

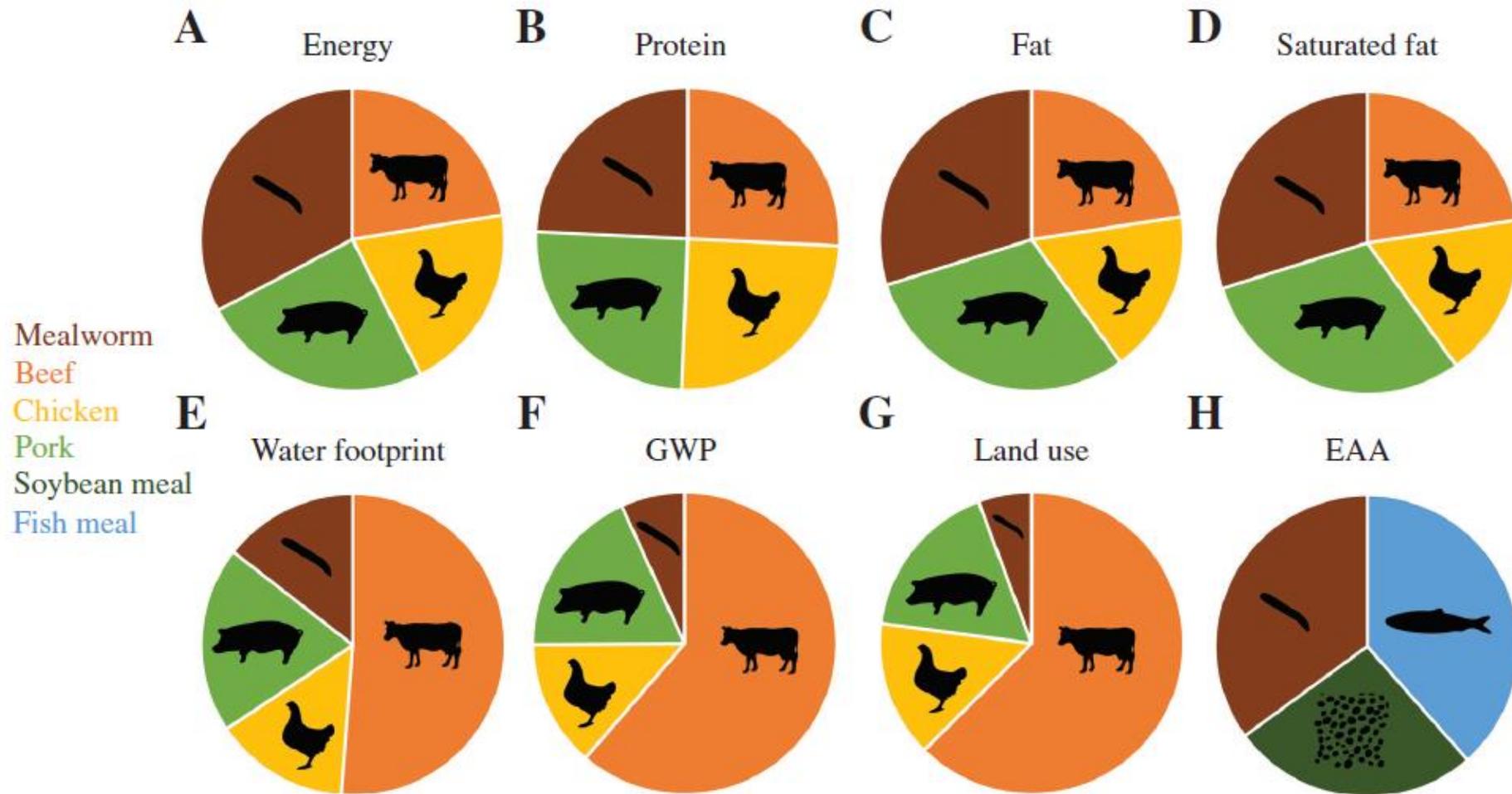
# INSETOS COMO INGREDIENTES PARA A AQUICULTURA

