

SESSION 2: IMPROVING FEED EFFICIENCY AND FUNCTIONAL FEEDS - MORE WITH LESS



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Palatability Enhancers: Essential Nutrient for Aquafeeds

Abstract

The levels and types of attractants and palatability enhancers are often overlooked in aquafeed formulations. The technical knowledge and application of palatability enhancers are still undefined by species as well as by farm production conditions. There are chemoreceptor differences between marine fish, shrimp and catfish which indicate that the level and type of palatability enhancers will be different. And less is known for herbivorous fish such as gourami, grass carp, and even omnivorous tilapia.

Production conditions which affect feed consumption would include water quality, dissolved oxygen (DO), temperature, salinity, physiological animal status, and animal age. However, regardless the of situation, all aquafeeds should have adequate levels of attractants and palatability enhancers to ensure maximum feed consumption in all situations.



Palatability Enhancers: Essential Nutrient for Aquafeeds

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Attractability & Palatability

Attractability, Palatability and Aquafeed Intake



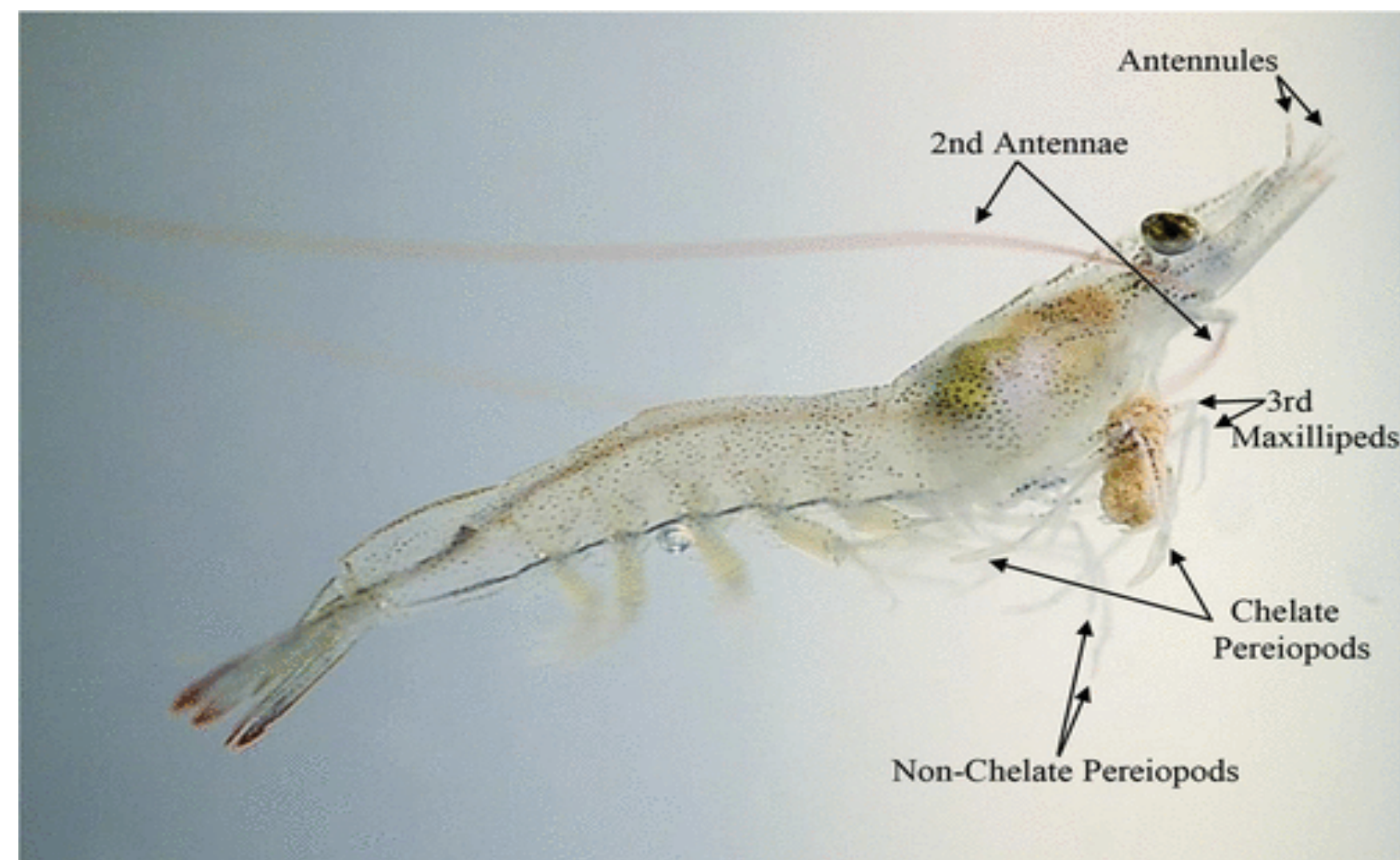
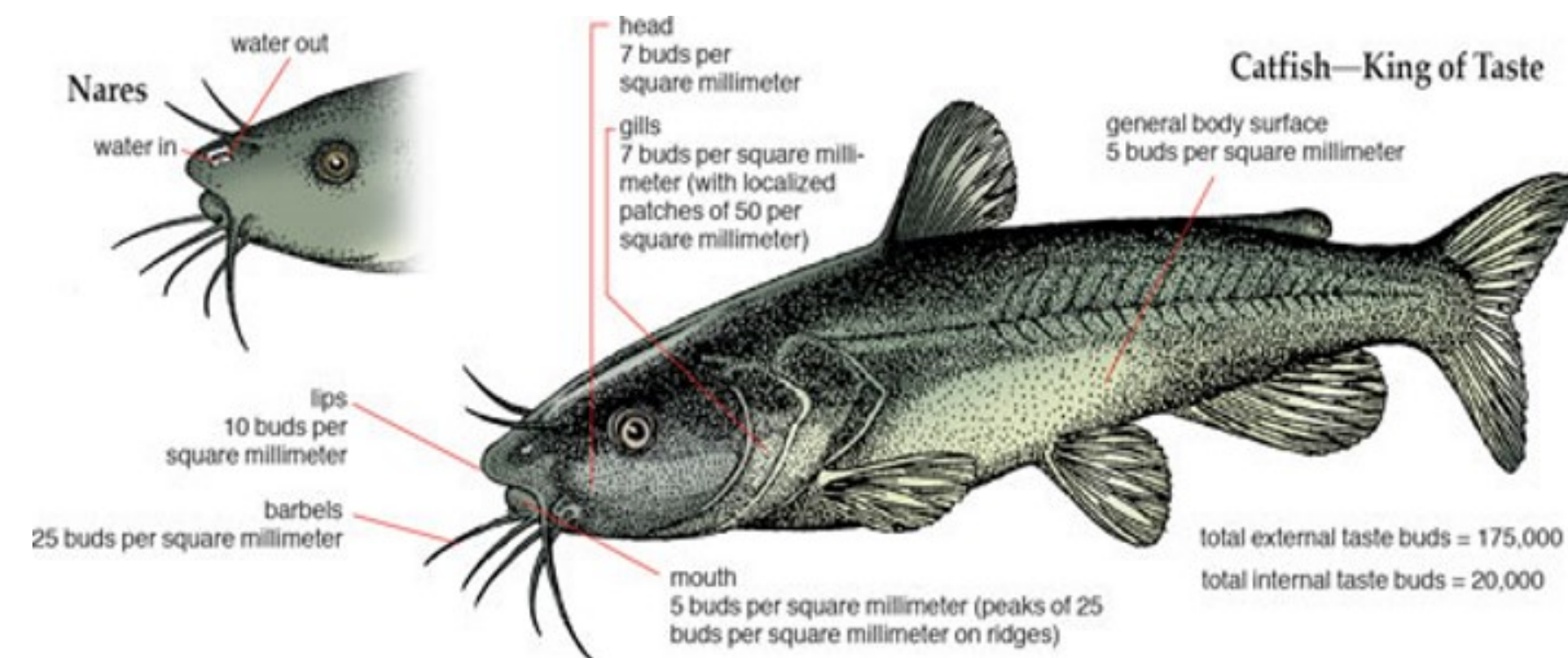
Attractability: Chemoreceptive response by animal

- Leached from feed into water and attracts animals
- Elicit faster feeding and feed location but not necessarily increase consumption

