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**EFFECT OF LIGHT COLORS ON SPERMATION  
AND SPERM KINETICS PARAMETERS DURING OUT OF SEASON  
REPRODUCTION IN POND-REARED EURASIAN PERCH**

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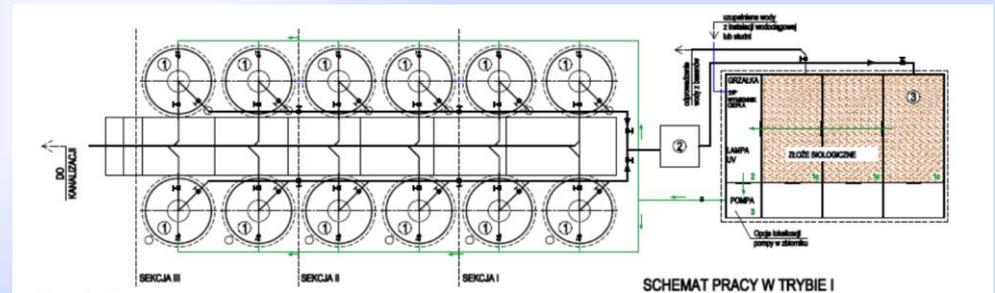
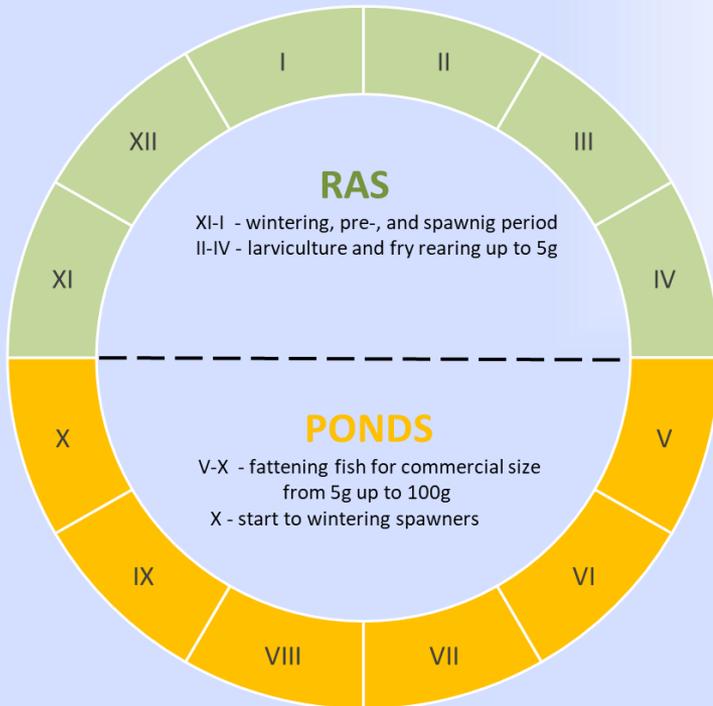
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# Diversification of pond-based production through semi-intensive aquaculture of Eurasian perch



project on development of integrated semi-intensive aquaculture technology of Eurasian perch by combination RAS-based production of juveniles followed by semi-intensive fattening in modified earthen-ponds





## Main task of the „reproductive work package” in PRO-PERCH project

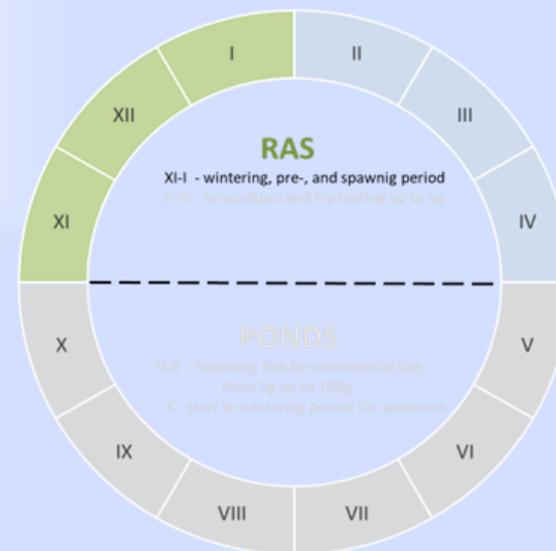
optimization of the out of season (January / February)  
reproduction protocol of pond-reared Eurasian perch  
under controlled conditions in RAS



influence of different photo-thermal conditions on  
perch reproductive effectiveness through wintering,  
pre-, and spawning period



- stress markers and HPG axis functioning via blood plasma hormones level (estradiol, cortisol and DHP), gonadoliberin and gonadotropins (LH and FSH) genes expression
- histological examination of the gonad and liver
- kinetics of haematocrit and leukogram
- kinetics of the final oocyte maturation (FOM) process,
- ovulation rate,
- and gametes quality



## Q&A in the context of the undertaken research



- controlled out of season reproduction protocol in Eurasian perch still require further optimization
- the optimal lighting conditions during this period is a need for more detailed investigations (is reconsidered as a tool for the reduction of stress)
- photoperiod between 12 and 16 h of light is typically applied during controlled, hormonally supported reproduction in perch and constant darkness have negative effects on reproductive traits throughout controlled out of season reproduction in this species
- the color of light is a very important environmental factor that affects fish physiology including sex determination, early maturation, reproductive performance or stress response
- knowledge about influence of different light color on reproductive aspects during controlled reproduction of percid species is unknown

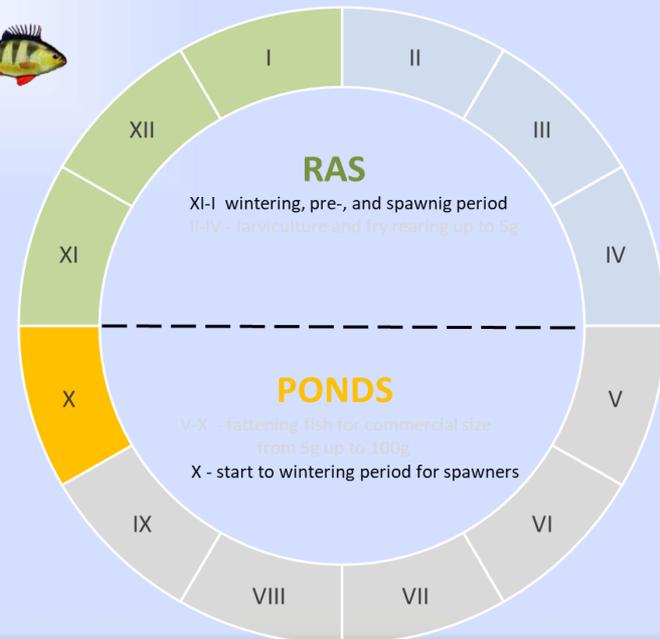
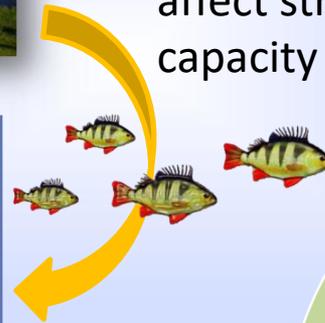
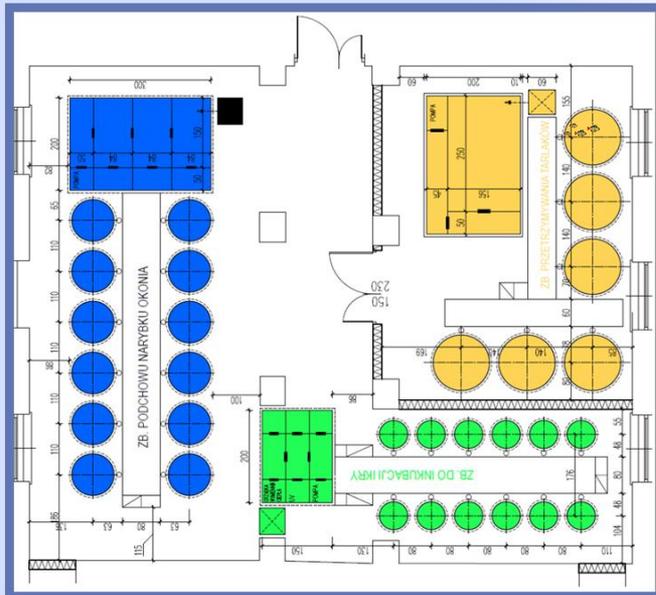