Carlos Peres Silva – UFSC-CCB-BQA

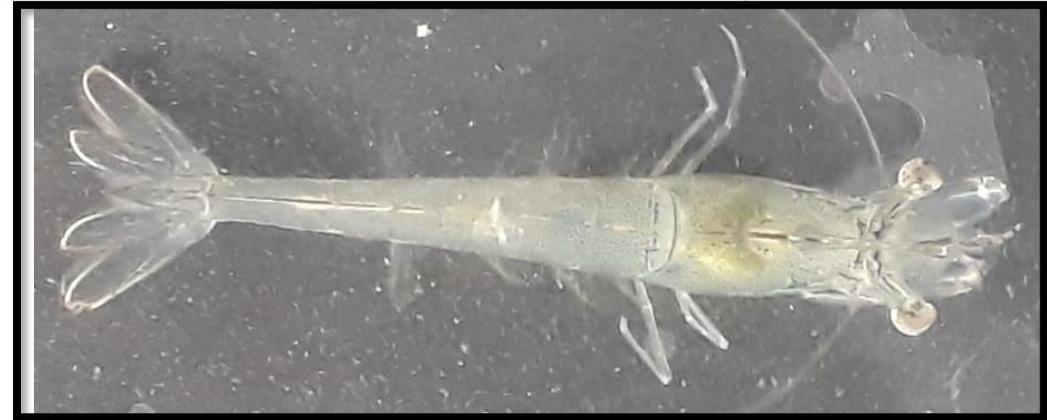


**1 kg de peixe de viveiro é produzido a partir de 2-5 kg de peixe capturado**

# Insetos beneficiam a economia



# Insetos rendem mais que vertebrados confinados





## The potential of various insect species for use as food for fish

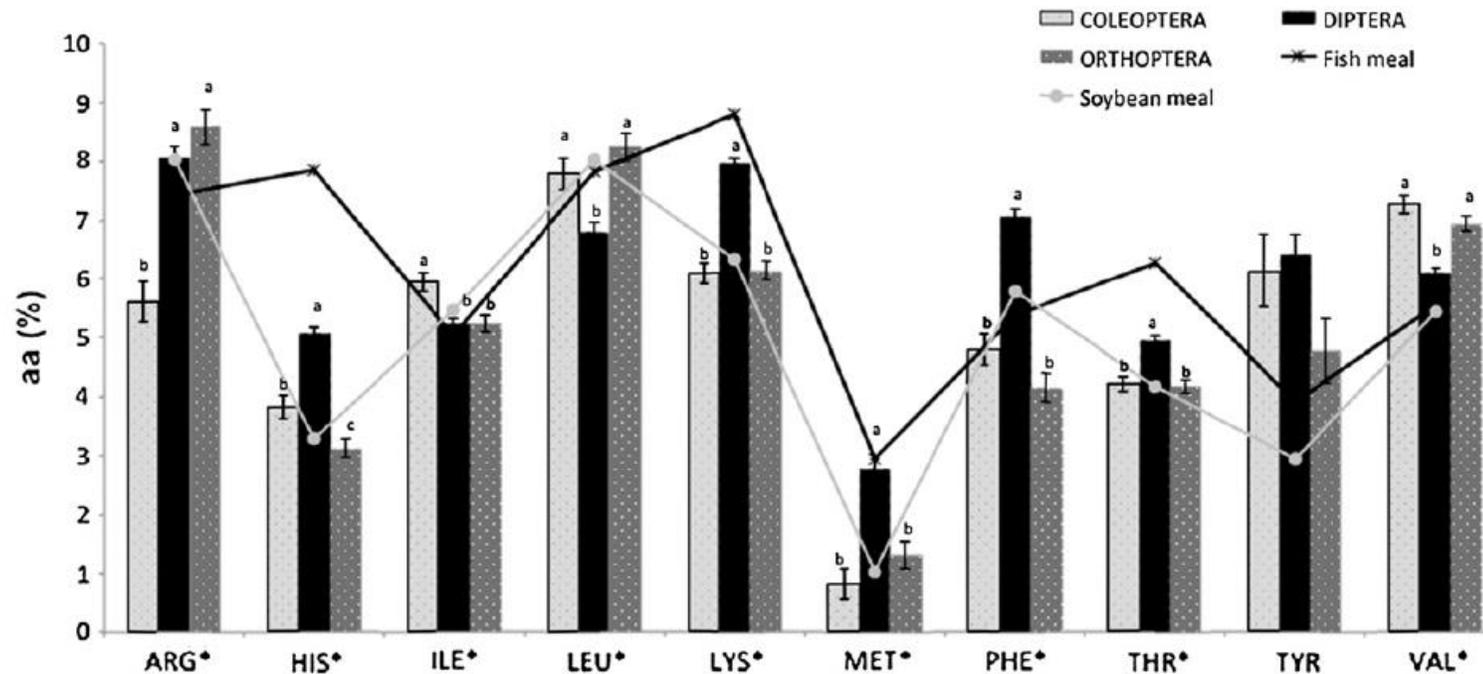


Fernando G. Barroso <sup>a,\*</sup>, Carolina de Haro <sup>a</sup>, María-José Sánchez-Muros <sup>a</sup>, Elena Venegas <sup>b</sup>, Anabel Martínez-Sánchez <sup>c</sup>, Celeste Pérez-Bañón <sup>c</sup>

