ASSESSING THE POTENTIAL OF ERI SILKWORM (*Samia ricini*) MEAL AS AN AQUAFEED INGREDIENT FOR JUVENILE MALABAR GROUPER, *Epinephelus malabaricus*

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Introduction

Insect meals are increasingly explored as sustainable aquafeed ingredients, but evidence for high-value marine carnivores remains limited. Eri silkworm (*Samia ricini*) pupae meal (ESW) is protein- and lipid-rich, typically high in α-linolenic acid (18:3n-3) yet low in n-3 long-chain PUFA (LC-PUFA). Despite its nutritional potential, ESW has, to our knowledge, been rarely evaluated as an aquafeed ingredient, particularly for marine carnivorous fish. This study assessed the suitability of ESW for juvenile Malabar grouper (*Epinephelus malabaricus*).





Materials and methods







Table 1. Proximate composition of ESW powder

(%, d.b.)	ESW powder
Moisture	2.8
Crude Ash	5.2
Crude Protein	65.2
Crude Lipid	23.2



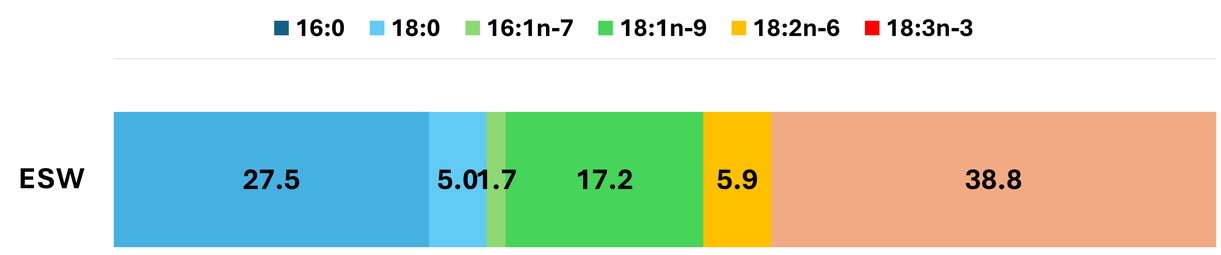


Figure 1. Fatty acid profile of ESW powder

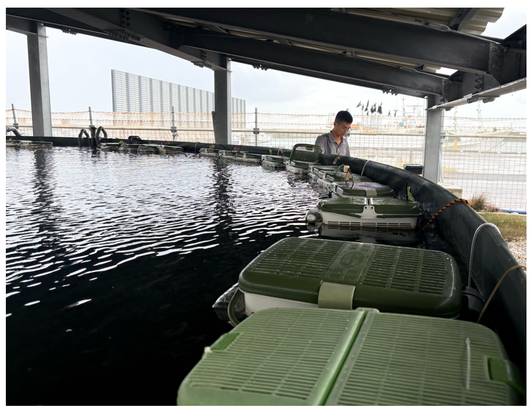
Table 2. Formulation, proximate composition and fatty acid profile of the experimental diets

(g/100g)	Control	ESW
Commercial fish meal	60	45
Pork-chicken meal	15	15
Eri silkworm meal	0	15
Wheat flour	7.6	6
Starch	7.2	11
Trace mineral premix	1	1
Vitamin premix	1	1
Fish oil	8.2	6
TOTAL	100	100
(% d.b.)		
Moisture	2.2	2.2
Ash	14.7	12.9
Protein	52.4	52.4
Lipid	16.9	16.9
(% in lipid)		
Total saturated FA	27.6	33.9
Total monounsaturated FA	38.3	34.3
Total n-6 PUFA	7.1	6.3
18:3n-3	0.9	8.5
20:5n-3	6.3	4.3
22:6n-3	8.8	5.2
Total n-3 PUFA	20.8	21.6
Total n-3 LCPUFA	18.9	12.5

Experimental Setup
- Duration: 56-day feeding trial
- System: Flow-through system
- Tank Setup: 45L baskets within 100t tanks
- Fish Stocking: 12 fish per basket (initial weight: 53.9g)

Feeding Protocol
- Feeding Method: Hand-fed to near satiation
- Environmental Conditions: Natural temperature and light conditions







Results

Table 3. Rearing result

	Control	ESW	*p*-value
IW (g)	53.9 ± 0.0	53.9 ± 0.0	
FW (g)	82.9 ± 5.3	84.5 ± 3.3	0.750
WG (%)	153.9 ± 9.8	156.7 ± 6.1	0.767
FCR (g/g)	0.8 ± 0.2	0.9 ± 0.2	0.736
PER (g/g)	2.3 ± 0.4	2.2 ± 0.3	0.870
SGR (%/day)	0.8 ± 0.2	0.8 ± 0.1	0.777
SR (%)	100.0 ± 0.0	100.0 ± 0.0	N/A
DFI (%/day)	1.1 ± 0.0	1.2 ± 0.1	0.407
HSI (%)	2.5 ± 0.6	3.0 ± 0.5	0.501

Mean ± SD; Welch's *t*-test; $p < 0.05$

Table 4. Proximate composition of the fish body

(w.b.)	Control	ESW	*p*-value
Moisture	69.7 ± 0.4	69.4 ± 0.0	0.461
Ash	4.9 ± 1.2	5.0 ± 0.4	0.927
Protein	16.7 ± 0.9	16.5 ± 0.6	0.791
Lipid	6.5 ± 1.3	8.1 ± 0.5	0.290

Mean ± SD; Welch's *t*-test; $p < 0.05$

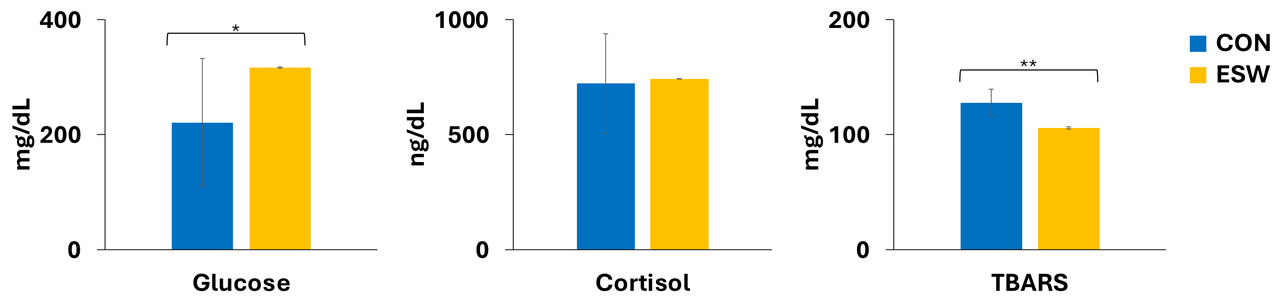


Figure 2. Result of the biochemical parameters

Key findings
- 8-week performance: No differences in rearing results (Welch's p > 0.05)
- Fishmeal replacement: ESW 15% inclusion = ~25% fishmeal replacement
- Diet fatty acids: ESW diet ↑ ALA (18:3n-3), ↓ n-3 LC-PUFA (EPA/DHA fraction)
- TBARS: Lower in ESW (p = 0.005)
- Glucose: Higher in ESW (p = 0.045)
- Cortisol: No difference (p = 0.865)

These results demonstrate the feasibility of using ESW as a partial fishmeal replacement in juvenile Malabar grouper diets, with no adverse effects on short-term growth or feed efficiency, while highlighting the need for further evaluation of tissue fatty acid composition and longer-term health and quality outcomes

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