NEW FEED DEVELOPMENTS IN THE EARLY WEANING OF LARVAL AND JUVENILE DOVER SOLE, SOLEA SOLEA (L.)

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CEFAS
The Centre for Environment, Fisheries & Aquaculture Science

Introduction

The following trials form part of a CEFAS research programme aimed at optimising the use and effectiveness of formulated diets for marine fish larvae and juveniles.

Larval Weaning

Our standard hatchery procedure for this species is to wean metamorphosed juveniles (approximately 25-30mm in length) at 45-50 days post hatch (DPH) from a live diet (SELCO enriched *Artemia* metanauplii) onto an agglomerated larval feed. During this trial, sole larvae aged 21 DPH (Stage 4 development as shown in Figure 1) were offered either the agglomerated feed or an experimental weaning diet produced by INVE Technologies N.V.

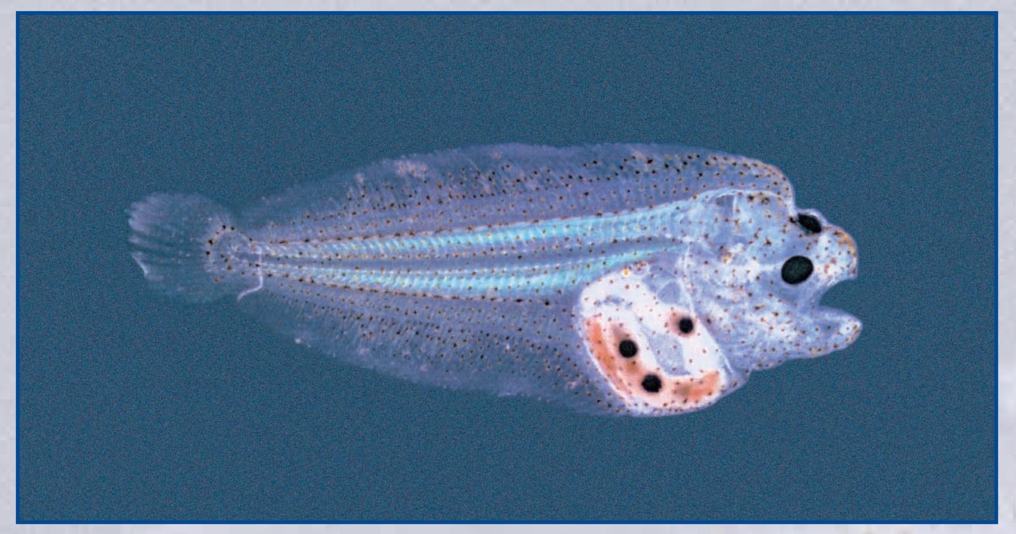


Figure 1. Stage 4 larva

The INVE diet was a distinct rod shaped particle of approximately 400µm by 700µm (slightly larger than *Artemia* metanauplii); the agglomerated feed consisted of particles 100-300µm in diameter. The new techniques used to produce the INVE feed resulted in a dust free diet with very high water stability (see Figure 2 as follows).

Figure 2. INVE diet (Fig. 2a) and agglomerated feed (Fig. 2b).

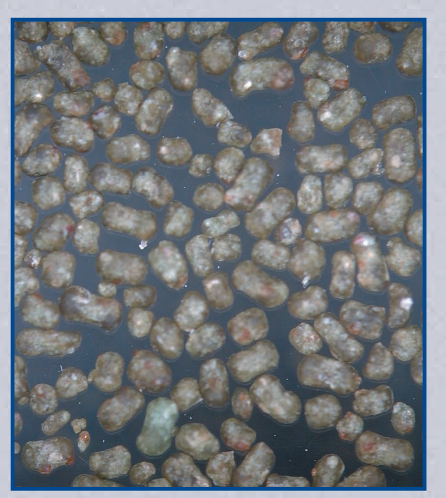
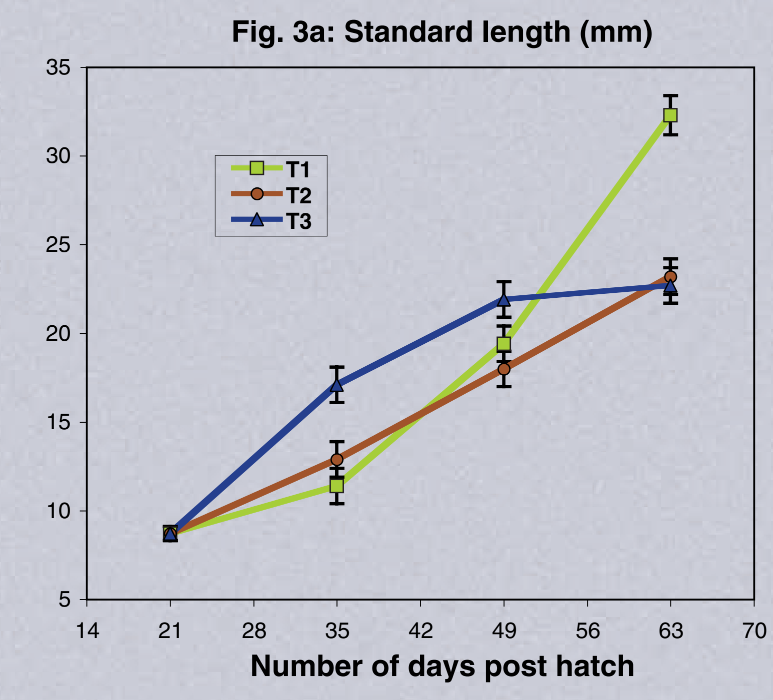