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Full length article

Effects of dietary *Tenebrio molitor* meal on the growth performance, immune response and disease resistance of yellow catfish (*Pelteobagrus fulvidraco*)



Jingzhi Su <sup>a, b</sup>, Yulong Gong <sup>a, b</sup>, Shenping Cao <sup>a, b</sup>, Fei Lu <sup>a, b</sup>, Dong Han <sup>a, c, \*</sup>, Haokun Liu <sup>a</sup>, Junyan Jin <sup>a</sup>, Yunxia Yang <sup>a</sup>, Xiaoming Zhu <sup>a</sup>, Shouqi Xie <sup>a</sup>

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A farinha de *Tenebrio* pode substituir pelo menos **75%** da FM para o bagre-amarelo sem redução significativa no desempenho do crescimento.

A suplementação alimentar de *Tenebrio* pode inclusive melhorar a resposta imune inata e adaptada do bagre-amarelo.

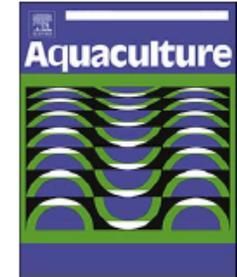


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## Mealworm as dietary protein source for rainbow trout: Body and fillet quality traits



Valeria Iaconisi<sup>a</sup>, Antonio Bonelli<sup>a</sup>, Rita Pupino<sup>a</sup>, Francesco Gai<sup>b</sup>, Giuliana Parisi<sup>a,\*</sup>

<sup>a</sup> *Department of Agri-Food Production and Environmental Sciences, University of Florence, Firenze, Italy*

<sup>b</sup> *Institute of Science of Food Production, National Research Council, Grugliasco, Italy*

A farinha de Tenebrio pode substituir parcialmente a farinha de peixe na dieta da truta arco-íris, sem afetar negativamente as características dos peixes e a maioria das características de qualidade da carne.

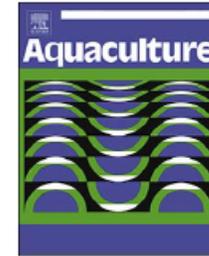
**50%**



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## Potential of insect-based diets for Atlantic salmon (*Salmo salar*)

Ikram Belghit<sup>a,\*</sup>, Nina S. Liland<sup>a</sup>, Rune Waagbø<sup>a</sup>, Irene Biancarosa<sup>a,b</sup>, Nicole Pelusio<sup>c</sup>, Yanxian Li<sup>d</sup>, Åshild Krogdahl<sup>d</sup>, Erik-Jan Lock<sup>a</sup>

<sup>a</sup> Institute of Marine Research, P.O. Box 1870 Nordnes, 5817 Bergen, Norway

<sup>b</sup> University of Bergen, Department of Biology, Thormøhlensgt. 53 A/B, P.O. Box 7803, 5020, Bergen, Norway

<sup>c</sup> Department of Life and Environmental Science (DISVA), Università Politecnica delle Marche, Ancona, Italy

<sup>d</sup> Department of Basic Sciences and Aquatic Medicine, Faculty of Veterinary Medicine, Norwegian University of Life Sciences (NMBU), Oslo, Norway



Este estudo mostrou que o farelo proteico e o óleo das larvas da BSF (*Hermetia illucens*) têm um grande potencial como fonte de nutrientes para o salmão do Atlântico.

