CARP WELFARE IN RECIRCULATING SYSTEMS:

Experiences of the Center of Fishery and Applied Hydrobiology of the
Faculty of Agriculture University of Belgrade



POLJOPRIVREDNI FAKULTET - BEOGRAD
Faculty of Agriculture - Belgrade

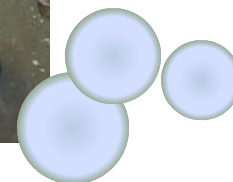
Projekti: TR 20047 Ministarstvo za nauku i tehnološki razvoj Republike Srbije
EU Project ROSA (FP7-REGPOT-2007-3)



Aktivnosti Centra obuhvataju primenu modernih uzgojnih programa šarana i izvođenje ogleda iz oblasti ishrane, selekcije, stresa i dobrobiti riba, kao i zaštite voda od zagađenja iz akvakulture.



The Center activities are: implementing of modern breeding programs for carp, and experiments in the field of fish nutrition, selection , stress and welfare, and water protection from pollution as well.





U recirkularnom sistemu omogućeno je prečišćavanje i priprema vode za tankove za izvođenje eksperimenata

In recyrculating aquatic system (RAS) is posible to make filtration and preparation of water for experimental tanks.

**U KOJOJ MERI USLOVI SMEŠTAJA
U RECIRKULARNOM SISTEMU
OMOGUĆAVAJU
ZADOVOLJENJE POTREBA RIBA?**

***HOW MUCH KEEPING CONDITIONS IN "RAS"
CAN FULLFIEL NEEDS OF FISH?***



POTREBE RIBA *Needs of fish*

HOW IS IN "RAS"?

1. Potreba za adekvatnim fizičkim i hemijskim uslovima sredine:

Need for adequate physical and chemical environmental conditions

- **Odgovarajuća količina kiseonika** *Appropriate oxygen concentration* ?
- **Odsustvo štetnih supstanci u vodi** *No harmful substances in water*..... ?
- **Odgovarajući vizuelni, olfaktorni i drugi uslovi sredine**..... ?
Appropriate visual, olfactory and other environmental conditions
- **Izbegavanje ekstremnih temperatura** *To avoid extreme temperatures* ☒
- **Osmoregulacija** *To osmoregulate* ?
- **Prostor za kretanje** *Space for movement* NOT ENOUGH !!!

