

## THE CARP, FROM THE AQUATIC FIELD TO THE DISH: KEY POINTS IN THE SEMI INTENSIVE PRODUCTION AND PLACEMENT

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### ŠARAN, OD VODENE NJIVE DO TANJIRA: KLJUČNE TAČKE U POLUINTENZIVNOJ PROIZVODNJI I PLASMANU

#### *Apstrakt*

Jedna od najviše gajenih ciprinidnih vrsta riba u svetu je šaran. Gaji se u različitim sistemima, od ekstenzivnih do intenzivnih. Među brojnim načinima gajenja, poluintenzivna proizvodnja je apsolutno dominantna. Ovakva proizvodnja se bazira na kombinaciji prirodne i dodatne hrane. Prirodnom hranom se obezbeđuje proteini, ali i ostali potrebni sastojci neophodni za pravilan rast i razvoj ribljeg organizma, dok se dodatnom prihranom podmiruju energetske potrebe, ali i nedostajući proteini, minerali, vitamini, pre svega u periodima depresije prirodne hrane. Hrana za gajenog šarana u velikoj meri utiče na proizvodne rezultate. Međutim hrana, iako veoma važna, samo je jedna karika u lancu bitnih ključnih tačaka od vodene njive do tanjira. **Priprema ribnjačkih jezera** pre nasada predstavlja važnu agrotehničku meru, a koja se često izostavlja, pre svega pri gajenju konzumnog šarana. Prezimljavanje ribnjačkog dna na suvom, tanjiranje, zakrečavanje, a potom đubrenje su od velikog uticaja na razvoj prirodne hrane, ali i na proces mineralizacije organskih materija u ribnjačkoj podlozi, kao i na dezinfekciju ribnjaka, čime se obezbeđuje povoljni ambijentalni uslovi za gajenje šarana. **Izbor monokulture ili polikulture** u velikoj meri može uticati na ostvarenje profita u poluintenzivnoj proizvodnji šarana, ne samo zahvaljujući maksimalnom iskorišćavanju prirodnih potencijala ribnjaka, već i zahvaljujući obezbeđivanju stabilnosti ribnjačkog ekosistema. **Kvalitet šaranske mladi za nasad** jedna je od najvažnijih ključnih tačaka. Izbor mladi dobijene od selekcionisanih matica predstavlja najbolji, a izbor mladi iz divljeg mresta najlošiji izbor sa nepredvidivim rezultatima. Jedna od dilema je i da li u ribnjačkim objektima gajiti samo **jednu uzrasnu kategoriju ili**

**primeniti mešani nasad?** Nasad dvogodišnje mlađi za gajenje konzumnog šarana koji je u toku prethodnog perioda bila bolesna zajedno sa jednomesečnom ili jednogodišnjom mlađi predstavljaju loš tehnološki potez. Međutim, mešani nasad, predstavlja dobar izbor ukoliko želimo da maksimalno iskoristimo prirodnu hranu, kao i u ribnjačkim uslovima u kojima prihranu riba obavljamo peletiranom hranom. Nakon dobre pripreme ribnjačkog objekta, kao i izbora mlađi za nasad predstoji nam **odluka kojom vrstom hrane prihranjivati šarana**. Izbor žitarica u poluintenzivnoj proizvodnji je opravdan u uslovima dobre razvijenosti prirodne hrane, želje da se proizvodi od 1 do 1,5 t/ha, kao i nemogućnosti plasmana veće količine ribe na tržište. Koncentrovane smeše su u prednosti kada se želi proizvesti više od 1,5 t/ha i šaran boljih nutritivnih svojstava. Od koncentrovanih, ekstrudirana hrana je po najvećem broju kriterijuma u prednosti u odnosu na peletiranu. Veoma je važno voditi računa i o činjenici da u različitim periodima proizvodne sezone (pre svega u zavisnosti od temperature i razvijenosti prirodne hrane) gajenom šaranu odgovara hrana različitog sastava (različitog sadržaja proteina, ugljenih hidrata, vitamina, minerala). Jedan od ključnih faktora za dobre proizvodne rezultate je i potreba **da se ribe sačuvaju od ihtiofagnih ptica, sisara, pa i čoveka**. Pored odabira pravih tehnoloških postupaka **stalno praćenje zdravstvenog stanja gajenog šarana, kao i preventivno delovanje** su najbolji načini održavanja stabilnosti zdravstvenog stanja gajenih riba. Iako poluintenzivno gajenje šarana u pogledu **dobrobiti riba**, predstavlja jedan od oblika proizvodnje koji je najbliži idealnom, sam izlov, transport i skladištenje u prodavnicama živog šarana je period „pakla“ za ovu vrstu. Otuda je neophodno posebnu pažnju posvetiti tehnologiji izlova i transporta šarana u cilju unapređenja dobrobiti riba, a sa ciljem smanjenja stresa kod izlovljene šaranske mlađi, što će imati pozitivan efekat na smanjenje mortaliteta, održavanje dobrog zdravstvenog stanja u narednim periodima gajenja šarana, kao i samog kvaliteta mesa konzumnog šarana. Među poslednjim, ali za dalji razvoj šaranskog ribarstva jednim od ključnih faktora je **način prometa šaranom**. Promet živog šarana sa aspekta ekonomije predstavlja skup način, sa aspekta dobrobiti riba nehuman, a sa aspekta praćenja trendova plasmana ribe zastareli i neusklađen način prodaje sa zahtevima savremenog kupca.

