

Tailoring your feeds

INFLUENCE OF FEEDING PROTOCOLS ON GROWTH AND SKELETAL ANOMALIES IN ATLANTIC COD LARVAE (*Gadus morhua*)

João Henriques^{1*}
 Joana Pedro²
 Michael Viegas³
 Maria Bergvik⁴
 Konstantinos Tzakris⁵
 Nils Tokle⁵
 Luís Conceição¹

*Email: joaohenriques@sparos.pt

¹SPAROS, Lda
 Olhão, Portugal

²CIIMAR
 University of Porto, Matosinhos, Portugal

³S2AQUA
 Olhão, Portugal

⁴Ode, AS
 Stadsbygd, Norway

⁵Planktonic, AS
 Trondheim, Norway



Acknowledgments:
 The work is part of project E!219 EarlyCOD_17205, supported by EUROSTARS-3 program, and by Portugal and the European Union through ERDF, Algarve 2030, and COMPETE 2030, in the framework of Portugal 2030.



INTRODUCTION

Atlantic cod aquaculture bottlenecks can be partially tackled through optimized feeding protocols. Marine organisms with a balanced nutritional profile such as Barnacles have been successfully tested in larvae feeding protocols and offer a viable alternative to the traditional protocols with enriched rotifers and Artemia.

The weaning stage in Atlantic cod larvae can be challenging and it is paramount to develop customized microdiets as they influence:

- Appetite & digestive tract maturation
- Skeletal development
- Growth performance



This study evaluated the potential of a feeding protocol with plankton eggs and barnacle nauplii, and compared the effect of two novel microdiets on growth performance and skeletal anomalies in Atlantic cod larvae.

CONCLUSION

- The treatment including rotifers, Cryo-μ, Cryo-S, Cryo-L and microdiet D1 led to lower incidence of skeletal anomalies in cod larvae, including severe anomalies. These results highlight the potential of optimizing feeding protocols for Atlantic cod larvae and the positive effects it may bring on larval and juvenile quality.

MATERIALS AND METHODS

- 3 feeding regimes with 1 microdiet each:

D1	Rotifers + Cryo-μ + Cryo-S + Cryo-L + D1 diet
D2	Rotifers + Cryo-μ + Cryo-S + Cryo-L + D2 diet
CTRL	Rotifers + Cryo-L + CONTROL diet

