

## Larval rearing of ide (*Leuciscus idus* (L.)) using decapsulated Artemia

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**Abstract.** The use of decapsulated Artemia cysts as food for ide, *Leuciscus idus* (L.), larviculture was investigated. Three days after hatching, the larvae were fed on different diets: (a) dried decapsulated Artemia cysts, (b) Artemia nauplii, (c) Artemia nauplii for 7 days and then trout starter, (d) diet for marine larvae (manufactured artificial diet), (e) trout starter. After a 21-day rearing period, the highest survival rate was obtained with the larvae receiving decapsulated Artemia cysts. Feeding of the larvae with artificial diets resulted in a significantly lower survival rate compared to the other groups. At the end of the experiment, the larvae fed on Artemia nauplii gained significantly higher length compared to the other groups. Feeding different artificial diets resulted in significantly lower average mean length and weight compared to the other groups.

**Keywords:** ide (*Leuciscus idus*), larvae, Artemia nauplii, decapsulated Artemia, formulated diets

Ide, *Leuciscus idus* (L.), belong to the family of cyprinid which are widely distributed in Europe. This species has considerable value in sport fishing and is also as an ornamental fish. They are mostly reared using extensive or semi-extensive culture systems. In extensive culture systems, the rearing process is difficult to control and may result in highly variable growth and survival. Therefore the development of controlled

larval rearing is necessary to provide sufficient material for restocking. The use of decapsulated, dried or brine-dehydrated Artemia cysts as experimental diets, solely or in combination with artificial feed, has been tested in the larval rearing of many fresh water fish species (Verreth et al. 1987, Vanhaecke et al. 1990, Pector et al. 1994).

The aim of the present study was to investigate the suitability of decapsulated Artemia cysts for ide larvae during their early feeding stage.

Ide eggs were obtained from broodfish held at the Research Centre (Linkebeek, Belgium). Fertilized eggs were distributed on an artificial substrate (nylon-curl) (Montauban N.V., Belgium) submerged in aerated and dechlorinated tapwater at  $18 \pm 1^\circ\text{C}$ . Larvae hatched after 4 days of incubation. Three days after hatching, the larvae were exposed to different feeding conditions: (a) decapsulated Artemia cysts, (b) freshly hatched Artemia nauplii, (c) Artemia nauplii for 7 days and trout starter afterwards, (d) formulated diet for marine larvae (60% protein, 17% crude fat; Tesgofarm Aqua, Holland), (e) granulated trout starter (58% crude protein, 12% crude fat; Aqua Bio, Belgium). Three replicates were used per treatment. The three week experiment was conducted in a flow-through system consist of fifteen 20 dm<sup>3</sup> tanks using dechlorinated tapwater (water temperature ranged between 19 and 20°C). The larvae were stocked (10 larvae dm<sup>-3</sup>) at random in rearing tanks. Growth parameters (total length and wet

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**TABLE 1**Total length (mm) of ide larvae measured on days 7, 14, and 21 of the experiment (mean  $\pm$  SD)

Feeding group	Day 7	Day 14	Day 21
(a) (decapsulated cysts)	9.60 $\pm$ 0.40	12.97 $\pm$ 0.57	16.3 $\pm$ 0.9
(b) ( <i>Artemia</i> nauplii)	10.29 $\pm$ 0.74	14.11 $\pm$ 0.52	18.25 $\pm$ 1.03
(c) ( <i>Artemia</i> + trout starter)	10.40 $\pm$ 0.52	12.82 $\pm$ 0.40	13.48 $\pm$ 1.00
(d) (diet for marine larvae)	8.90 $\pm$ 0.34	11.09 $\pm$ 0.54	12.03 $\pm$ 0.87
(e) (trout starter)	9.12 $\pm$ 0.33	9.97 $\pm$ 0.52	11.35 $\pm$ 0.64

