

## **Weaning of Fish Larvae**

**Sathiya Kala A\* and Susitharan V.**

ICAR- Central Institute of Fisheries Education, Mumbai

### **SUMMARY**

This article summarises the importance of weaning the fish larvae to artificial diets, characteristics of weaning diet, different weaning diets used and weaning strategies followed and some of the weaning diet prepared by Indian research institutes. Weaning is recommended for preventing abnormalities in larvae. While considering the disadvantages of live feed, artificial diet is best for larvae. Microdiet also has high ingestion, allow easy digestion, prevent nutrient loss and disaggregation, floatability, sinking speed, dispersion both in tank surface and water column. Different weaning diets such as MED, MBD, MCD, flake diet and spray dried diets are used to wean the larvae.

### **INTRODUCTION**

The weaning of fish larvae is the process of transferring larvae from live feed diet to formulated diet. Weaning can be done once the fish larva has completed metamorphosis. Weaning of fish is a critical stage during larval rearing and could cause high mortality. Proper larval weaning period selection is crucial for the success of larviculture. Feeding with live feed can be continued till all the larvae are weaned to formulated feed. Different sizes of formulated feeds need to be used as per the mouth size of the larvae. Weaning is recommended for preventing abnormalities in larvae. Weaning to formulated feed has to be done with great care.

#### **What is the need of weaning to formulated diet?**

- The current use of live prey for larviculture is an expensive.
- Time consuming process.
- The availability of live feed is season-dependent.
- Nutritional deficiencies in cultured organisms such as rotifers and *Artemia*.
- Hygiene problems can also be encountered when using harvested zooplankton.
- Collapse of live feed culture by contamination, infection etc.
- Nutritional enrichment only can be done (additional cost and care).

#### **Benefits of Weaning and pre-growing**

- ✓ Avoidance of forced swimming
- ✓ Enriched *Artemia* or rotifer and well balanced artificial diets
- ✓ Selection and elimination of abnormal fry
- ✓ Quality assessment and subsequent verifications
- ✓ Good growth of larvae
- ✓ Reliability due to use of formulated diets.
- ✓ Homogeneity in growth.

### Consideration prior to formulating weaning diet

- The organogenesis of fish larvae is not completely achieved at hatching
- Need to know larvae nutritional requirements and digestive mechanisms.
- Insufficiency of digestive enzymes in larvae to thrive on compound diets
- Onset of secretion mechanisms may delay due to inadequate diets.
- In the early stages, peptidases exhibit high activity, so larvae can digest protein hydrolysate.
- The pattern of Enzyme activity is age-dependent, but can be modulated by diet composition.
- The ontogeny of digestive enzymes is primarily 'preprogramed' and only modified by the diet composition (Henning et al., 1994).
- Compound diets may delay the onset of digestive enzymes.

### Characteristics of weaning diet

- Stable enough to prevent the particles disintegration after the immersion in water
- Should have slow sinking rate
- Should maintain a good retention of hydro soluble micronutrients
- Should be accessible to larval fish being available in the water column and having an appropriate diameter
- Be digestible by the larval digestive system
- The particles have to be identified as a food item to be ingested
- Has to meet the energy and nutritional requirements for larval growth and development
- Should have different attractants (mostly free amino acids)
- Should have hydrolyzed proteins and peptides ready to be digested by the larvae
- Should have immune-stimulants (pre- and probiotics and other products) to protect digestive and immune systems
- Should have other additives to avoid skeletal deformities.
- A formulated feed would be easier to use, lower cost.
- Weaning feed have to deliver nutritionally balanced diet, bio secure, highly digestible nutrients, palatable and attractive.
- Should fit the larval requirements in terms of composition, size, buoyancy, and flavour.