Palatability: Stimulate appetite and more continuous feed

- More palatable the feed, the more feed is consumed

Feed intake = Attractability + Palatability



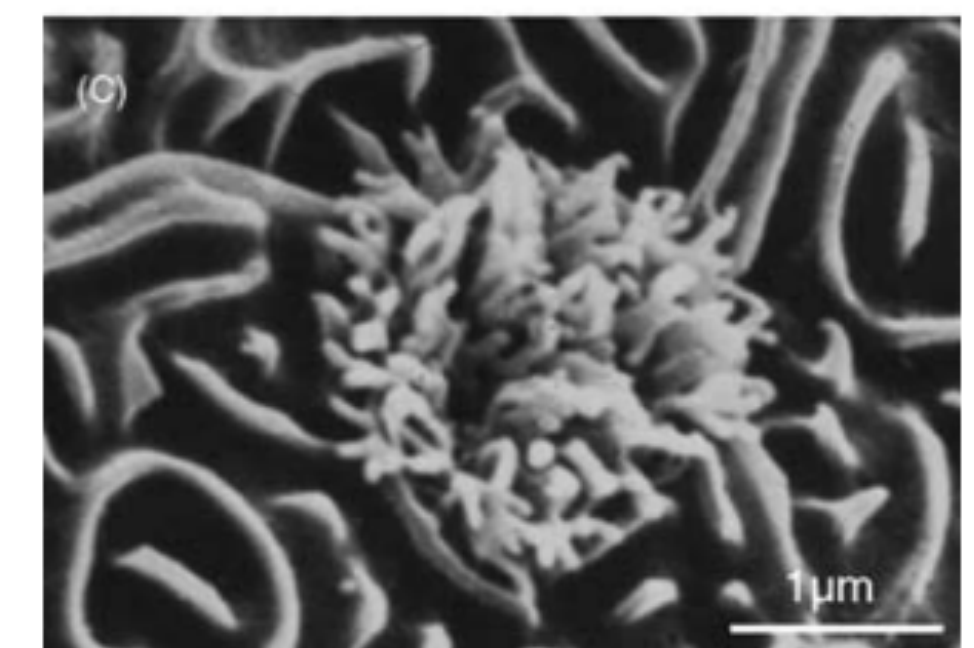
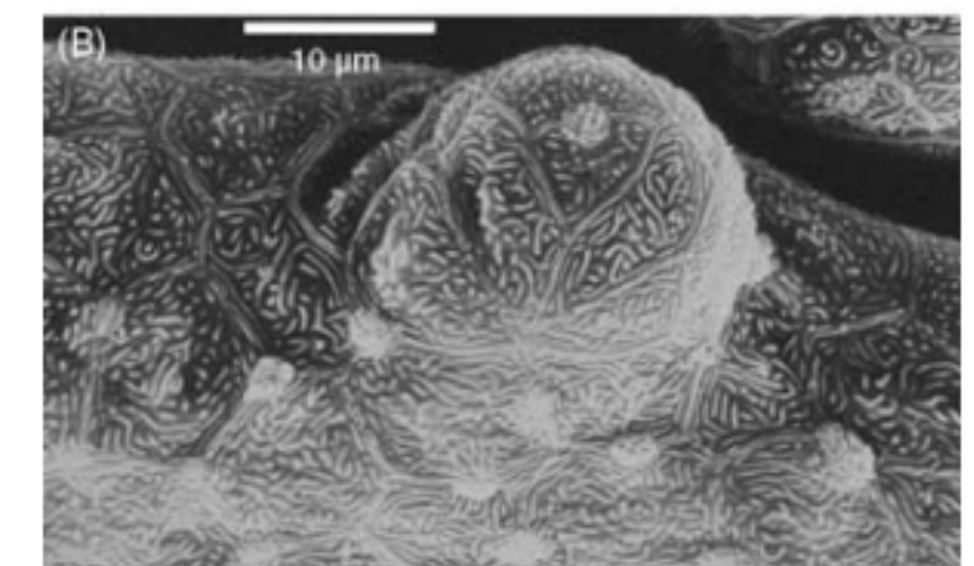
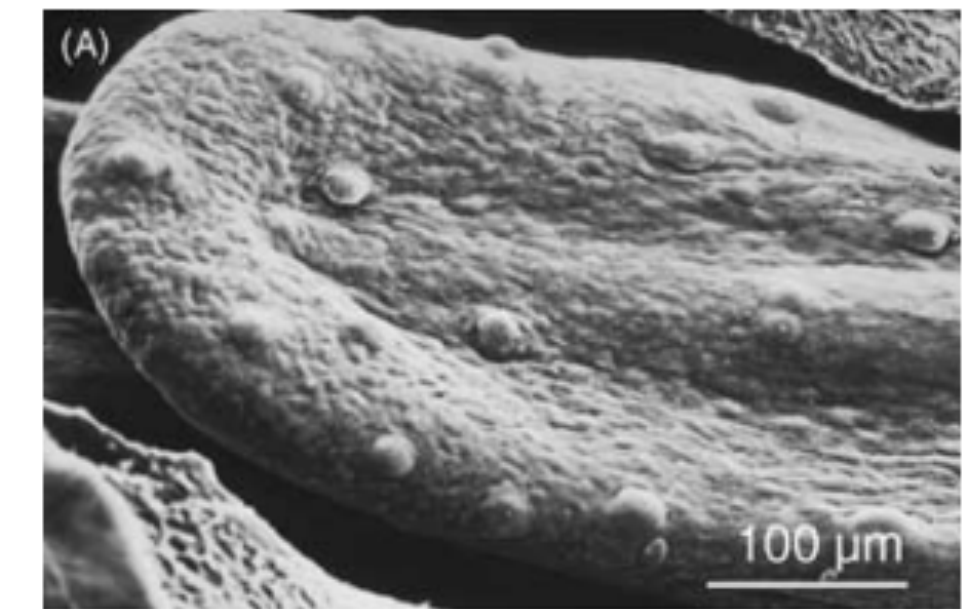
The sensory system of fish and shrimp is composed of external and internal sensory buds.