2. Potreba za odgovarajućim socijalnim interakcijama ?

Need to have appropriate social interactions

3. Potreba za izbegavanjem predatora..... ☒

Need to avoid predators

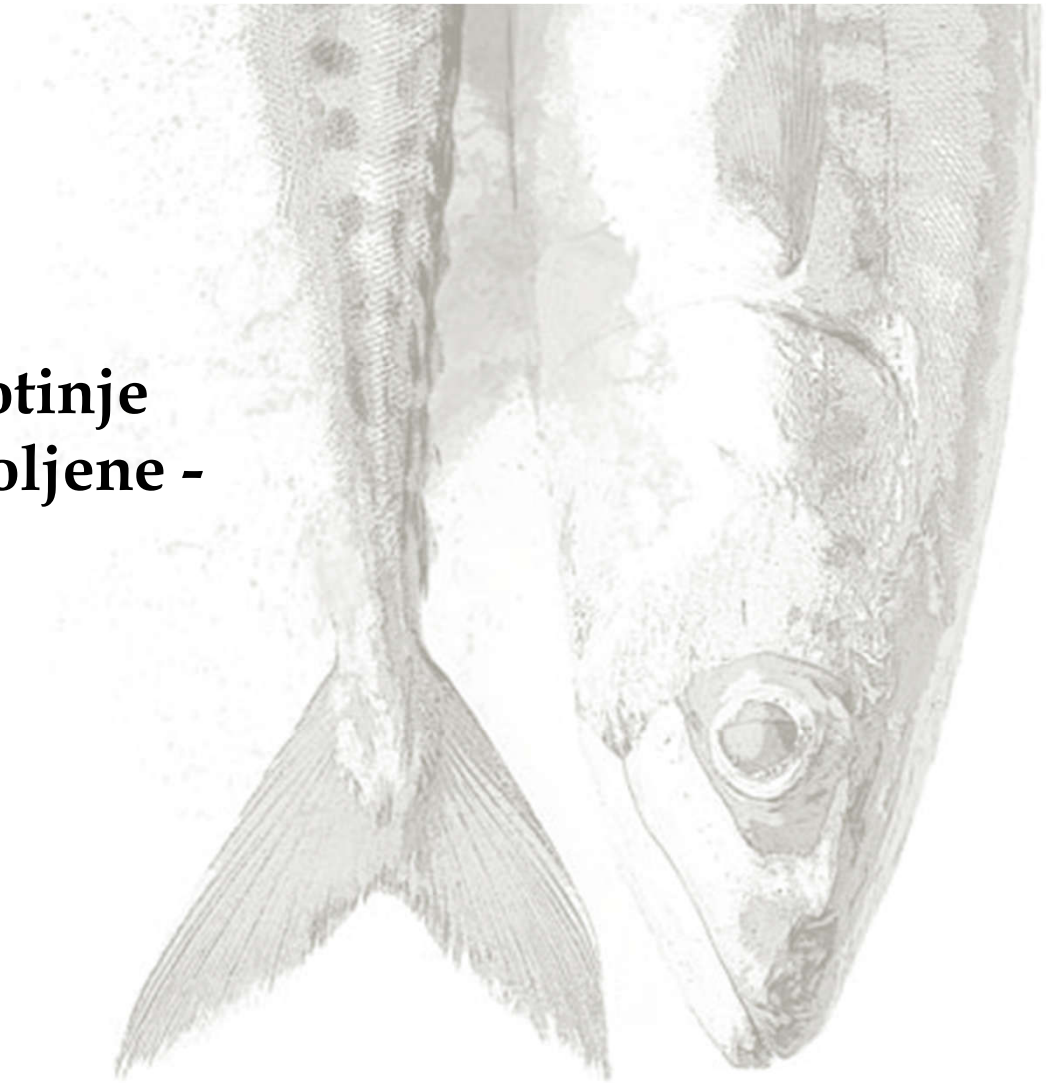
4. Potreba za odgovarajućom ishranom ☒ ?

Need to feed for maintenance and growth

5. Potreba za održavanjem dobrog zdravlja..... NOT ENOUGH !!!

Need to maintain good health condition

**Ako životne potrebe životinje
nisu u potpunosti zadovoljene -
kakva je dobrobit?**



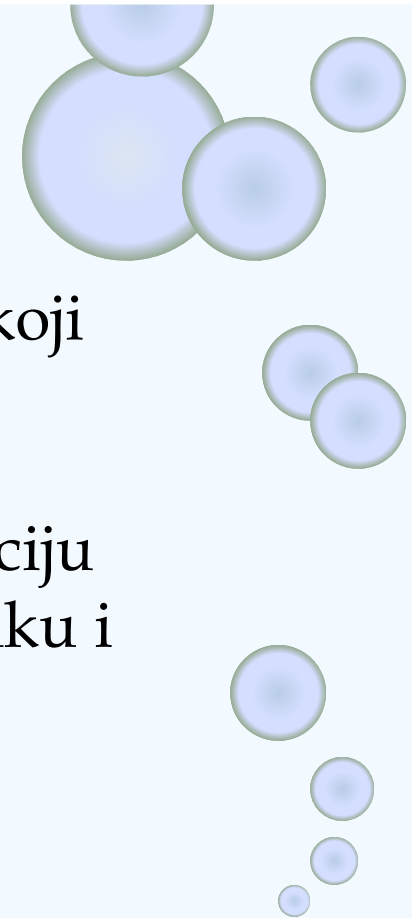
If life needs of animal are not completely satisfied - what is about welfare?