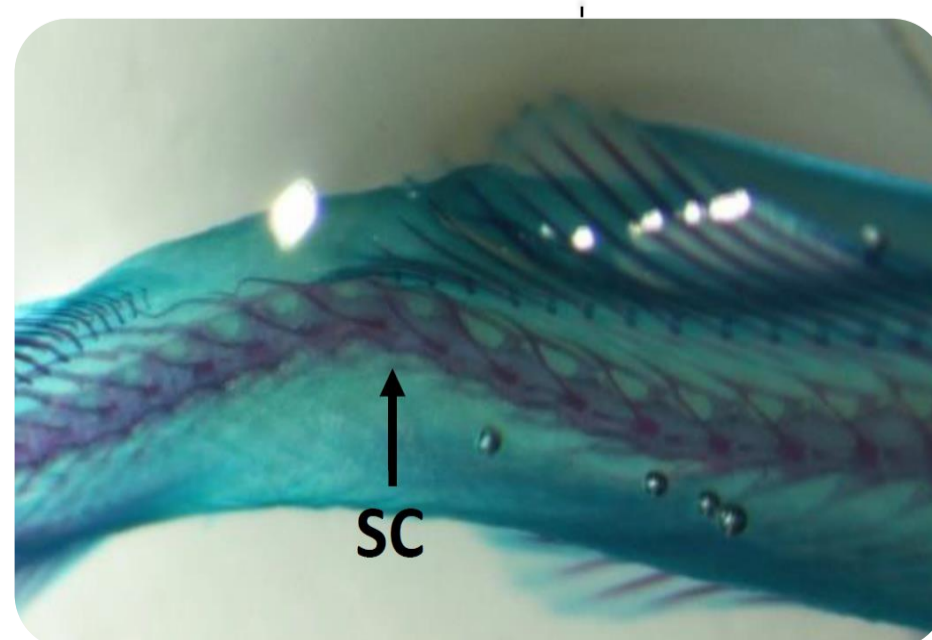
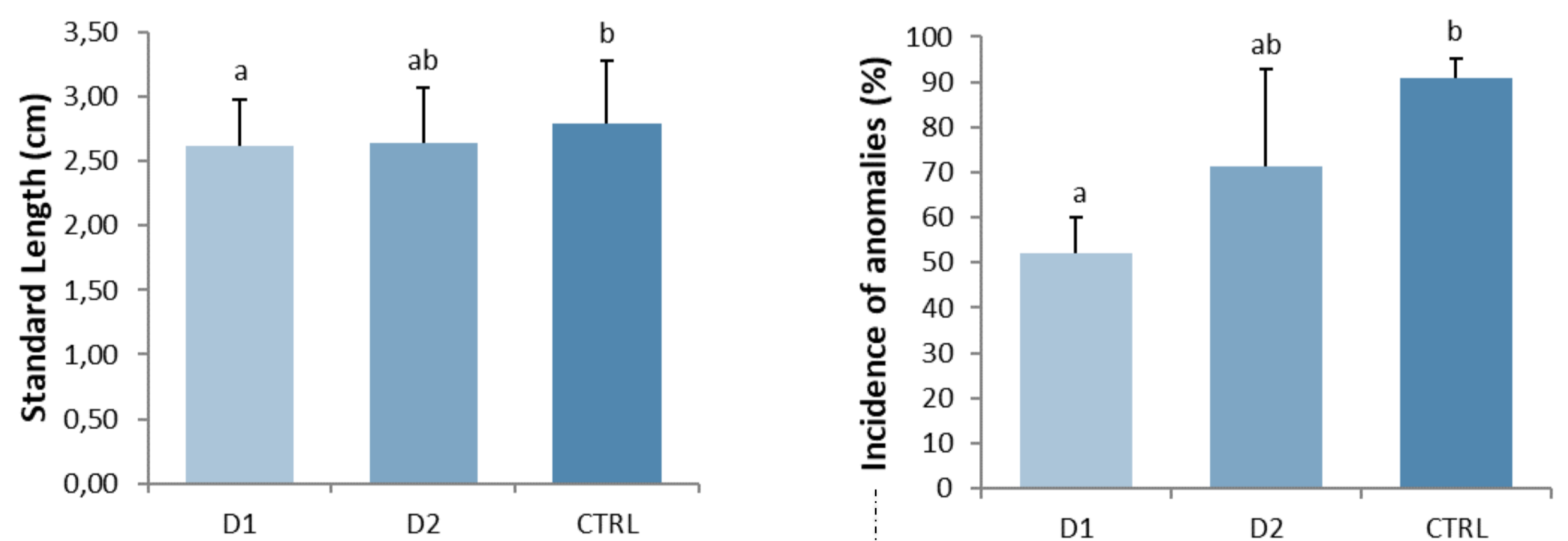
- Cod larvae were fed from 3-66dph:

Live Feeds	→ 3-27 dph
Co-feeding	→ 28-45 dph
Inert Feeds	→ 46-66 dph

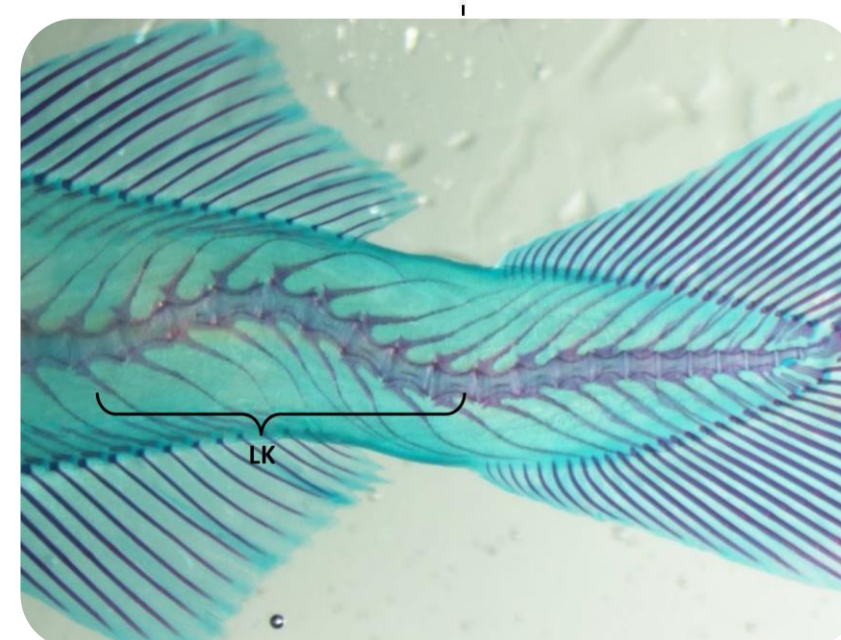
Sampling occurred at 3, 30, 50 and 66 dph and comprised the analyses of several parameters including Standard Length (SL) and skeletal anomalies, detected by double staining with alcian blue and alizarin red S.



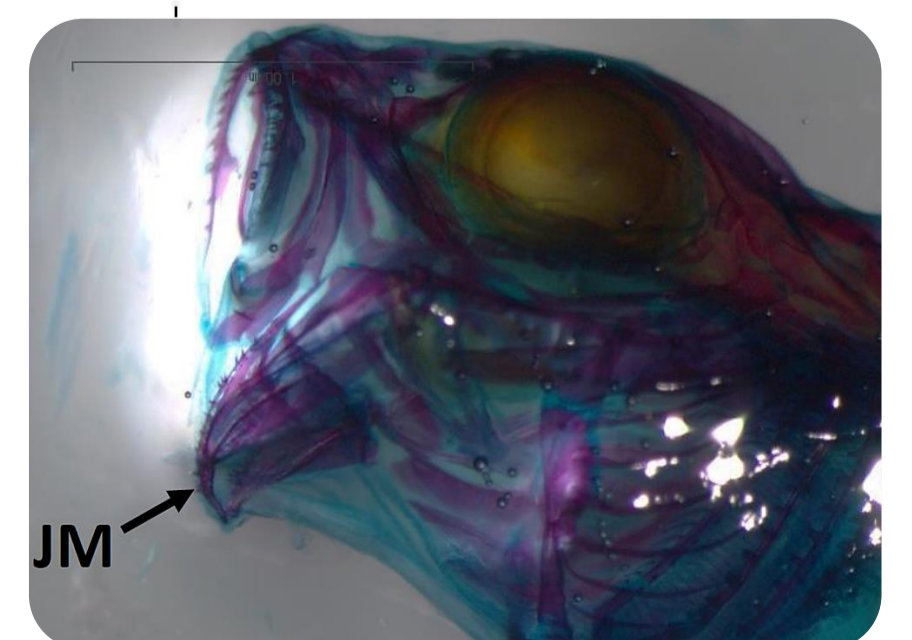
RESULTS



SC – Scoliosis



LK – Lordosis/Kyphosis



JM – Jaw malformation

At 66 dph, no significant differences were found on SL between the two experimental treatments - D1 and D2. Furthermore, both experimental groups showed lower incidence of skeletal anomalies. In particular, D1 group presented lower incidence of skeletal anomalies ($P < 0.05$) than the control group (CTRL).