Potential of insects as Animal Feed - Aquaculture

Short course on Insects as food and Feed. November 2016.
Nathan Preteseille. AETS Thailand, French consulting company.
0. Context

- Population growth
0. Context

- Population growth
- Resource limitation
0. Context

- Population growth
- Resource limitation
- The protein model

The Protein model: Efficacy vs Efficiency
0. Context

- Population growth
- Resource limitation
- The protein model
- Food waste
I. Aquaculture
Introduction

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II. Aquaculture

A. Introduction

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FIGURE 29

RELATIVE CONTRIBUTION OF AQUACULTURE AND CAPTURE FISHERIES TO FISH FOR HUMAN CONSUMPTION

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## I. Aquaculture

### Introduction

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<table>
<thead>
<tr>
<th>Specie</th>
<th>Diet</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishes (Seabass, Tilapia, Catfish,..)</td>
<td>Carnivorous</td>
<td>Fresh-water</td>
</tr>
<tr>
<td>Shrimps (Monodon, Vannamei,..)</td>
<td>Herbivorous</td>
<td>Marine water</td>
</tr>
<tr>
<td>Molluscs (squid,..)</td>
<td>Omnivorous</td>
<td>Brackish</td>
</tr>
</tbody>
</table>
I. Aquaculture

Introduction

Pelagic Fishes → Fishmeal for carnivorous fishes and shrimps → Aquaculture, (poultry, pet) feed
I. Aquaculture
Introduction

Worldbank 2013:
Global Fishmeal Use.

Fish to 2030:
Prospects for Fisheries and Aquaculture
I. Aquaculture

Introduction
I. Aquaculture
Introduction

Litopennæaeus Vannæmei shrimp life cycle:

- Egg
- Nauplii-Zoeia-Mysis
- Post-Larvae
- Shrimp
- Broodstok

<table>
<thead>
<tr>
<th>Stage</th>
<th>Duration</th>
<th>Weight Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg</td>
<td>45 days</td>
<td>From 0 to 2 gr.</td>
</tr>
<tr>
<td>Nauplii-Zoeia-Mysis</td>
<td>60 days</td>
<td>From 2 to 15 gr.</td>
</tr>
<tr>
<td>Post-Larvae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shrimp</td>
<td>120 days</td>
<td>From 15 to 50 gr.</td>
</tr>
<tr>
<td>Broodstok</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
I. Aquaculture

Introduction

Illegal fishing (IUU)

The EU rules to combat illegal, unreported and unregulated fishing

Illegal fishing worth $600m in the Pacific amounts to ‘daylight robbery’

Calls for better policing of the industry as report finds licensed fishing vessels are responsible for majority of the illegal catch.
II. Aquaculture

A. Introduction

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**Netherlands:**
417 participants.
Average age: 35 years.
Feed industry stakeholders, citizens, farmers.

**Thailand:**
120 Students, 3 Schools.
Average age: 15 years.
II. « Entomoculture »
Introduction

- Species=> target
- An unexplored potential
- From wild to control
- A simply complicated management

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II. « Entomoculture »
Introduction

Production: Some key parameters:

- Substrate
- Management
- Processing
II. « Entomoculture »

Introduction

Building Value: Waste management and valorisation
III. Bridging at different levels

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III. Bridging at different levels

Example: Vannamei Broodstock

- Currently used as 80% of the feed
- Still wild harvested
- Potential of further trials
III. Bridging at different levels
First Idea: The entry of a new product on the markets needs technical proves of its value.

First Step: Test the Product in comparative trials against its target replacer.

Second step: Promote the use of the new product based on the previous step.

Third step: Enable the development of a new sector and its implementation inside a market.
III. Bridging at different levels

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III. Bridging at different levels