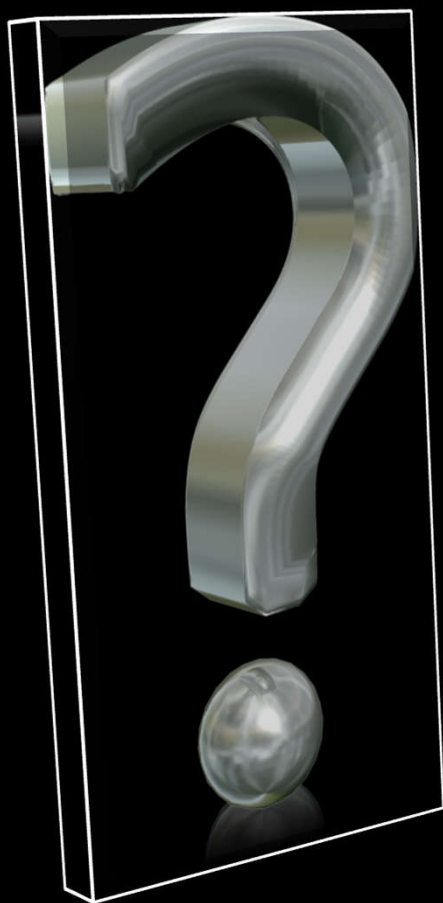
Činjenice:

- ✓ Kvalitet vode jedan je od najvažnijih faktora koji utiču na dobrobit riba.
- ✓ U nekim slučajevima kvalitet vode ima tendenciju pogoršanja kada ribe duže vreme ostaju u tanku i ukoliko gustina nasada nije odgovarajuća.

Facts:

- ✓ *Water quality is one of the most important factors which influences on fish welfare*
- ✓ *Water quality has tendency of deterioration when fish stay longer in tank and if density is not appropriate*





KOJI JE NAJBOLJI NAČIN ZA
PROCENU DOBROBITI RIBA?

The best way for animal welfare assessment is.....?

indikatori dobrobiti:

parametri koje je moguće kvalitativno i kvantitativno proceniti

welfare indicators:

quantitative and qualitative evaluable parameters

- **Zdravstveni** *Health*
- **Proizvodni** *Production*
- **Bihevioralni** *Behaviour*
- **Biohemijski (fiziološki)**
Biochemical (physiological) parameters



- Procena uticaja kvaliteta vode na dobrobit → procena rizika po dobrobit na osnovu parametara kvaliteta vode (Scientific Opinion of the Panel on Animal Health and Welfare on a request from the European Commission on animal welfare aspects of husbandry systems for farmed fish: carp. The EFSA Journal (2008), 843, 1-28)

- Identifikacija opasnosti tj. činilaca koji mogu izazvati negativan efekat po zdravlje riba, čak i mortalitet
- Što je negativniji efekat – veći je rizik po dobrobit

- Assessment of water quality influence on welfare → assessment of welfare risk based on water quality parameters (Scientific Opinion of the Panel on Animal Health and Welfare on a request from the European Commission on animal welfare aspects of husbandry systems for farmed fish: carp. The EFSA Journal (2008), 843, 1-28)
- Identification of hazards e.g. factors which can cause negative effect on fish health, even mortality
- Worst effect = higher risk for welfare

MATERIJAL I METODE *Material and methods*

- ❑ 45 dana praćenja parametara kvaliteta vode
- ❑ 240 jedinki mlađi šarana, početne prosečne TM 28,21 g
- ❑ 12 tankova, V = 120 L
- ❑ gustina nasada 5 kg/m³
- ❑ ekstrudirana hrana, 38% proteina i 12% masti, 3% u odnosu na ihtiomasu, u 11 AM

2 x nedeljno, MULTI 340i/SET, WTW

Temperatura vode

Količina rastvorenog kiseonika (DO)

Mortalitet praćen svakodnevno

2 x mesečno, Spektrofotometar, WTW

Nejonizovani amonijak (NH₃-N)

Procena izvršena prema metodi opisanoj u publikaciji EFSA-e (2008) zasnovane na analizi rizika

EFSA method based on welfare risk analysis

Formula:

$$\text{Nivo rizika} = (\text{ozbiljnost efekta}/4) * (\text{trajanje efekta}) * (\text{procenat populacije koja je izložena negativnom efektu}/5) * (\text{učestalost pojavljivanja opasnosti}/5) * 100$$

$$\text{Risk score} = (\text{severity of effect}/4) * (\text{duration of effect}) * (\text{proportion of the population affected}/5) * (\text{frequency of hazard}/5) * 100$$

Identifikacija i rangiranje opasnosti za šaransku mlad (EFSA, 2008)

Identification and ranking of hazards for carp fry (EFSA, 2008)

