


# Aquaria Food Sustainability: Optimising Aquarium Feeding Strategies by Utilising Aquaculture Feeding Practices and Developments

©Tony McEwan<sup>1</sup>, Maryke Musson<sup>2</sup>  
 South African Association of Marine Biological Research<sup>1</sup>  
 Two Ocean Aquarium<sup>2</sup>

**AQUARIA FOOD SUSTAINABILITY:**  
 OPTIMISING AQUARIUM FEEDING STRATEGIES  
 BY UTILISING AQUACULTURE FEEDING  
 PRACTICES AND DEVELOPMENTS

by  
 Tony McEwan\* & Maryke Musson\*\*

\*uShaka Sea World, SAAMBR, Durban  
 \*\*Two Oceans Aquarium, Cape Town



1

**Differences:**

<b>Aquaculture:</b>	<b>Aquariums:</b>
• Small number of species (mono-culture)	• Many species (350+)
• Uniform size	• Large size range
• High stocking density >15kg/m <sup>3</sup>	• Low stocking density <2kg/m <sup>3</sup>
• Short life span: Trout; 1 – 2 years Salmon; 2 – 3 years Tilapia; ½ - 1 year	• Long life span: Pompano; 20+ Tropical fish; 5+
• Similar diets	• Varied diets


4

Optimal conditions and good nutrition are strong focuses for commercial Aquaculture and Aquariums




2

Aquaculture generally not concerned about long term health of fish (except brood stock)



Aquariums hold animals for many years so long term individual health is very important (fatty livers)



5

**Aquaculture and Aquariums are similar, yet different:**

Aquaculture wants optimal (fast) growth for a quality product.



Aquariums want long term exhibition of good looking specimens.



3

**Aquaculture**

Aquaculture have developed many diets for a few commercial species.

Each species has different nutritional requirements for different life stages:

- Larvae, post-larvae, fry, fingerling, smolt, grow-out, brood stock, immune booster, parasite control
- Many sizes from <1mm crumble to 10+mm pellet

6

## Aquariums

Exhibits hold many species and size range of individuals large.

The types of feeding varies from carnivore to herbivore.



7

Test was as Scientifically Rigorous as possible.

Two common species randomly mixed into two tanks.



Each fish individually tagged.

Length/Weight (fish BMI)

Blood at start and end (hematocrit, metabolomics)

Statistics – four populations, normality; equal variance; growth slopes; ANOVA; non-linear mixed effects model

11

## Move to artificial feeds



8



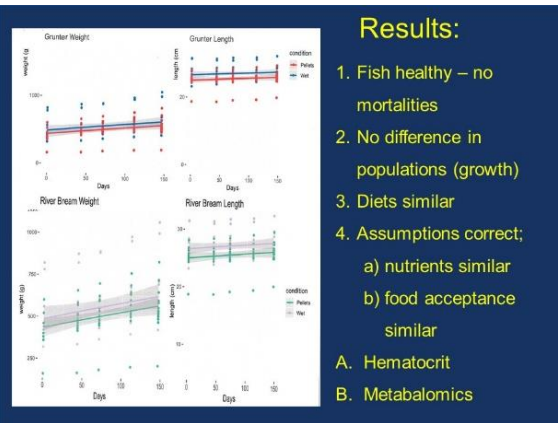
12

Developed a general balanced aquarium pelleted feed.

Important features:

- **Formulation** – maintenance (lower protein and fat) pre-mixes (vitamins, colorants, etc.)
- **Ingredients** – what is available locally
- **Manufacturing technique** – floating / sinking
- **Pellet size**

9



13

- Assumption: what we have been feeding for the past 50yrs is successful.
- Artificial feed (pellets) tested against what we currently feed.
- Feed experiment duration 4 months.



10

## Results:

- Pelleted feed 39% cheaper
- Amount pellets fed 41% less
- Total Cost saving 83%

14

### Consequences:

- In 8 months saved 6 tons wet feed out of 22 tons per year
- Happy boss 
- Never completely replace wet feeds
- Dubai Aquarium and Underwater Zoo tested artificial feeds and found good health husbandry and cost benefits

15

### Sustainability

- Use less wet feed
- Feed companies sustainability statements – nutrition, ingredients, operations, community responsibilities

19

### Consequences:

- Less feed preparation
- Easier feeding
- Less mess in water
- Testing of more feeds
- Testing of additives that claim improved digestibility



16

### Aquarium Sustainability Program:

- Energy saving – lights, pumps, heaters
- Less waste - recycling
- Less effect on environment – carbon footprint

20

### Consequences:



Feeding device

17

## Thank You

\*Tony McEwan, SAAMBR  
1 King Shaka Avenue, Point, Durban, 4001  
tmcewan@seaworld.org.za

\*\*Maryke Musson, Two Oceans Aquarium  
Dock Road, Waterfront, Cape Town, 8002  
maryke.musson@aquarium.co.za



21

Take note of Aquaculture feed and other developments.

Increase utilization of artificial feeds:

- Cost savings
- Nutritional control
- Increase sustainability

18