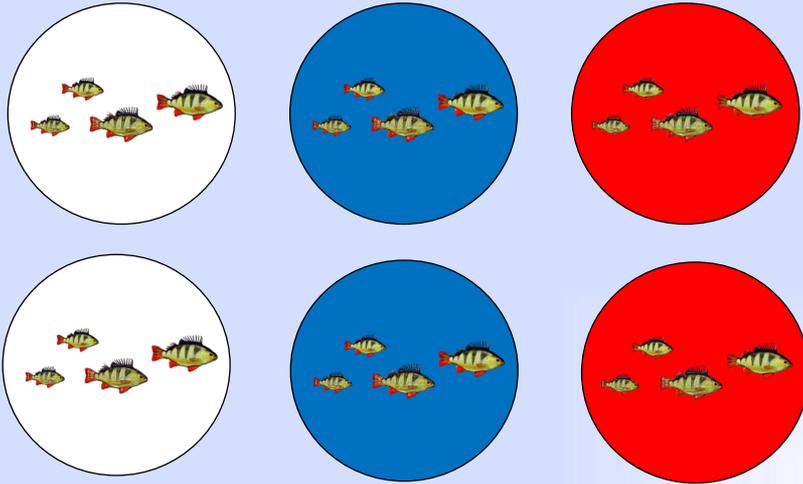
# Effect of light colors on spermatation and sperm kinetics parameters during out of season reproduction in pond-reared Eurasian perch



## Objectives:

In the present study, we have focused on characteristic of pond-reared Eurasian perch sperm parameters following controlled wintering and pre-spawnig periods with application of different light colors (White, Blue or Red), hypothesizing that this might affect stress level and further reproductive capacity of males.





- males and females kept together
- 3 groups exposed on different color White, Blue or Red color in duplicate
- tank volume – 1 m<sup>3</sup>
- stocking - 15 kg per tank
- average weight of fish - 150 g
- feeding - three times a week with a commercial frozen bloodworm larvae
- photo-thermal programme throughout experiment

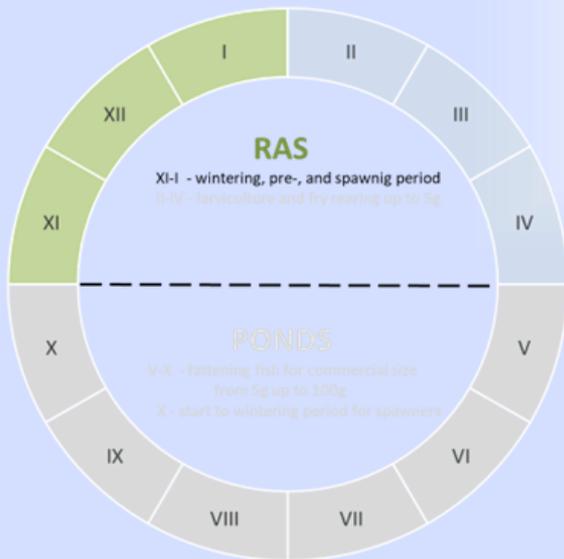
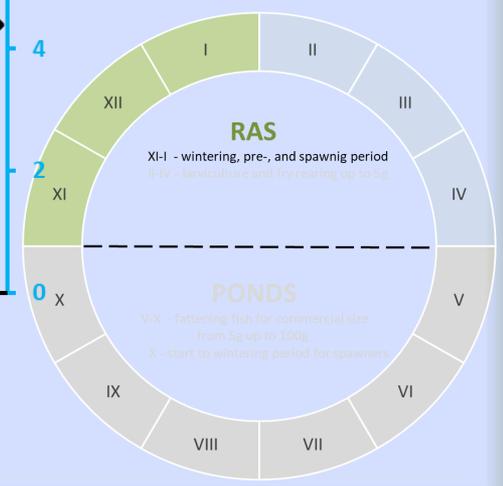
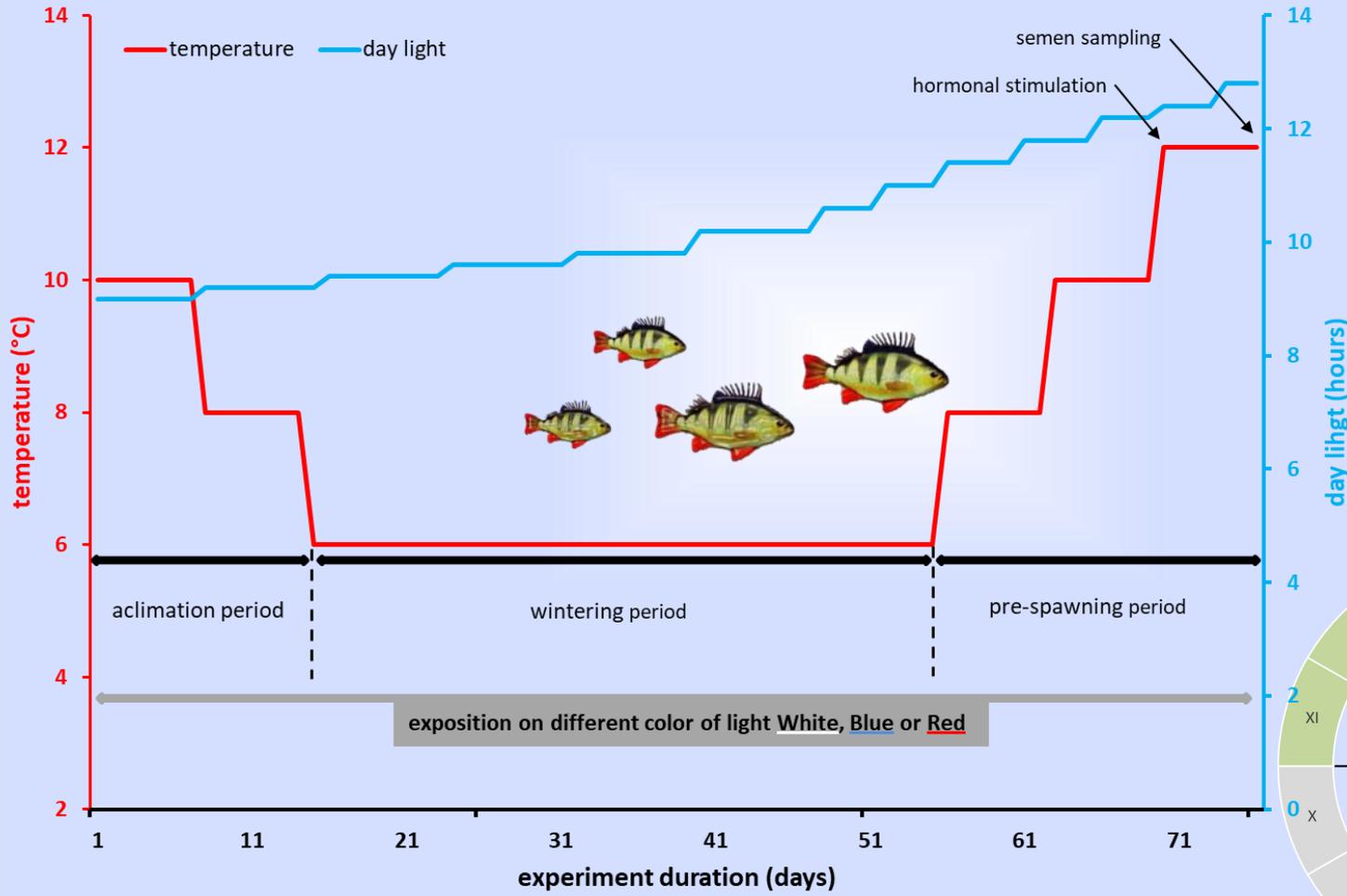
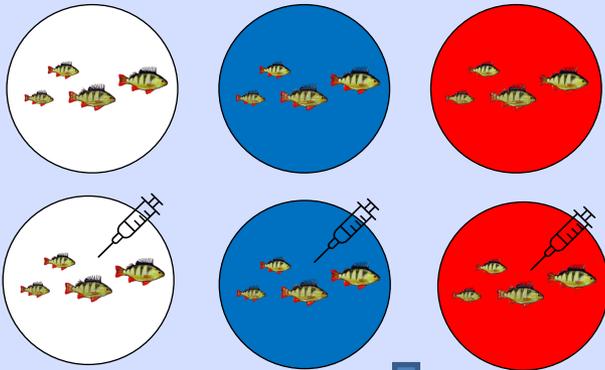