Opasnost <i>Hazard</i>	Opis opasnosti <i>Description of the hazard</i>	Posledice <i>Consequences of the hazard</i>
Koncentracija kiseonika <i>Water oxygen content</i>	suviše niska <i>too low</i>	Hipoksija. Slabiji rast i konverzija hrane, moguće pogoršanje kvaliteta vode. Moguće uginuće. Hypoxia. Poor growth, poor feed conversion and possible water quality issues. Possible mortalities.
Temperatura vode <i>Water temperature</i>	suviše niska <i>too low</i>	Usporen rast, nerado uzimanje hrane. Slaba kondicija. Moguća uginuća. Slow growth, reluctance to feed. Poor condition. Possible mortalities.
Koncentracija nejonizovanog amonijaka <i>Unionised ammonia content</i>	suviše visoka <i>too high</i>	Visok i nivoi usled povišenog pH i prisustva raspadnute organske materije mogu sprečavati izlučivanje metaboličkih ekskreta iz tela . High levels caused by elevated pH and presence of decomposing organic matter may hamper ability of fingerlings to excrete own metabolic by-products.
Temperatura vode <i>Water temperature</i>	nagle promene <i>rapid change</i>	Nagle promene temperature vode mogu biti uzrok stresa čijim delovanjem može doći do uginuća, smanjenog rasta i smanjenu otpornost bolesti i bio-stresore. Rapid changes in water temps may cause stress to the fingerlings resulting in mortalities, reduced growth and reduced resistance to disease and bio-stressors.
Temperatura vode <i>Water temperature</i>	suviše visoka <i>too high</i>	Nizak sadržaj kiseonika u vodi. Visok nivo metaboličkih procesa i povećane potrebe za kiseonikom. Low oxygen content of water. High metabolic rates and oxygen demand.

Vrednosti parametara kvaliteta vode utvrđene merenjem

Parametar <i>Parameter</i>	Prosečna vrednost <i>Average value</i>	Minimalna vrednost <i>Minimal value</i>	Maksimalna vrednost <i>Maximal value</i>
T (° C)	22,74	18,30	24,80
O ₂ (mg/l)	4,42	2,26	5,95
NH ₃ -N (mg/l)	0,183	0,024	0,510