*Ključne reči: šaran, ključne tačke, poluintenzivna proizvodnja, promet*  
*Keywords: carp; key points; semi-intensive production; trade*

## INTRODUCTION

One of the globally most commonly cultured fish species is the Carp (Takeuchi et al., 2002). It is cultured in different systems, from extensive production forms to intensive systems. Among numerous culture systems, a semi intensive production is more dominant than the others. Such production is based on combining natural with added feed. With natural food body building blocks are provided – proteins and other essential constituents (vitamins, minerals, carbohydrates...) needed for proper growth and development of the fish organism. Added carbohydrates are primarily supplied for energy needs, but also missing proteins, minerals, vitamins, mainly during periods of natural food depression. The right choice of feed for cultured carp influences production results to a great extent. Although added feed is of utmost importance, it is still just a single link in the chain of key points from aquatic field to consumer's plate.

## PREPARATION OF FARM INFRASTRUCTURE

Pond preparation before stocking is an important agrotechnical procedure, often omitted, primarily in ponds where 2 summer old and consumable size carp is stocked. Dry pond bottom during wintering, disking, liming, and subsequent fertilization are of utmost importance for natural food development and also for bottom organic matter mineralization and natural pond disinfection. Preparation of farm infrastructure in the cold season (from November till March) provides better environmental conditions for the next season of carp culture (Marković, 2010).

## CHOICE BETWEEN MONOCULTURE AND POLYCULTURE

The decision whether to produce in mono or polyculture influences the final profitability in the semi intensive carp culture to a great extent. This is not only because of maximal use of pond natural potential (natural food for accompanying species), but also because of the maintenance of the pond ecosystem stability. In cases of higher development of macrophytes, that is white grass carp (*Ctenopharyngodon idella*) food, it is necessary to stock with one summer old fry of this species in cases when common duckweed (*Lemna minor*) is present, and with bigger specimens in cases when larger macrophytes (common reed – *Phragmites communis*, bulrush – *Typha latifolia*) are developed. It has to be kept in mind that some macrophytes, such as Yellow Floating-heart (*Nymphoides peltata*) will not be consumed by the white grass carp. White bighead (*Hypophthalmichthys molitrix*) is stocked when phytoplankton (primarily green algae) dominates, and gray bighead (*Aristichthys nobilis*) when there is more zooplankton than common carp can consume. Stocking of predator species (catfish – *Silurus glanis*; pikeperch – *Stizostedion lucioperca*) is carried out by building pikeperch nests, for pikeperch stocking, or restocking with small catfish, mainly in ponds where larger carp categories are reared. By this procedure wild fish that enters the pond through the water supply system is controlled, as well as weak individuals and those that are not healthy. The choice of monoculture is a better option in cases of semi intensive production intensification, with the use of extruded feed, and when natural food is largely neglected, as well as in cases when natural food is still not fully developed. In cases when accompanying species are stocked in the pond where natural food is insufficient, this fish will be directed towards carp feeding points and eat extruded feed. This will have a negative effect on production profitability.