Photo-thermal regime applied in RAS during the acclimation, wintering, pre-, and spawning period of pond-reared Eurasian perch males. Arrows indicate the time of the application of hormonal treatment and of semen collection.

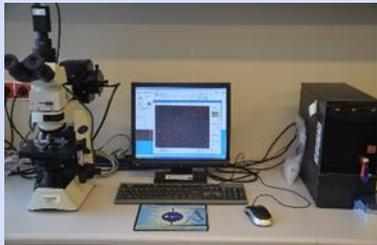
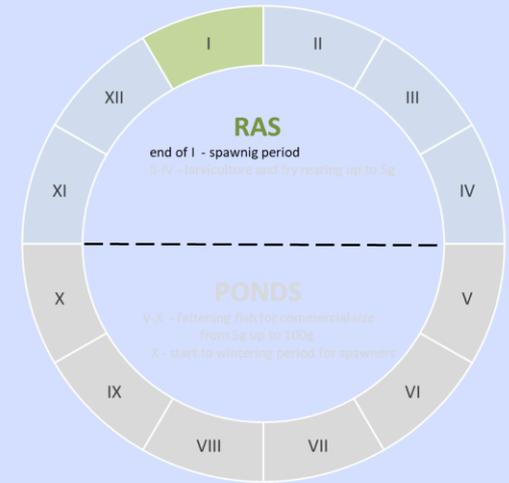




Fish were exposed on three different light colors: White, Blue and Red, half of them was stimulated for spermiation with  $50 \mu\text{g kg}^{-1}$  of the sGnRH $\alpha$



Semen was collected with a catheter from 5 males originated from each group. The total volume of semen (VOL) was determined with accuracy of 0.1 ml.



CASA system  
(SCA, Microptic S.L.)



Vapor Pressure  
Osmometer 5600

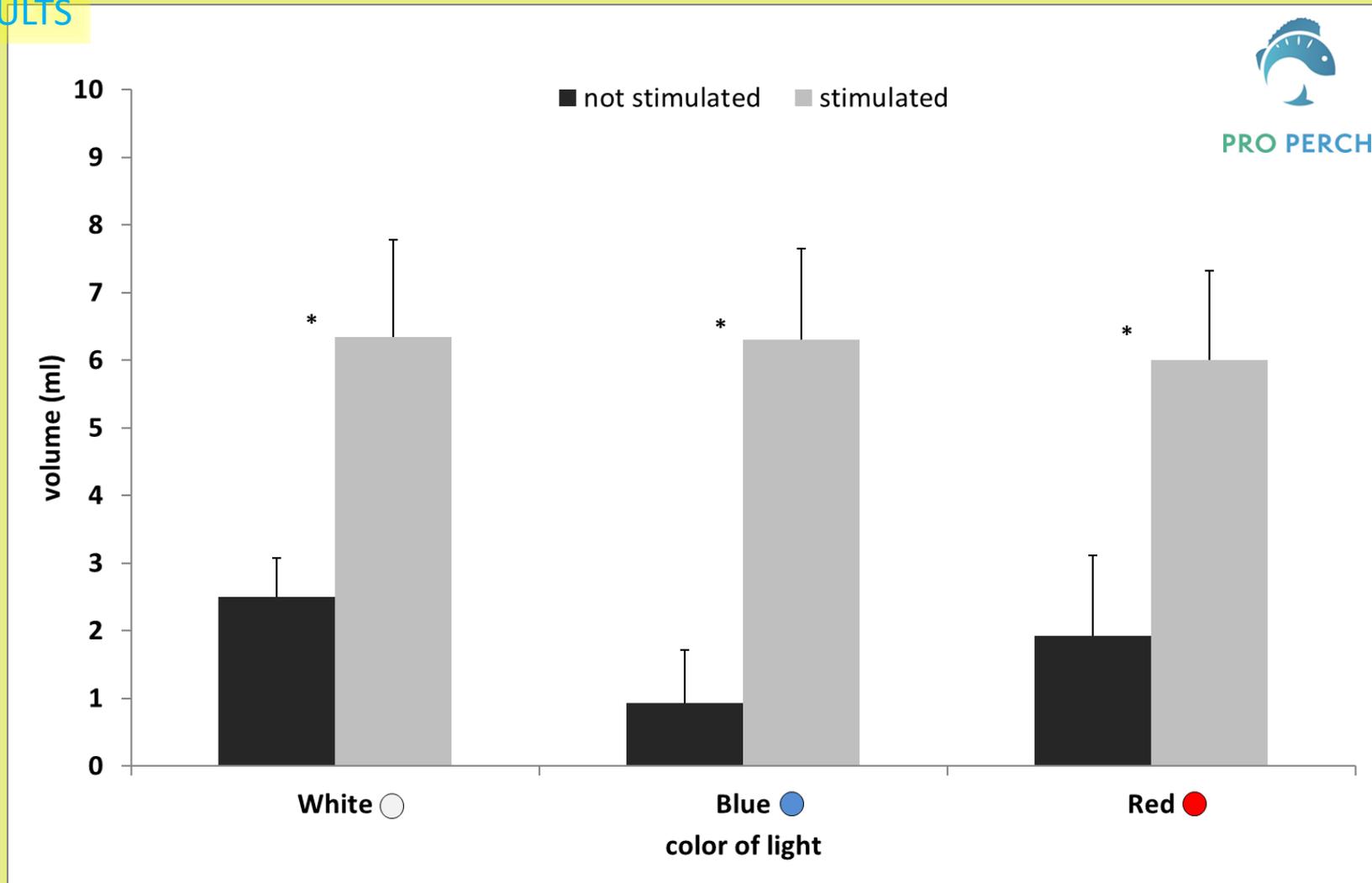
CASA analysis: MOT (%), VCL ( $\mu\text{m s}^{-1}$ ), VAP ( $\mu\text{m s}^{-1}$ ), VSL ( $\mu\text{m s}^{-1}$ ), LIN (%), ALH ( $\mu\text{m}$ ), BCF (Hz).