The external sensory systems

detects chemicals at a distance: attractability.

The internal sensory systems

determines feed intake or rejection: palatability.



All species have different preferences

Fish/shrimp species differences

Herbivorous vs Omnivorous vs Carnivorous species

Fresh water vs Salt water species

Formulations need to consider species, type and level of attractant

Small amino acids and betaine

Biogenic amines

Nucleotides

Others...



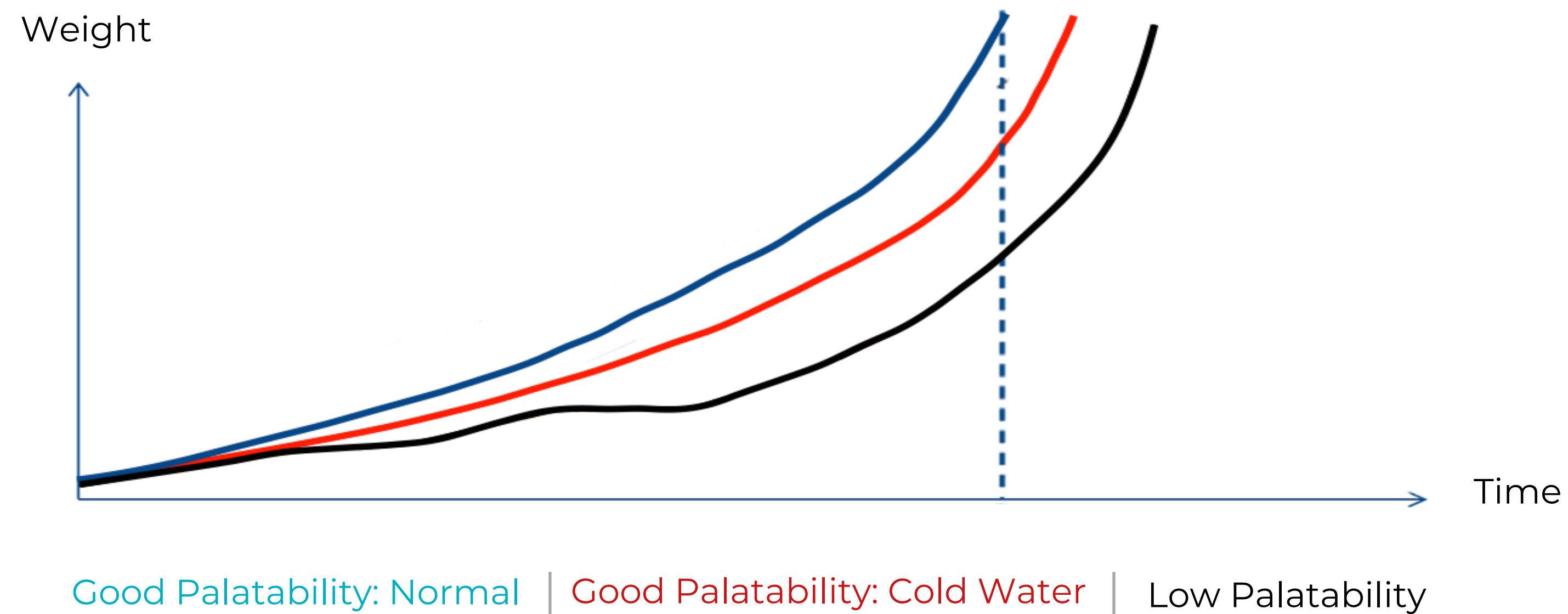
It is generally known that attractant and palatability enhancers have **additive effects and synergistic interactions**.