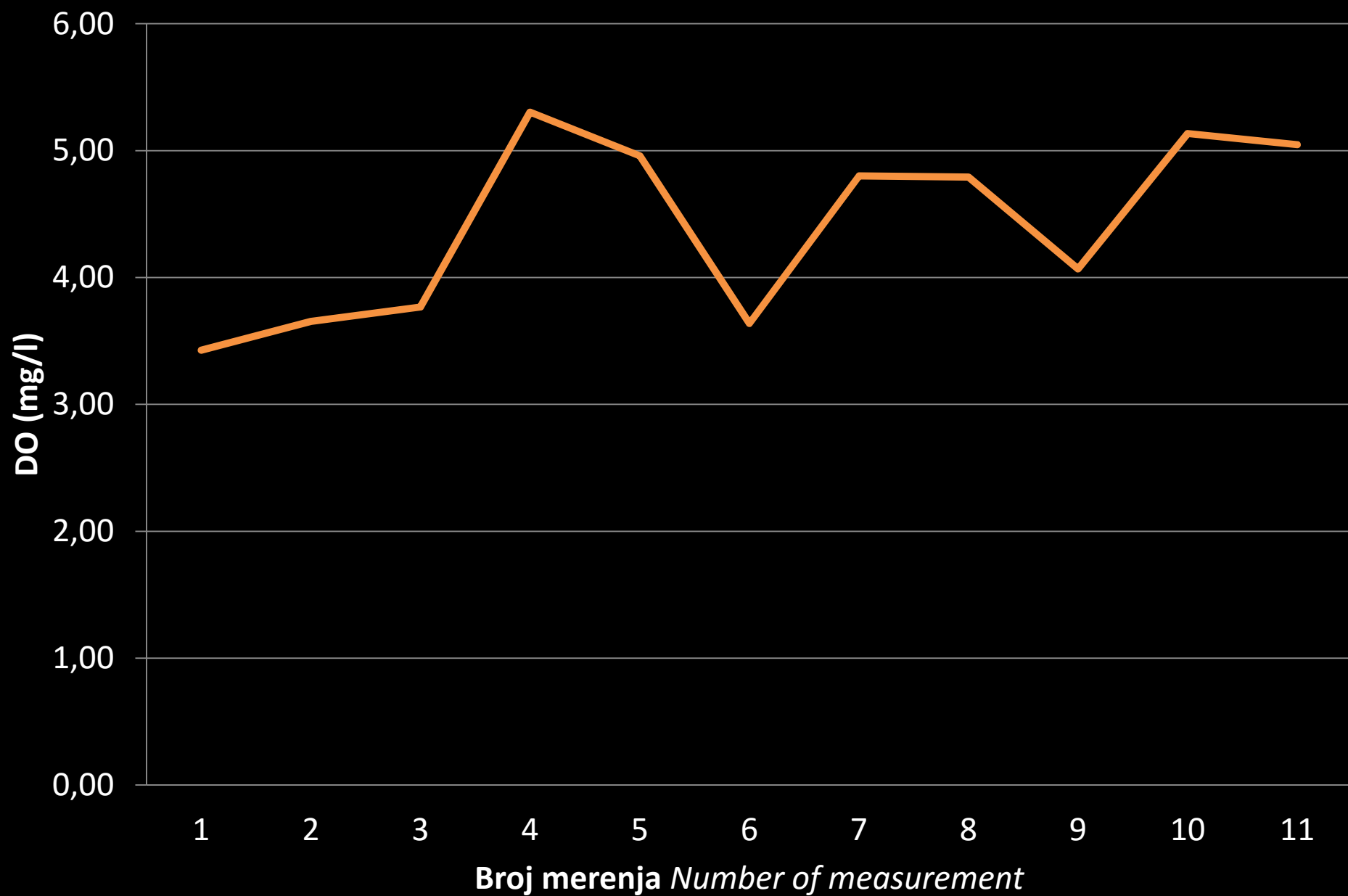
Srednje vrednosti temperature vode

Average values of water temperature



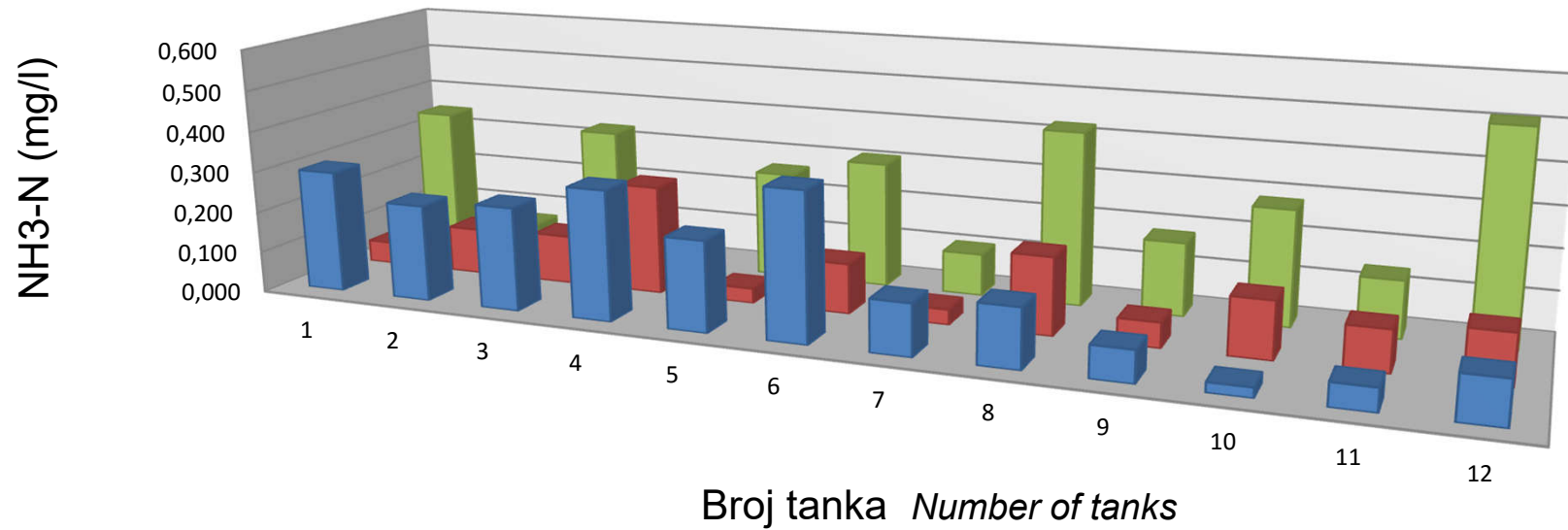
Srednje vrednosti rastvorenog kiseonika

Average values of DO

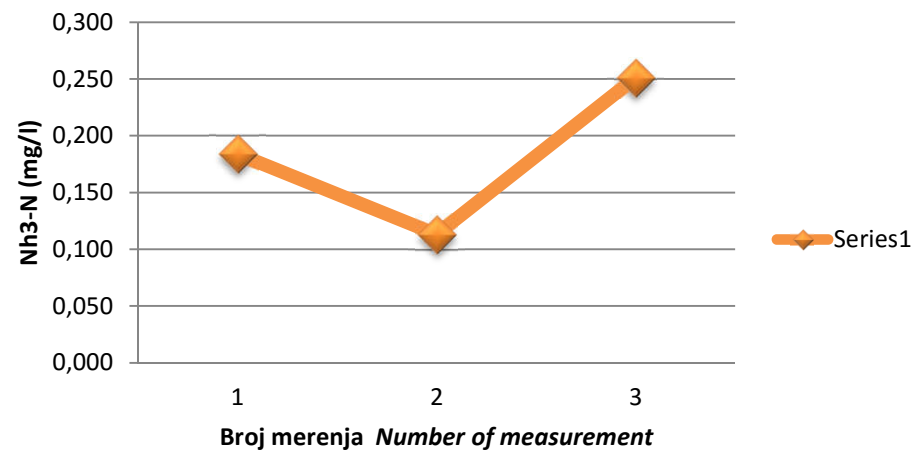


Promene koncentracije NH₃-N

Changes in concentration of NH₃-N



Promene prosečnih vrednosti NH₃-N



- I merenje (first measurement)
- II merenje (first measurement)
- III merenje (first measurement)

Rezultatati *Results*

Opasnost <i>Hazard</i>	Opis opasnosti <i>Description of the hazard</i>	Konačan nivo rizika <i>Final risk scoring</i>
Koncentracija kiseonika <i>Water oxygen content</i>	suviše niska <i>too low</i>	0.16
Temperatura vode <i>Water temperature</i>	suviše niska <i>too low</i>	0.0016
Koncentracija nejonizovanog amonijaka <i>Unionised amonia content</i>	suviše visoka <i>too high</i>	14.4
Temperatura vode <i>Water temperature</i>	nagle promene <i>rapid change</i>	0.8
Temperatura vode <i>Water temperature</i>	suviše visoka <i>too high</i>	0.06

...što znači da rangiranje opasnosti po dobrobit u ovom sistemu treba da izgleda.....

...what means that welfare hazard ranking in this system should be

...ovako:

...like this:

Opasnost <i>Hazard</i>	Opis opasnosti <i>Description of the hazard</i>	Konačan nivo rizika <i>Final risk scoring</i>
Koncentracija nejonizovanog amonijaka <i>Unionised amonia content</i>	suviše visoka <i>too high</i>	14.4
Temperatura vode <i>Water temperature</i>	nagle promene <i>rapid change</i>	0.8
Koncentracija kiseonika <i>Water oxygen content</i>	suviše niska <i>too low</i>	0.16
Temperatura vode <i>Water temperature</i>	suviše visoka <i>too high</i>	0.06
Temperatura vode <i>Water temperature</i>	suviše niska <i>too low</i>	0.0016

UMESTO ZAKLJUČKA.....

Ovaj način procene može ukaže na slabosti sistema u pogledu obezbeđenja odgovarajuće dobrobiti riba i na moguće posledice

Pogodan je za poređenje različitih proizvodnih sistema za istu kategoriju riba

Ne ukazuje na interakciju između pojedinih parametara

Ovaj sistem ima mogućnost modifikacije i poboljšanja

INSTEAD OF CONCLUSION.....

This method can show weakness of the system regarding to appropriate welfare of fish and possible consequences

It can be used for comparison of different production systems of the same life stage

Interaction between hazards is not included

This system could be modified and enhanced