The osmolality of seminal plasma was also determined. Statistical significance level - 0.05 (HSD Tukey post hoc test).

## RESULTS

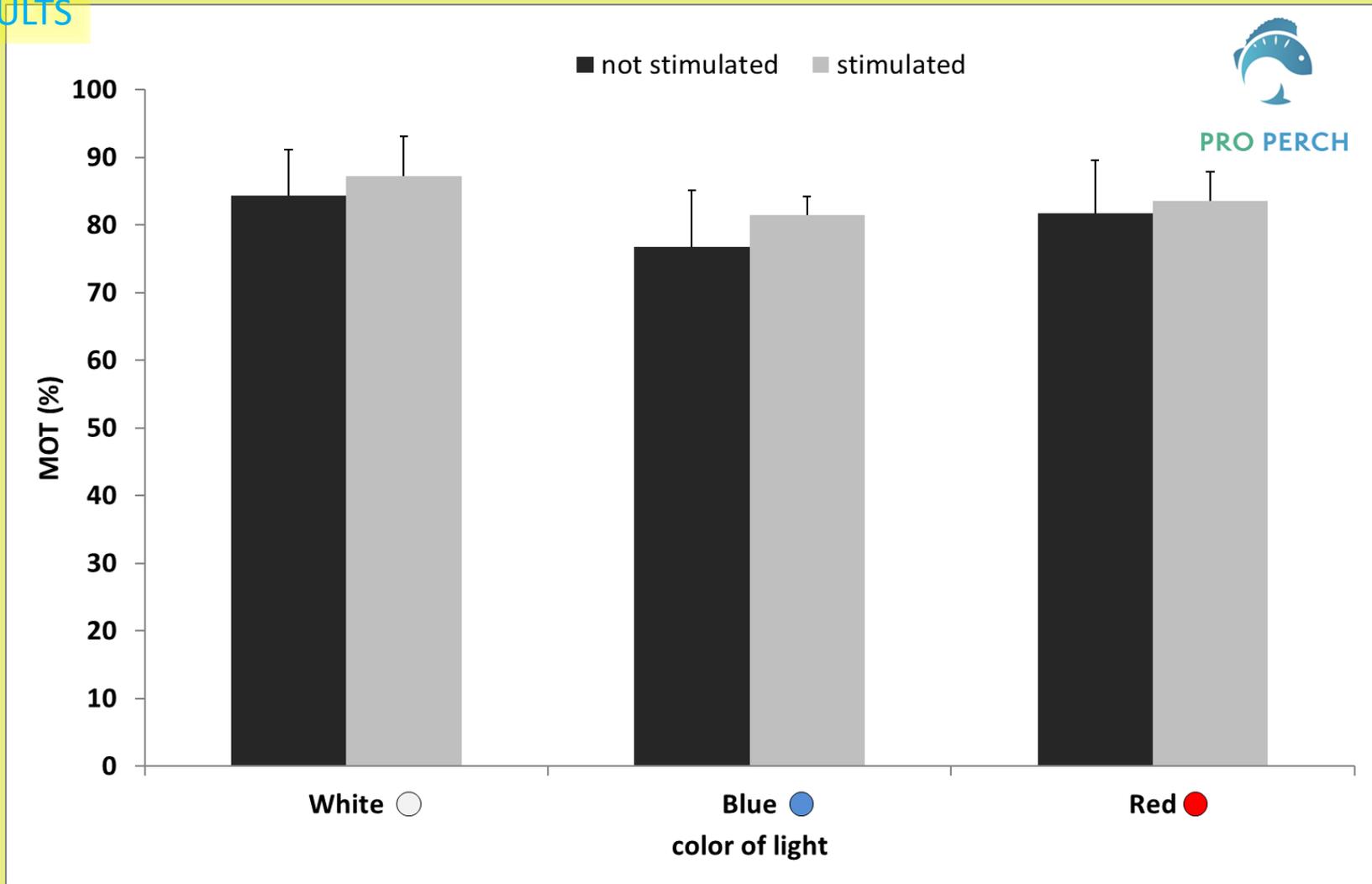


PRO PERCH



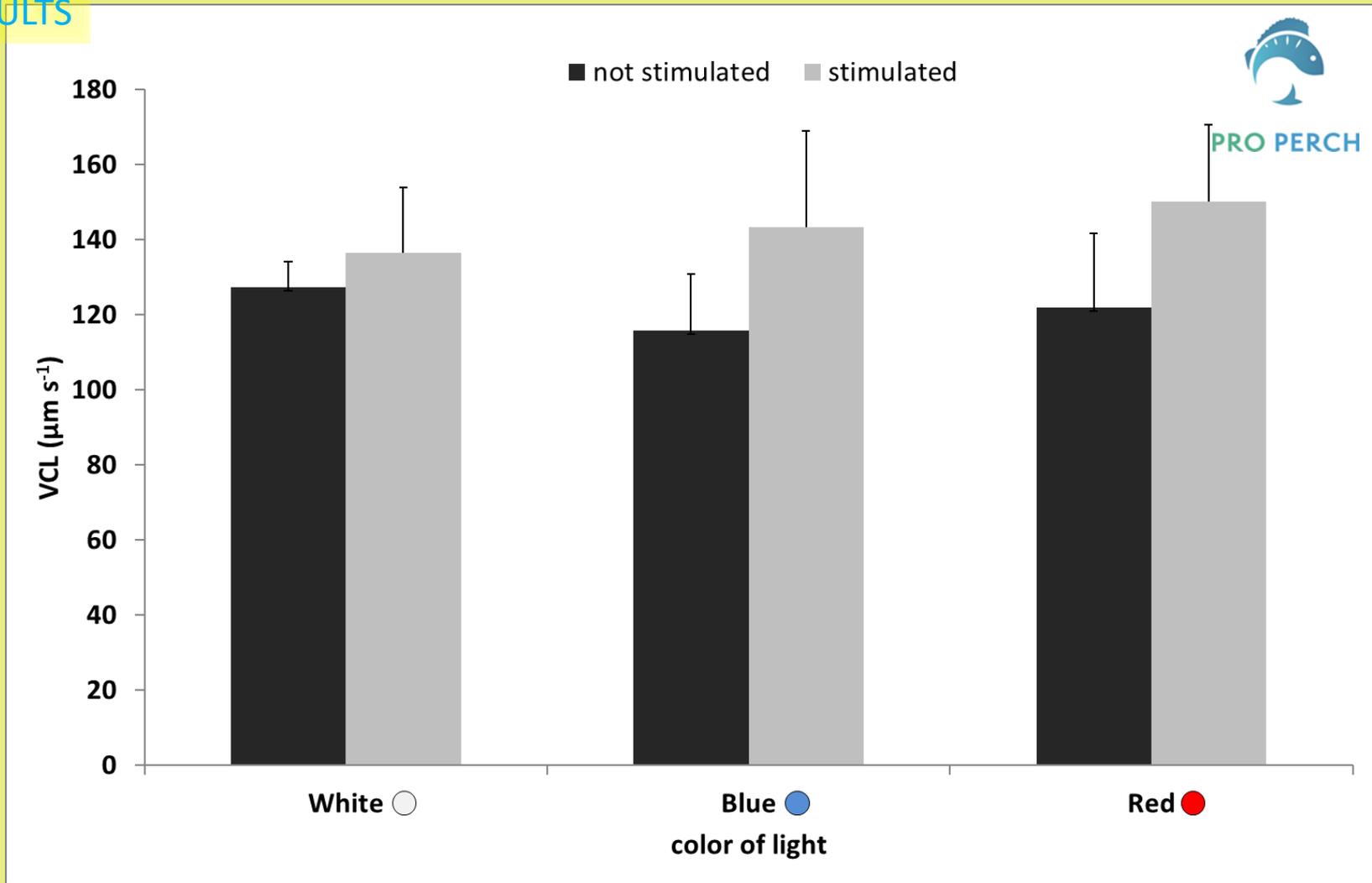
Semen volume obtained from Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: **White**, **Blue** or **Red** and were hormonally stimulated for spermiation or not. Asterisks indicate significant difference between stimulated and not stimulated fish within lighted groups ( $P < 0.05$ )