**TABLE 2**Wet weight (mg) of ide larvae measured on days 7, 14, and 21 of the experiment (mean  $\pm$  SD)

Feeding group	Day 7	Day 14	Day 21
(a) (decapsulated cysts)	3.78 $\pm$ 0.23	12.57 $\pm$ 1.49	30.92 $\pm$ 3.53
(b) ( <i>Artemia</i> nauplii)	4.75 $\pm$ 0.68	15.83 $\pm$ 0.89	38.30 $\pm$ 5.45
(c) ( <i>Artemia</i> + trout starter)	4.68 $\pm$ 0.20	9.46 $\pm$ 0.54	14.65 $\pm$ 0.87
(d) (diet for marine larvae)	2.66 $\pm$ 0.78	6.56 $\pm$ 0.32	12.03 $\pm$ 0.26
(e) (trout starter)	2.73 $\pm$ 0.37	5.08 $\pm$ 0.20	11.34 $\pm$ 0.31

weight) were measured on days 0, 7, 14 and at the end of the experiment (day 21) from 10 larvae per replicate. The initial average total length (mean  $\pm$  SD) and wet body weight were 8.29  $\pm$  0.29 mm and 2.2 mg, respectively.

*Artemia* cysts were decapsulated according to procedures recommended by Bruggeman et al. (1980). Every day, fresh stocks of cysts were prepared. Decapsulated cysts were distributed on a 100  $\mu$ m screen in a layer < 5 mm thick and dried at 35°C for 24 h. The granulated diet was prepared from the trout starter. This starter (0.3-0.5 mm) was crushed with a mortar and sieved to a particle size of < 200  $\mu$ m. From day 12 onwards, trout starter of 300-500  $\mu$ m size was used. Larvae were fed ad libitum with the artificial diets and dried decapsulated cysts. *Artemia* nauplii concentrations were adjusted daily to 4 individuals  $\text{cm}^{-3}$ . The analysis of variance (ANOVA) was performed to determine any significant difference among the treatments. Significant differences between treatments were determined by Tukey's multiple range test ( $P < 0.05$ ).

At days 7 and 14, the mean length and wet weight of the larvae fed on freshly hatched *Artemia* nauplii were significantly ( $P < 0.05$ ) higher than the larvae fed

on decapsulated cysts and artificial diets (Tables 1 and 2). The mean size (length and wet weight) of the larvae receiving decapsulated cysts was significantly ( $P < 0.05$ ) higher as compared with the larvae fed on artificial diets (Tables 1 and 2). Growth (in terms of length and wet weight) in the larval group (group c) receiving trout starter from day 8 was higher than the groups fed artificial diets during the entire course of the experiment. Feeding larvae with trout starter from day 8 did not produce higher growth as compared with the treatments receiving *Artemia* nauplii and decapsulated cysts.

At day 7, the survival of larvae fed on *Artemia* nauplii was not significantly different ( $P > 0.05$ ) from those receiving decapsulated cysts. The larval survival was significantly lower in treatments receiving trout starter (46.40%) compared to the other treatments (Table 3). At the end of the experiment, the highest survival rate (75%) was obtained with the larvae receiving decapsulated cysts. The average survival rate of the larvae fed on *Artemia* nauplii was 70.80% (Table 3).

The good growth and survival of ide larvae fed on decapsulated cysts indicated that the decapsulated cysts were well accepted and ingested. They seem to

TABLE 3

Survival rate of larvae counted on day 7 and at the end of the experiment (mean  $\pm$  SD)

Feeding group	Day 7	Day 21
(a) (decapsulated cysts)	79.86 $\pm$ 6.12	75.33 $\pm$ 6.60
(b) ( <i>Artemia</i> nauplii)	84.13 $\pm$ 7.40	70.80 $\pm$ 10.6
(c) ( <i>Artemia</i> + trout starter)	70.40 $\pm$ 2.84	48.53 $\pm$ 2.41
(d) (diet for marine larvae)	70.13 $\pm$ 13.86	46.67 $\pm$ 8.55
(e) (trout starter)	46.40 $\pm$ 3.55	30.13 $\pm$ 6.60

be an appropriate food item for larval rearing of ide. Dried and decapsulated cysts, have a high floating capacity and sink slowly to the bottom of culture tank. A similar result was observed with chub larvae, *L. cephalus* (L.) (Shiri Harzevili et al. 2003). In contrast to decapsulated cysts, the formulated diets were not well accepted. Although the fish were able to ingest the formulated diets, their growth was inferior as compared with the decapsulated and live *Artemia* nauplii groups. When comparing the two artificial diets, higher growth and survival was obtained with the larvae fed on diet manufactured for marine fish.