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<table>
<thead>
<tr>
<th>Day</th>
<th>Stage</th>
<th>Predicted Av. Weight</th>
<th>Survival (%)</th>
<th>PL population</th>
<th>Daily Feed Amount (kg)</th>
<th>EZ Artemia (mL)</th>
<th>Cumulative Feed amount (kg)</th>
<th>Proposition de test</th>
<th>% de remplacement du fishmeal</th>
<th>% de fishmeal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PL 12</td>
<td>0.006</td>
<td>100</td>
<td>10000</td>
<td>0.04</td>
<td>22</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>PL 13</td>
<td>0.0074</td>
<td>99.5</td>
<td>9950</td>
<td>0.04</td>
<td>22</td>
<td>0.1</td>
<td></td>
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<tr>
<td>3</td>
<td>PL 14</td>
<td>0.0091</td>
<td>99</td>
<td>9900</td>
<td>0.04</td>
<td>13</td>
<td>0.1</td>
<td></td>
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<tr>
<td>4</td>
<td>PL 15</td>
<td>0.0112</td>
<td>98.5</td>
<td>9850</td>
<td>0.04</td>
<td>13</td>
<td>0.2</td>
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<tr>
<td>5</td>
<td>PL 16</td>
<td>0.0138</td>
<td>98</td>
<td>9800</td>
<td>0.04</td>
<td>18</td>
<td>0.2</td>
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<td>6</td>
<td>PL 17</td>
<td>0.0169</td>
<td>97.5</td>
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<td>97</td>
<td>9700</td>
<td>0.04</td>
<td>4</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>PL 19</td>
<td>0.0254</td>
<td>96.5</td>
<td>9650</td>
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<td>9</td>
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<td>96</td>
<td>9600</td>
<td>0.05</td>
<td>4</td>
<td>0.4</td>
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<tr>
<td>10</td>
<td>PL 21</td>
<td>0.0384</td>
<td>95.5</td>
<td>9550</td>
<td>0.06</td>
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<tr>
<td>11</td>
<td>PL 22</td>
<td>0.0467</td>
<td>95</td>
<td>9500</td>
<td>0.07</td>
<td>4</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Proposition de test**

- Diet 1: 0.4
- Diet 2: 0.8

**% de remplacement du fishmeal**

- Control: 0.675
- Diet 1: 0.405
- Diet 2: 0.135

**Paramètres de test**

<table>
<thead>
<tr>
<th>Nombre de bassins</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taille de bassin</td>
<td>5m²</td>
</tr>
<tr>
<td>Renouvellement journalier d’eau</td>
<td>30 %</td>
</tr>
<tr>
<td>Densité de stockage</td>
<td>10 0000 Post Larve</td>
</tr>
</tbody>
</table>

**Données à mesurer**

- Croissance moyenne journalière
- Taux de survie
- PH
- Température
- Composition des crevettes
- Composition de l’aliment
- Taux de conversion de l’aliment
- Taux de d’utilisation des protéines
III. Bridging at different levels

- Results: Not only one answer, but definitively potential!

- Samon feed Trial with BSFL: 50% replacement: No adverse effect

- Seabass trial with TM: 50% replacement => lower weight gain
III. Bridging at different levels

Two Scales

Two approaches

Two history
IV. Insects as Feed for aquaculture - Barriers and Developments

Chitin, an issue?
IV. Insects as Feed for aquaculture - Barriers and Developments

Quantity And Quality
IV. Insects as Feed for aquaculture - Barriers and Developments
IV. Insects as Feed for aquaculture - Barriers and Developments

ANNEX IV - CHAPTER IV - SECTION D NOW

Specific conditions applicable to the production and use of processed animal protein, other than fishmeal, derived from non-ruminants and compound feed containing such processed animal protein intended to be used for feeding aquaculture animals. The following specific conditions shall apply to the production and use of processed animal protein, other than fishmeal, derived from non-ruminants and compound feed containing such protein intended to be used for feeding aquaculture animals:

(a) The animal by-products intended to be used for the production of processed animal protein referred to in this Section shall be derived either from slaughterhouses which do not slaughter ruminants and which are registered by the competent authority as not slaughtering ruminants or from cutting plants which do not bone or cut up ruminant meat.

ANNEX IV - CHAPTER IV - SECTION D tomorrow

21) In order to allow for more possibilities in the types of raw materials used for the production of non-ruminant processed animal protein destined for use in feed for aquaculture animals or destined for export, it is appropriate to amend point (a) of Section D of Chapter IV of Annex IV to Regulation (EC) No 999/2001 in order to allow the use of animal by-products originating from establishments other than slaughterhouses or cutting plants, provided that those other establishments are dedicated exclusively to the handling of non-ruminant materials, or are authorised by the competent authority, following an on-site inspection, based on the same...
IV. Insects as Feed for aquaculture - Barriers and Developments

Enterra gets Canadian regulatory backing for insect larvae in chicken feed

By Jane Byrne
21-Jul-2016
Last updated on 21-Jul-2016 at 17:27 GMT

Black soldier fly © Enterra Feed Corporation
Thank you!

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http://www.jugaaddict.com/

Nathan Preteseille, AETS Thailand. 29th of November 2016. Kasetsart University.
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- The state of world fisheries and aquaculture 2016. FAO.

Nathan Preteseille, AETS Thailand. 29th of November 2016. Kasetsart University.