## RESULTS



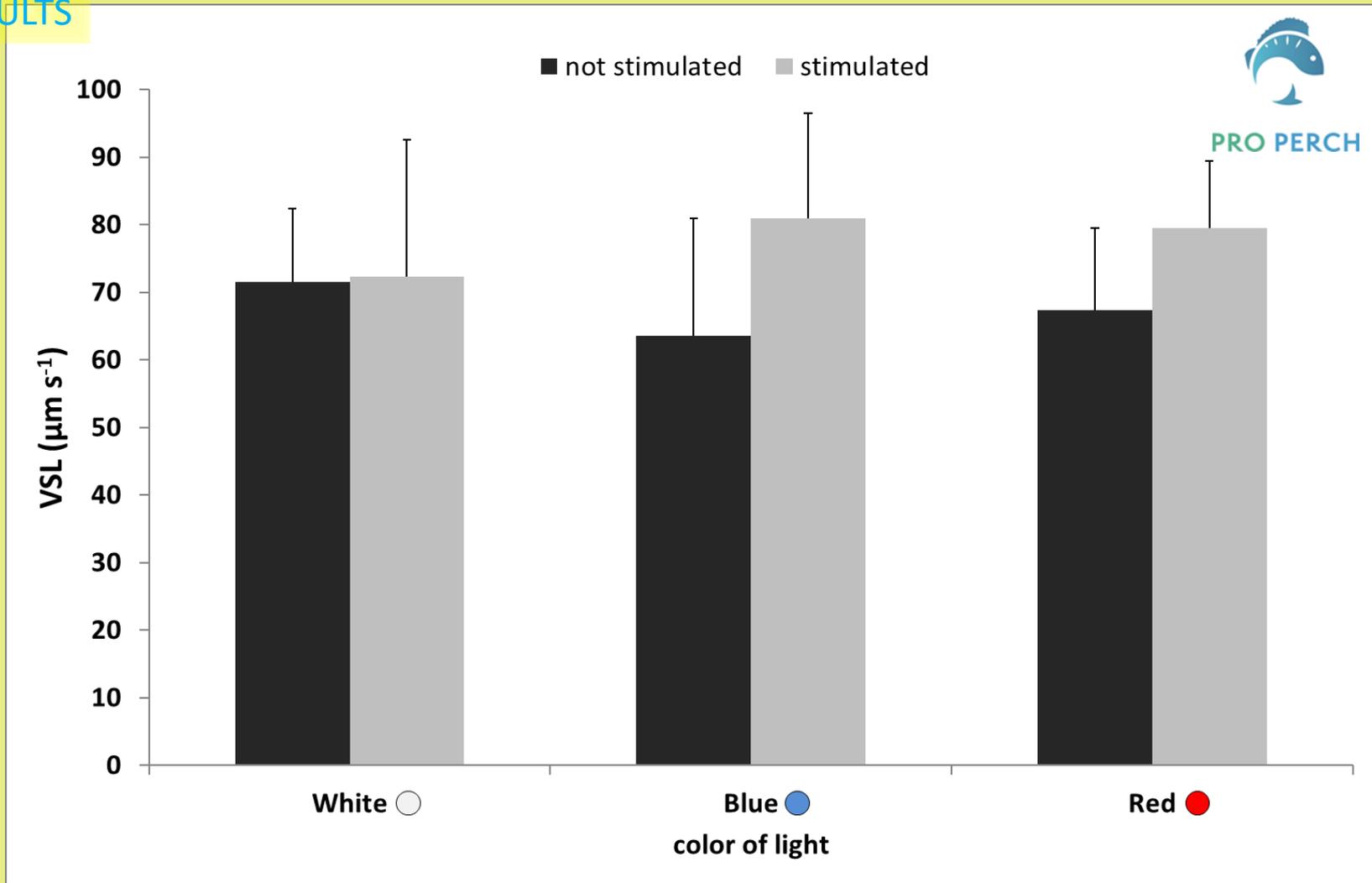
Sperm motility of semen obtained from Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: White, Blue or Red and were hormonally stimulated for spermiation or not. No significant difference between groups were found ( $P>0.05$ )