In the current experiment, the survival rate of larvae fed on *Artemia* nauplii was lower as compared to the results of Kestemont et al. (1991) and Kujawa et al. (1998). This was probably related to the quality of the larvae. Wolnicki and Górný (1995) reported low survival and growth rates of ide larvae fed exclusively on an artificial diet. The switching of food for ide larvae from live food to an artificial diet should start few days after exogenous feeding (Kujawa et al. 1998). In this study, the shift of *Artemia* nauplii to trout starter after 7 days did not improve the growth as compared to decapsulated cysts.

At the end of the experiment, mean total length and wet weight of the larvae fed on *Artemia* nauplii was significantly ( $P < 0.05$ ) greater than the larvae fed on decapsulated cysts. However, no significant difference ( $P > 0.05$ ) was observed between the survival of larvae fed on *Artemia* nauplii and those of decapsulated cysts, though the latter was slightly higher.

The results indicate that the tested artificial dry diets were not suitable for ide larvae. Ide larvae need

a few days feeding on live food before adapting them to any artificial diet. In conclusion, the results of the present work demonstrate that under intensive culture conditions, the larvae of ide can be raised on dried decapsulated *Artemia* cysts during early exogenous feeding.

## References

- Bruggeman E., Sorgeloos P., Vanhaecke P. 1980 – Improvements in the decapsulation techniques of *Artemia* cysts – In: The brine shrimp *Artemia*: Ecology, culturing, uses in aquaculture. Vol. III (Eds.) G. Persoone, P. Sorgeloos, O. Roels and E. Jaspers Universa Press: Wetteren, Belgium: 261-269.
- Kestemont P., Mélard Ch., Poncin P., De Backer L., Micha J.C., Philippart J.C. 1991 – Controlled breeding and intensive larvae rearing of fresh water cyprinids at a pilot scale – Aquaculture and Environment. Short communications and abstracts contributions presented at the International Conference Aquaculture Europe 91(Eds.) N. De Pauw and J. Joyce. European Aquaculture Society, Special Publication 14, Bredene, Belgium: 169-170.
- Kujawa R., Kucharczyk D., Mamcarz A., Skrzypczak A. 1998 – The rearing methods of ide (*Leuciscus idus* L.) and dace (*Leuciscus leuciscus* L.) on artificial diets – In: Aquaculture Europe 98 (Eds.) H. Grizel and P. Kestemont. European Aquaculture Society, Special Publication 26, Oostende, Belgium: 153-154.
- Pector R., Tackaert W., Abelin P., Ollevier F., Sorgeloos P. 1994 – A comparative study on the use of different preparations of decapsulated *Artemia* cysts as food for rearing catfish (*Clarias gariepinus*) larvae – J. World Aquacult. Soc. 25(3): 366-370.
- Shiri Harzevili A., De Charleroy D., Auwerx J., Vught I., Van Slycken J. 2003 – Larval rearing of chub, *Leuciscus cephalus* (L.) using decapsulated *Artemia* as direct food – J. Appl. Ichthyol. 19: 123-125.

- Vanhaecke P., De Vries L., Tackaert W., Sorgeloos P. 1990 – The use of decapsulated cysts of the brine shrimp *Artemia* as direct food for carp *Cyprinus carpio* (L.) larvae – J. World Aquacult. Soc. 21(4): 257-262.
- Verreth J., Storch V., Segner H. 1987 – A comparative study on the nutritional quality of decapsulated *Artemia* cysts, micro-encapsulated egg diets and enriched dry feeds for *Clarias gariepinus* (Burchell) larvae – Aquaculture 63: 269-282.
- Wolnicki J., Górny W. 1995 – Controlled rearing of ide (*Leuciscus idus* L.) larvae using live food and dry feed – Aquaculture 129: 255-256.