Thus, combinations of multiple attractant and palatability enhancers are better.



Fish and shrimp will accept a **low palatability feed** over time (weeks) of conditioning.

However, with **lost growth rate** over the conditioning period.



Feeding response: What influences feed intake?

ENVIRONMENT



- Water quality: Temperature, DO, Salinity, pH, etc...
- Light, moving shadows, abrupt sounds, etc...

AQUAFEED



- Formulation
- Feed Processing: Texture, size, shape, etc...

FISH / SHRIMP



- Species differences of fish or shrimp
- Physiological stress, disease, animal health, molting, etc...

Aquafeed considerations



All aquafeeds need an **appropriate palatability enhancer or combination** and the **proper level** of the attractants and palatability enhancers.

This is essential for fish or shrimp feeds regardless of the environmental conditions or the physiological status of the animal to **ensure maximum feed consumption**.

If fish and shrimp eat more feed, they will **grow faster**.

Aquafeed considerations

Need to establish palatability enhancer as a minimum nutrient restriction for formulations.

The Least Cost program will find appropriate level from all raw materials being offered at the lowest formula cost.

Normally, this nutrient restriction will be a “cost” similar to available phosphorous.

However, it will **stabilize the palatability enhancer level** and **deliver more stable feed consumption** at the farm level in **all conditions**.



The most common aquafeed palatability enhancer **is fish meal** as well as **other marine animal meals**.

Most studies for fish meal replacement often neglect the **value of palatability enhancers** replacement.

Commonly used palatability enhancers for aquafeeds

Ingredient	% Protein	% Fat	% Moisture	% Solubility (DMB)
Fish meal	60-70	6-10	8-10	20-25
Krill meal	55-60	15-16	6-8	20-25
Shrimp head meal	38-45	4-6	8-10	15-20
Whole shrimp meal	60-65	4-5	9-11	40-45
Squid liver meal	45-47	8-12	8-10	25-35
Squid meal	68-70	4-6	8-10	20-25
Fish solubles	30-40	2-5	40-60	70-80
Fish hydrolysate liquid	15-20	2-4	50-70	>90
Fish hydrolysate powder	68-80	8-16	2-5	>90





Aquafeed considerations

Aquafeed processing is also critical for optimum feed consumption.

- Pellet diameter and length
- Water stability, floating or slow sinking
- Pellet texture and hardness

Raw material quality is also critical.

- Rancidity
- Mold and fungus
- Antinutritional elements and repellents

The quality of palatability enhancer is highly dependent on:

Raw material quality

TVBN, Biogenic amines,
FFA, peroxide value,
Anisidine value, etc...

Processing standards

Time, temperature, pH,
enzyme supplementation,
sterilization, etc...

Summary



Feeding behaviour and feed intake are complex with a **variety of factors affecting palatability.**



Raw material quality, feed processing conditions and formulations all **affect attractability and palatability** of aquafeeds



Palatability enhancers allows the Nutritionist some **flexibility with raw material restrictions.**



There is limited information available/developed about attractability and palatability for the various aquaculture fish and shrimp.