## RESULTS



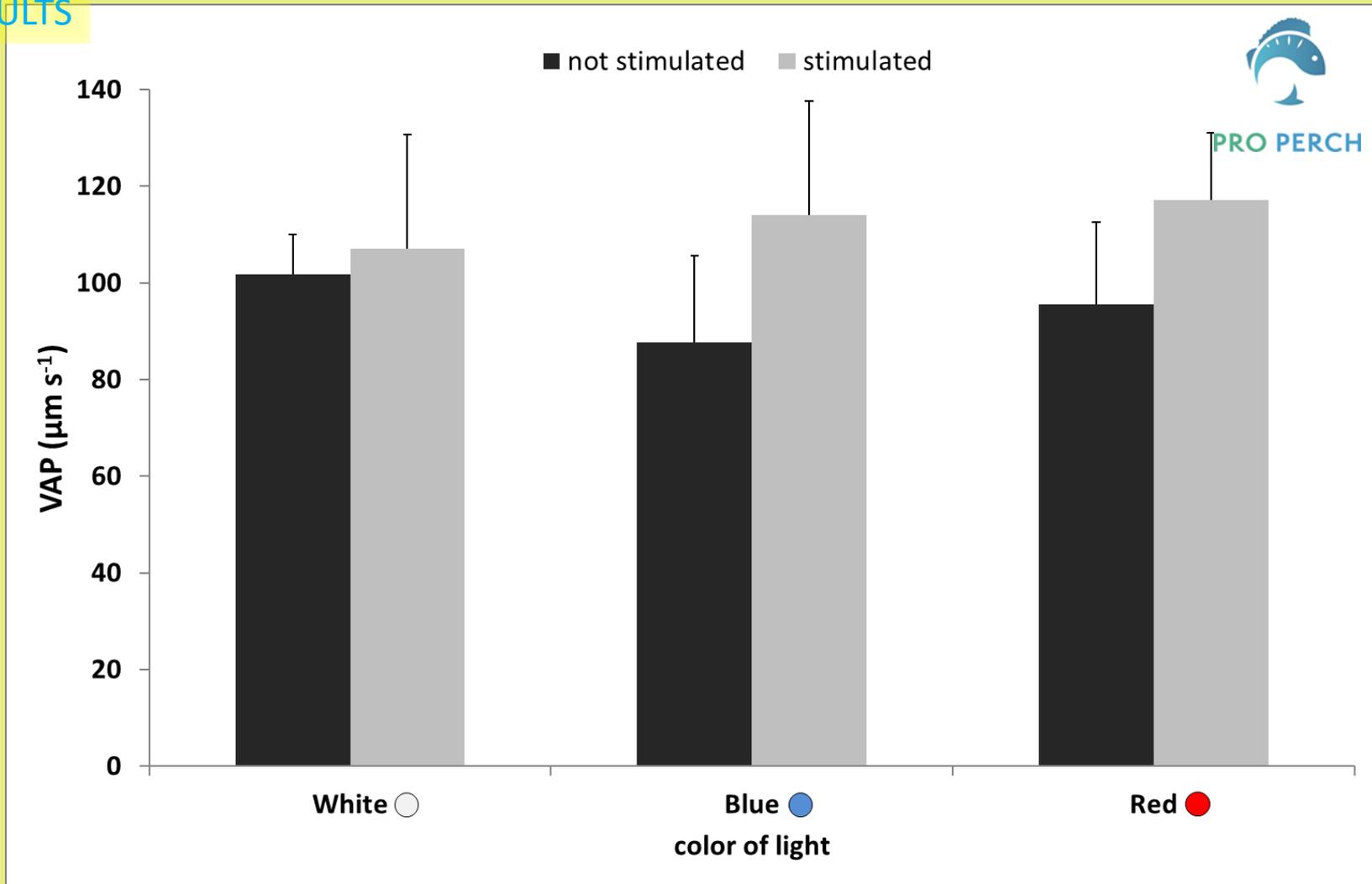
Sperm curvilinear velocity of semen obtained from Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: White, Blue or Red and were hormonally stimulated for spermiation or not. No significant difference between groups were found ( $P > 0.05$ )

## RESULTS



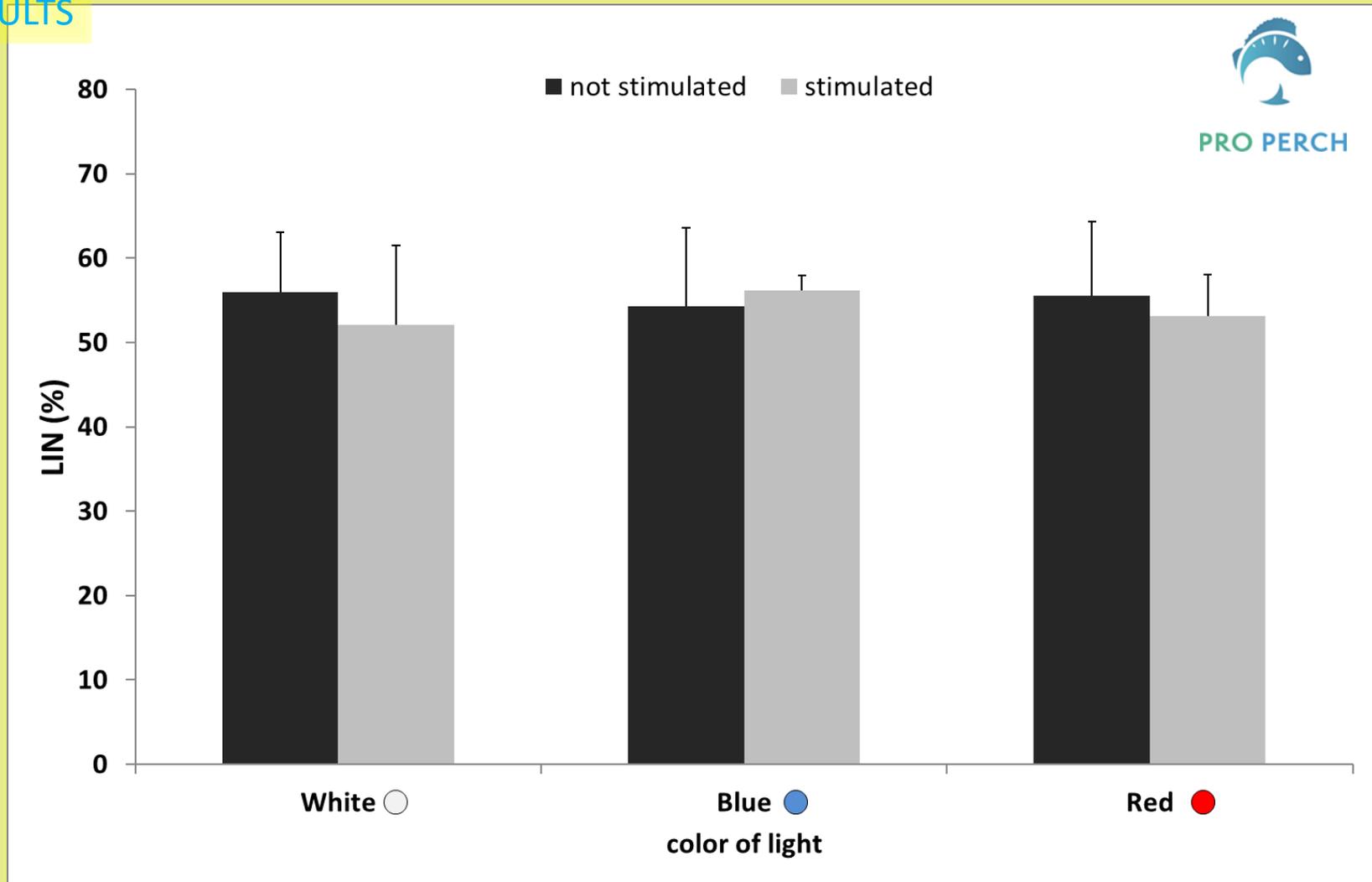
Sperm straight line velocity of semen obtained from Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: White, Blue or Red and were hormonally stimulated for spermiation or not. No significant difference between groups were found ( $P > 0.05$ )