**80%**

## Potential of field crickets meal (*Gryllus bimaculatus*) in the diet of African catfish (*Clarias gariepinus*)

Norhidayah Mohd Taufek<sup>a,b</sup>, Hasniyati Muin<sup>a,b</sup>, Ameenat Abiodun Raji<sup>a,b</sup>, Hanan Md Yusof<sup>c</sup>, Zazali Alias<sup>d</sup> and Shaharudin Abdul Razak<sup>a,b</sup>

<sup>a</sup>AquaNutri Biotech Research Laboratory, Institute of Biological Science, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia; <sup>b</sup>Glami Lemi Centre for Biotechnology Research, Glami Lemi, Jelevu, Malaysia; <sup>c</sup>Department of Fisheries, Fisheries Research Institute (FRI), Glami Lemi, Jelevu, Malaysia; <sup>d</sup>Institute of Biological Science, Faculty of Science, University of Malaya, Kuala Lumpur, Malaysia

Estes resultados indicaram que a farinha de grilo é capaz de servir como um substituto proteico alternativo para a FM na dieta de bagre africano até **100%**, sem afetar a composição corporal e a utilização de alimentos.

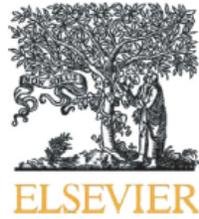
Grande parte da população humana se alimenta de insetos!!!



*Shrimp (NOT an insect)*

*Locust (an insect)*

- 2100 espécies de insetos comestíveis já foram catalogadas;
- Algumas como iguarias;
- Crustáceos comestíveis não passam de algumas centenas...



## Potential use of mealworms as an alternative protein source for Pacific white shrimp: Digestibility and performance



Roseane L. Panini <sup>a</sup>, Luiz Eduardo Lima Freitas <sup>b</sup>, Ariane M. Guimarães <sup>c</sup>, Cristina Rios <sup>d</sup>,  
 Maria Fernanda O. da Silva <sup>c</sup>, Felipe Nascimento Vieira <sup>c</sup>, Débora M. Fracalossi <sup>c</sup>, Richard Ian Samuels <sup>e</sup>,  
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<sup>a</sup> Department of Food Science and Technology, Federal University of Santa Catarina, Florianópolis, SC, Brazil

<sup>b</sup> Brazilian Agricultural Research Corporation, Embrapa Fisheries and Aquaculture, Palmas, TO, Brazil

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**Table 5**

Growth performance and whole body composition of *Litopenaeus vannamei* fed on diets with fishmeal replaced by different percentages of mealworm meal for a 42 day period (mean ± standard error of the mean).

Variables	Fishmeal replacement (%)					P value*
	0	25	50	75	100	
Final weight <sup>a</sup> , g	9.28 ± 0.16	8.96 ± 0.30	9.19 ± 0.58	9.50 ± 0.46	9.21 ± 0.07	0.57
Weight gain, g	4.86 ± 0.16	4.54 ± 0.27	4.76 ± 0.57	5.10 ± 0.42	4.78 ± 0.07	0.56
SGR <sup>b</sup>	1.76 ± 0.04	1.68 ± 0.07	1.73 ± 0.15	1.83 ± 0.09	1.64 ± 0.21	0.55
DFI <sup>c</sup>	4.49 ± 0.13	4.43 ± 0.43	4.65 ± 0.23	4.29 ± 0.25	4.98 ± 0.37	0.20
Feed conversion	2.65 ± 0.09	2.75 ± 0.25	2.82 ± 0.29	2.46 ± 0.29	2.99 ± 0.25	0.46
PRE <sup>d</sup>	17.62 ± 2.09	16.18 ± 3.75	16.79 ± 2.95	18.79 ± 3.46	16.24 ± 1.94	0.98
Survival (%)	89 ± 9	90 ± 10	88 ± 9	96 ± 2	81 ± 10	0.55
Body composition (g 100 g <sup>-1</sup> wet basis)						
Moisture	79.01 ± 1.08	78.43 ± 1.2	77.75 ± 0.91	77.56 ± 0.52	76.76 ± 0.52	<0.05
Protein	15.77 ± 0.7	15.77 ± 1.18	16.39 ± 0.55	16.12 ± 0.76	16.88 ± 0.33	0.07
Lipid	1.17 ± 0.04	1.13 ± 0.12	1.2 ± 0.08	1.26 ± 0.03	1.88 ± 0.13	<0.05