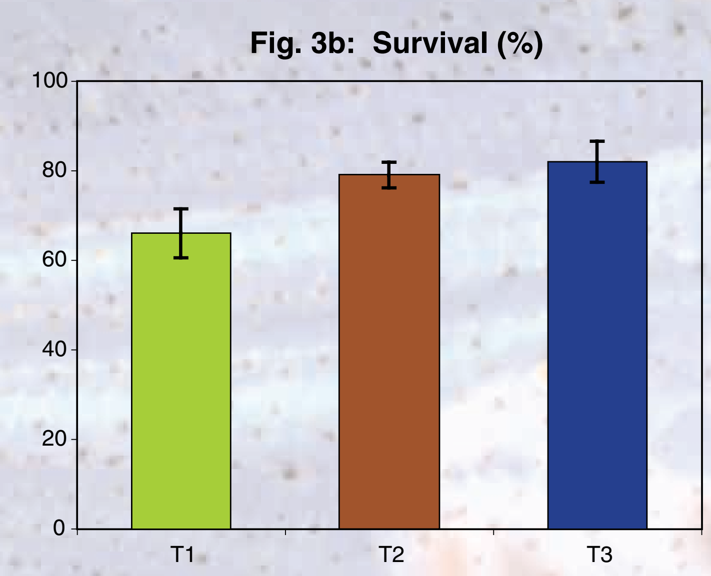
Fig. 2a		Fig. 2b	
Crude protein	65%	Crude protein	64%
Lipid	17%	Lipid	22%
Ash	13%	Ash	10%
Carbohydrate	5%	Carbohydrate	4%

A Control was also set up where the sole were weaned at 49 DPH onto a mixture of the two diets. The trial was run for a period of 6 weeks from 21 DPH until 63DPH.

The results of this trial are summarised in Figure 3 as follows:

Figure 3. Changes in standard length (Fig. 3a) and survival (Fig. 3b) (±S.E.) between Solea solea larvae weaned from live to formulated diets at 21 DPH vs. juvenile sole weaned at 49 DPH. T1 represents weaning at 21 DPH onto the distinct INVE particle; T2 represents weaning at 21 DPH onto the agglomerated diet; T3 represents weaning at 49 DPH.





These results showed that at 63 DPH the larvae that were successfully weaned onto the INVE diet at 21 DPH were significantly larger than those weaned at either 21 DPH onto the agglomerated feed or 49 DPH under the Control treatment. There was no significant difference in size between the sole weaned onto the agglomerated diet or the Control. There were also no significant differences between treatments in terms of survival (66% INVE diet; 79% agglomerated feed; 82% Control) or morphological characteristics (body length:width ratio, abnormal pigmentation, inter-ocular distance, and mouth-part morphology).

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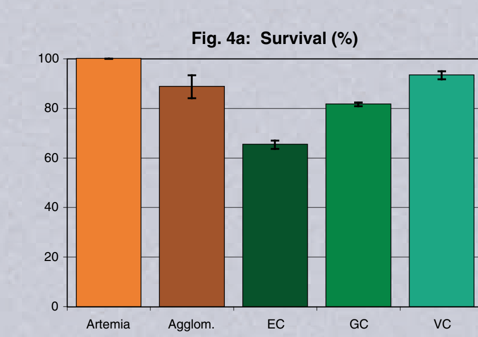
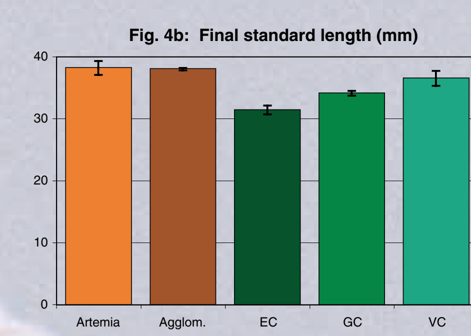
Juvenile Weaning

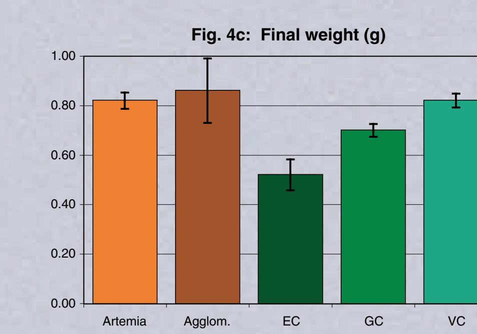
Juvenile sole aged 61 DPH were offered a range of experimental INVE diets (designated VC, GC and EC) for comparison against weaning onto an agglomerated feed or continuation with *Artemia* metanauplii. During the 4-week trial two sizes of diet were used for the INVE treatments. The sole were offered a 300-500µm particle feed for the first 2 weeks followed by the larger size of 500-800µm for the last 2 weeks of the trial.

The results of this trial are summarised in Figure 4 as follows:

Figure 4. Survival (Fig. 4a), final standard length (Fig. 4b) and weight (Fig. 4c) (±S.E.) of juvenile Solea solea weaned at 61 DPH onto a range of INVE diets (VC, GC and EC) vs. an agglomerated or live feed. Initial weight and length in all treatments was 0.33g and 29.5mm respectively.







The results showed that the best survival after weaning was obtained with the VC diet followed secondly by the agglomerated feed (93% and 89% survival respectively). Length and weight comparisons between treatments showed that, even after undergoing weaning, growth on the VC diet and agglomerated diet was equivalent to that of the live diet.

Conclusions

These trials show how recent advances in diet formulation and production can allow successful weaning of Dover sole at either the larval or juvenile stage of development. It also shows that the use of an effective diet in larval weaning can actually lead to improved growth rates over live feeds without detrimental effects on survival or fish quality. These results are especially encouraging for the potential commercial hatchery production of this species. Full details of both of these experiments can be obtained from the authors at the above address (e-mail: **m.l.q.syvret@cefas.co.uk**).