## RESULTS



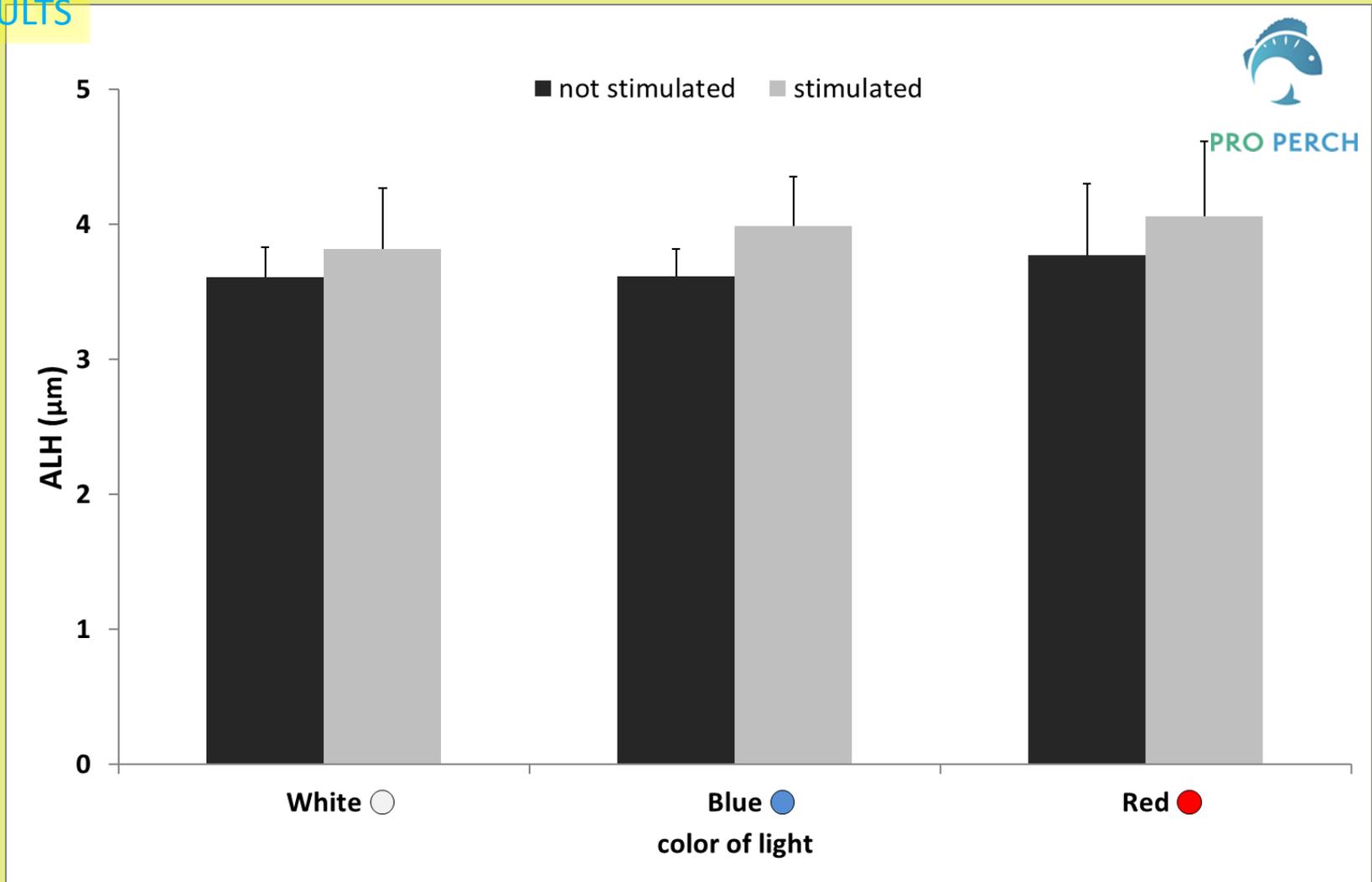
Sperm average path velocity of semen obtained from Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: White, Blue or Red and were hormonally stimulated for spermiation or not. No significant difference between groups were found ( $P>0.05$ )

## RESULTS



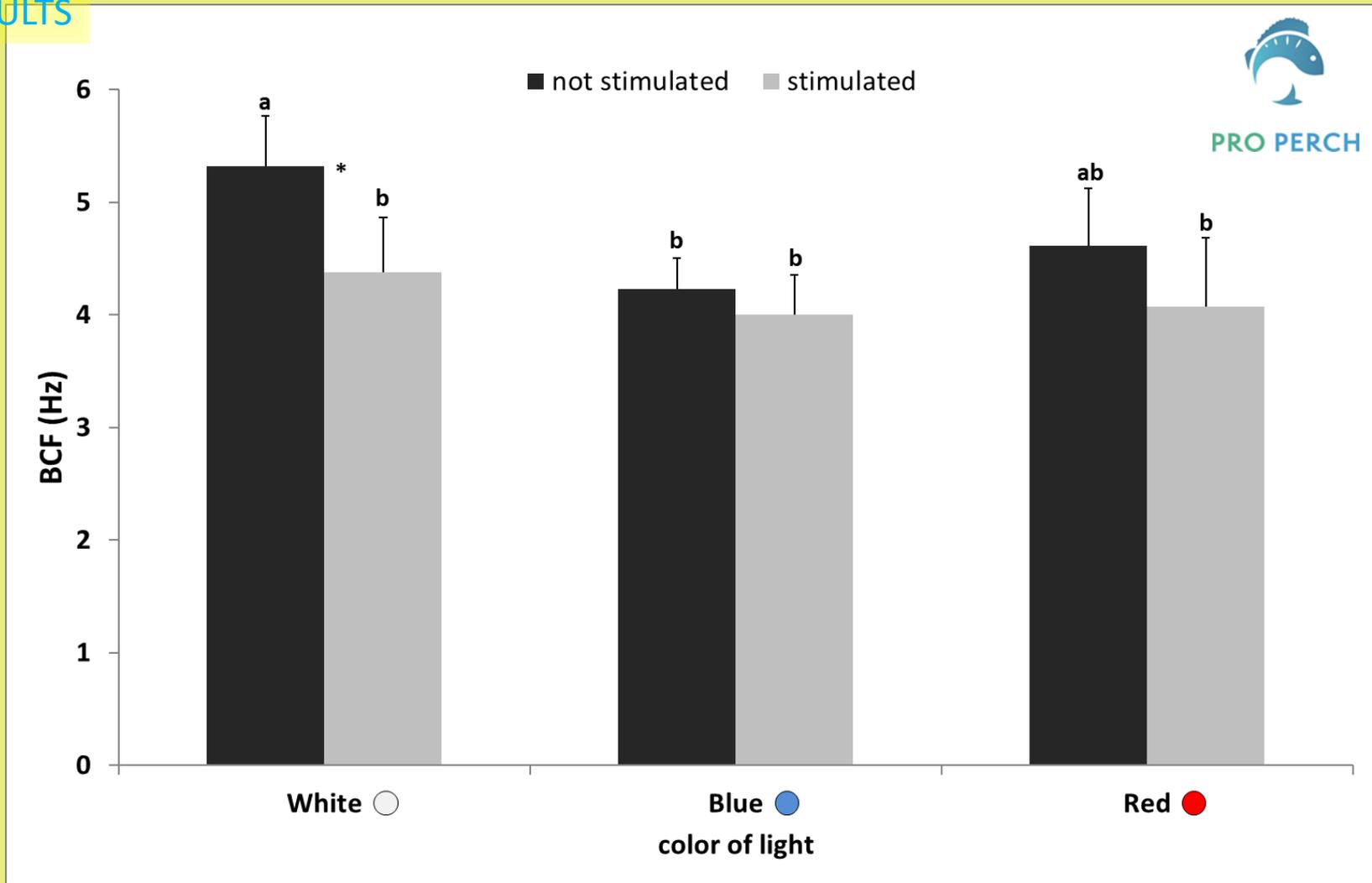
Sperm linearity of semen obtained from Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: White, Blue or Red and were hormonally stimulated for spermiation or not. No significant difference between groups were found ( $P>0.05$ )