## CHOICE OF THE CARP FRY FOR STOCKING

Carp fry quality is one of the most important key points. The choice of fry obtained from selected broodstock is the best decision, while taking fry from wild spawning is the worst due to unpredictable production results. One of the dilemmas is whether to culture only one age category or combine culturing fry and consumable carp. Fish ponds in which diseases appear are not suitable for mixed sized stocking. For consumable carp production stocking with fry that has been in poor health, together with one month old or one summer old fry, represents a faulty technological step, since disease-causing agents might be in a silent/latent state. However mixed sized stocking is a good choice in ponds where natural food is developed during most of the growing season, as well as when pelleted feed is used as supplemental.

## CHOICE OF FEED AND FEEDING DYNAMICS

After a proper preparation of fish ponds, the decision needs to be made on the type of culture and fry of good quality, and about the type of carp supplemental feed. The option of using cereals in the semi intensive system is justifiable if natural food is developed and if the goal is 1 to 1.5 tons fish per hectare, as well as the lack of opportunities for appropriate market placement. Concentrated formulated feed is an advantage when higher production than 1.5 t/ha is envisaged (Marković, 2010), and when the goal is to produce carp with better nutritive characteristics: higher protein content, less lipids, better fatty acid profile (Trbović et al. 2013). Among concentrated formulated feeds the extruded type compared to pelleted has many advantages when it comes to most criteria such as physical, chemical, or microbiological feed properties. However, in conditions of mixed sized stocking as well as carp fry monoculture in ponds, with good water quality, due to indirect positive effects on natural food development, the use of pelleted feed could result in higher production (Ćirić et al., 2015). Besides the right choice for supplementary feed for carp production, it is important to take care about different periods during the season, (primarily in terms of temperature and level of natural food development), since cultured carp needs different feed content/quality in terms of protein, carbohydrates, vitamins, and minerals.

When it is about feeding dynamics, more frequent feeding (several times a day), harmonized with

Highest utilization of natural food gives the best results.

## PROTECTING THE CARP FROM ICHTHYOPHAGOUS BIRDS, MAMMALS, POACHING AND MONITORING HEALTH STATUS OF CULTURED FISH

One of the key factors for good production results is the need to protect cultured fish from ichthyophagous birds, mammals, and poaching. Besides choosing best production procedures, monitoring carp health, prevention of diseases is the best way of keeping fish in good health conditions. When optimal technological procedures and maintenance of fish health are applied, the end of the growing season and harvest should not represent any problem and justify all the efforts invested. Although semi intensive carp production is the system close to the ideal with regards to fish welfare, harvest, transportation and stocking in fishmonger where live carp is sold represents the period of hell for the fish. Thus, special attention should be devoted to harvest technology and transportation in order to reduce stress and contribute to carp welfare. This will also have positive effects on mortality reduction and maintenance of good health status, as well as on flesh quality of consumable carp.

## CARP TRADE

One of the last but not the least key factors in carp culture development in the future is carp trade. Trade of live carp that is dominant in Europe, from economical point of view is an expensive method, particularly from the welfare aspect, as well as obsolete and not harmonized with consumers' demand. Selling live carp requires possession of appropriate transportation means by the producer and/or costumer; transport of water with the fish;

providing a pool for keeping live fish in a fishmonger; and finally gutting the fish. All this increases costs and decreases demand for this species. Trade of carp meat and more attractive products such as smoked carp with dried plums, currants or cranberries that are prepared "closer to the dish" will result in elimination or decrease of mentioned negative properties of carp trade, as well as more places and possibilities for offering new products of carp meat and increase its consumption.

#### ACKNOWLEDGMENT

The study was supported by Serbian Ministry of Science and Technological Development (project TR 31075) and by EC (project AREA – FP7-REGPOT-2012-2013-1, Grant agreement no 316004).

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