### Weaning diet – micro diet

One of the main problems of Leaching losses may compromise larval quality by nutrient loss and also reducing water quality. Microencapsulation can reduce nutrient leaching. As knowledge on larval nutrition progressed and newer technologies came, produced better performing micro-diets. These micro-diet also has high ingestion, allow easy digestion, prevent nutrient loss and disaggregation, floatability, sinking speed, dispersion both in tank surface and water column. These micro-diets provide faster growing larvae, with higher survival rates, lead to better quality juveniles. Live feed replacement begun that leading to many species start feeding exclusively on high quality inert micro-diets.

### Types of microdiet

It can be graded into adapted sizes (under 150-200 um for rotifer substitutes and from 150 to 250 um for artemia substitutes).

- ❖ **Microbound** diets (MBD) obtained by binding powdered diets or a mash.
- ❖ **Microencapsulated diets (MED)** obtained by encapsulating a complete diet with a membrane. (Micro-extrusion marumerization (MEM) and particle assisted rotational agglomeration (PARA). It can be further divided into nylon-protein MED, gelatin MED, egg albumin MED, glycopeptide MED and chitosan MED based on their capsule wall.

- ❖ **Microcoated diets (MCD)** obtained by coating powdered diets by specific materials such as lecithin and zein.
- ❖ **Flake diet** – it is prepared from double drum dryer. Size of the flakes can be reduced by grinding and sieving. It found better in striped bass, perch and ornamental fishes.
- ❖ **Spray dried feeds** – finely ground ingredients are sprayed into hot air and then dried.

### Different weaning strategies

To suppress or reduce live prey utilization, different feeding strategies can be used.

- Direct weaning at first feeding in large sized larvae.
- Direct weaning prior to metamorphosis.
- Progressive weaning as soon as possible for small sized larvae.

Protocols vary according to species, temperature (tropical/temperate climate), micro diet type, rearing system, feeding system and intervals

Weaning protocols are almost standard in terms of the weaning steps.

1. Rotifers
2. Artemia (nauplii and then enriched Artemia)
3. Artemia – microdiet co-feeding and complete weaning.

### Different weaning diet by Indian institutes

CMFRI - Cobia - The weaning to artificial larval diets has to be started from 15- 18 dph. While weaning, formulated feed should be given 30 minutes prior to feeding with live feed. Pampano - Weaning to larval inert feeds has to be started from 15 dph and co-feeding with Artemia needs to be continued until 19 dph.

CIFA - STARTER – M – Magur larval diet to wean *Clarias batrachus* larvae. It ensures faster growth and high survival (2004) and STARTER PANGAS – Larval feed developed to wean *Pangasius* larvae (2013).

CIBA developed weaning diet for Seabass

CIFE developed weaning diet for Tor Khudree

### Constraints in weaning of fish larvae

Utilization of feed particles in larvae depends on internal and external factors. Searching, identification and ingestion processes are influenced by colour, shape, size, movement and olfactory stimuli at a molecular level. The microdiet particles tend to stick, creating large clumps that sink immediately to the bottom and are therefore unavailable to the larvae. Microdiet particles accumulating on the tank bottom and walls will encourage bacteria proliferation and reduced water quality. If sinking speed is more, microdiets are unavailable for larvae.

### CONCLUSION

There is a need to develop suitable artificial diets for weaning the larvae. More research has to be done to find different particle size requirement for larvae, feeding stimulants and other ingredients. There is also a knowledge gap in larval feeding behaviour, onset of digestive enzymes and feeding protocols. Economic analysis has to done to reduce the price of weaning diet.

### REFERENCES

- Henning, S. J. 1994. Ontogeny of the intestinal mucosa. In *Physiology of the Gastrointestinal Tract*. (pp. 571–610). 3rd edition. Edited by L.R. Johnson. Raven Press, New York. NY.
- Phelps, R. P., 2010. Recent advances in fish hatchery management. *Revista Brasileira de Zootecnia*, 39, pp.95-101.
- Person, L., 1989. Early weaning of marine fish larvae onto microdiets: Constraints and perspectives. In *Advances in Tropical Aquaculture, Workshop at Tahiti, French Polynesia*.