## RESULTS



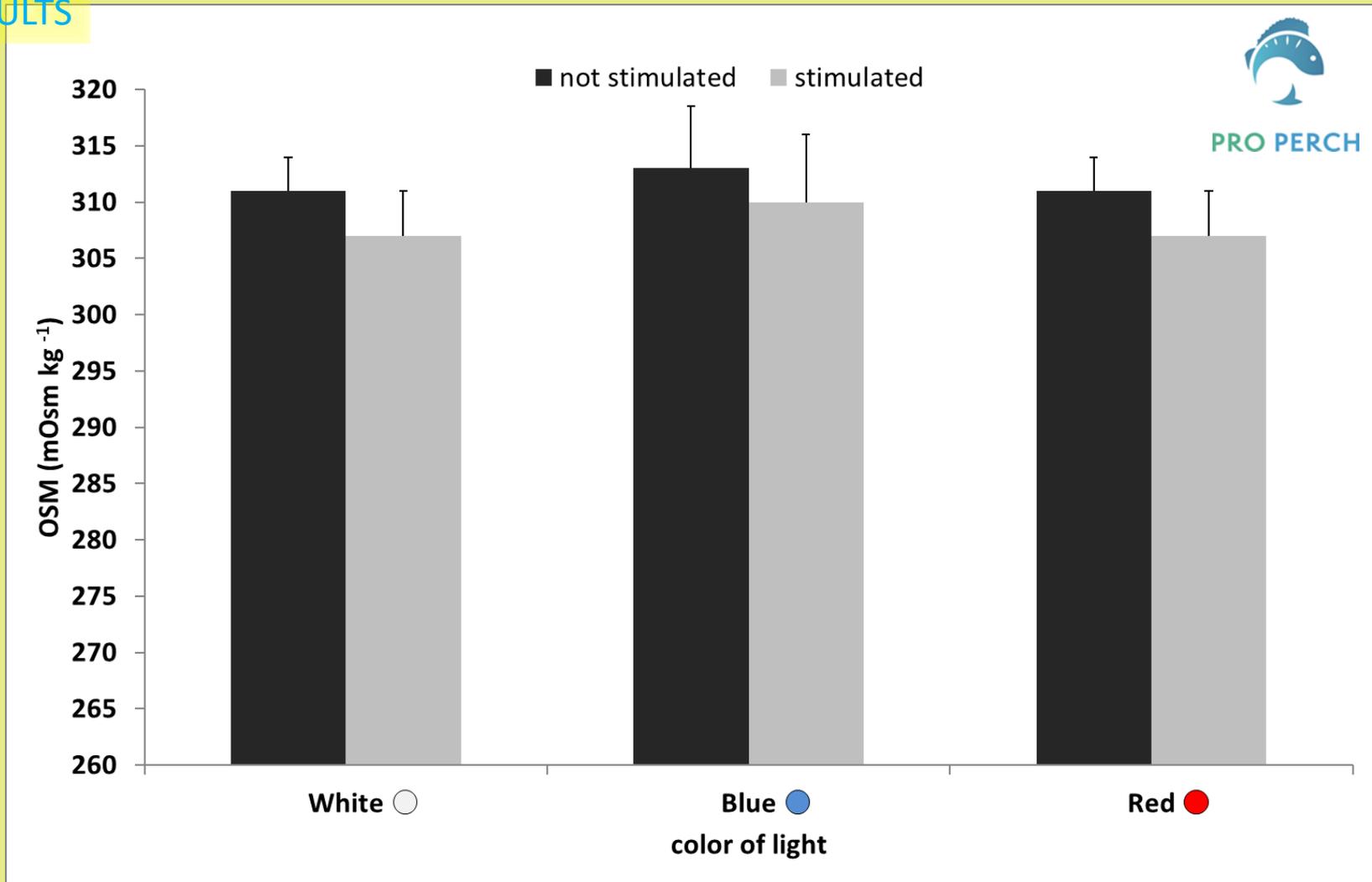
Amplitude of lateral sperm head displacement in semen obtained from Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: White, Blue or Red and were hormonally stimulated for spermiation or not. No significant difference between groups were found ( $P > 0.05$ )

## RESULTS



Sperm beat cross frequency in semen obtained from Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: White, Blue or Red and were hormonally stimulated for spermiation or not. Different letters indicate significant difference between groups ( $P < 0.05$ )

## RESULTS



The osmolality of seminal plasma obtained from semen of Eurasian perch males after 7 days of the end of wintering period preceding out of season reproduction, where fish were exposed on three different light colors: **White**, **Blue** or **Red** and were hormonally stimulated for spermiation or not. No significant difference between groups were found ( $P>0.05$ )

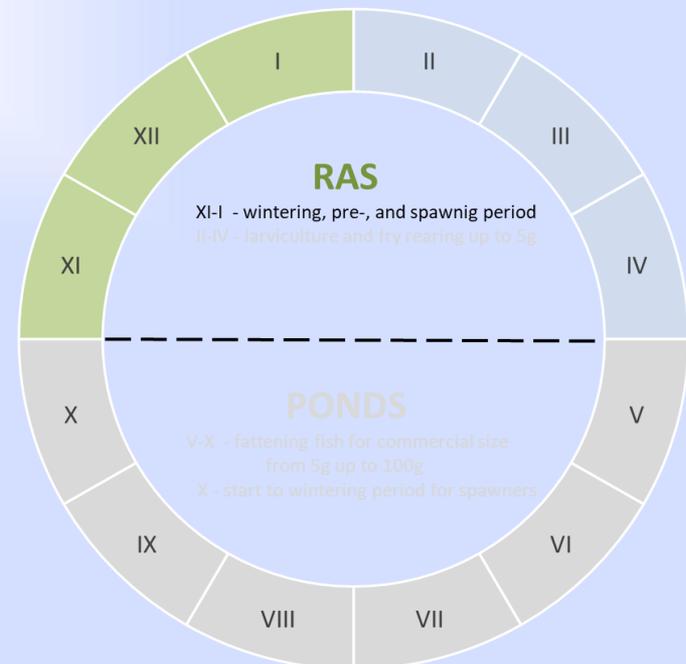
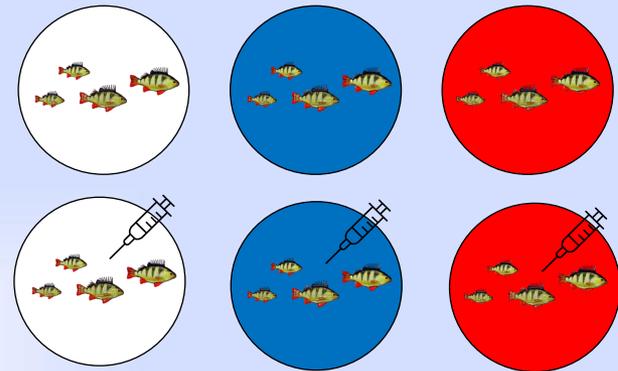
# SUMMARY

No significant differences in spermatation success, semen volume and most CASA variables in response to light colors (White, Blue or Red ) used during wintering and pre-spawning periods preceding out of season reproduction of Eurasian perch were found.

Hormonal stimulation had a positive effect on total semen volume in all tested groups, however it had no significant effect on the observed sperm kinetics parameters, irrespective of light color.

We consider that light color has no effect on spermatation and sperm kinetics parameters during controlled out of season reproduction in Eurasian perch.

The effect of light color on stress and immune response indices will be further investigated to elucidate linkage between light color and physiological reaction in this species.





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