## Effects of dietary replacement of fishmeal by mealworm meal on muscle quality of farmed shrimp *Litopenaeus vannamei*



Roseane L. Panini<sup>a</sup>, Stephanie S. Pinto<sup>a</sup>, Renata O. Nóbrega<sup>b</sup>, Felipe N. Vieira<sup>b</sup>,  
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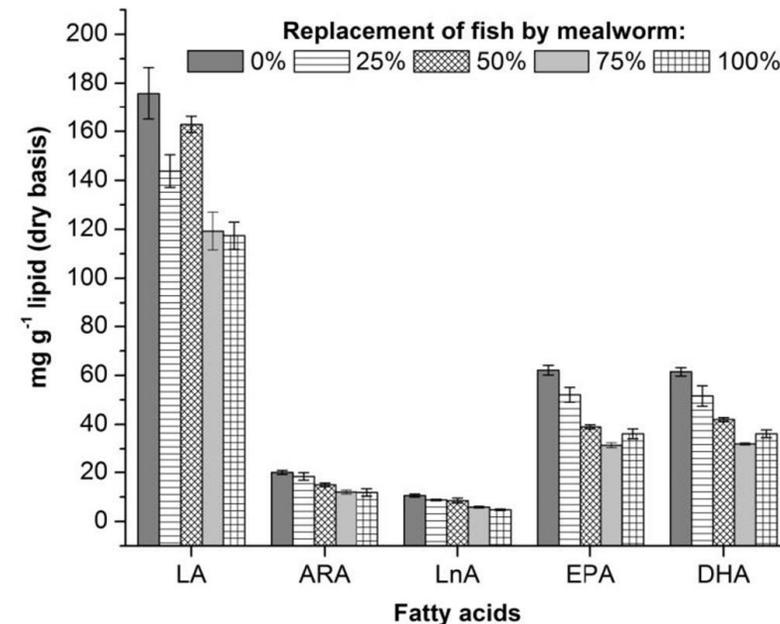
<sup>a</sup> Food Science and Technology Department, Federal University of Santa Catarina, Avenue Admar Gonzaga, 1346 Florianópolis, SC, Brazil

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<sup>d</sup> Biochemistry Department, Federal University of Santa Catarina, Trindade, Florianópolis, SC, Brazil

The main drawback to the use of insects as alternative ingredient is that they are lacking in polyunsaturated fatty acids (PUFA) of the n3 series, such as EPA and DHA, whilst they are rich in linoleic acid (LA), saturated and monounsaturated fatty acids





## Potential use of mealworms as an alternative protein source for Pacific white shrimp: Digestibility and performance



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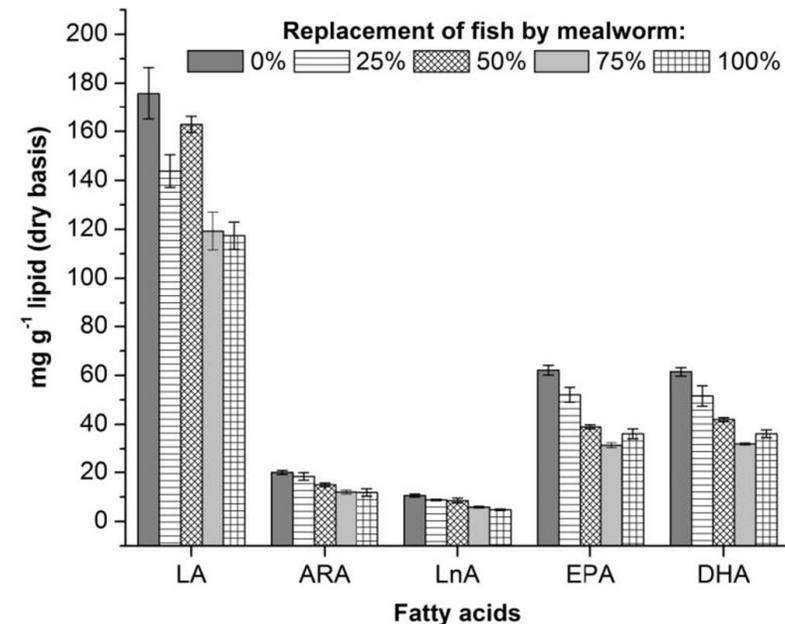
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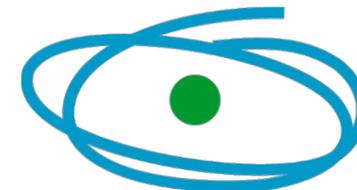
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A literatura fornece evidências convincentes de que os insetos são uma fonte promissora de novos nutrientes para o uso em rações na Aquicultura, que ainda se concentraram principalmente na farinha de peixe e na soja.



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Entomologia Molecular



**C A P E S**







Muito  
obrigado!



Bom apetite!

