

Challenges and Advances in Aquaculture Feed

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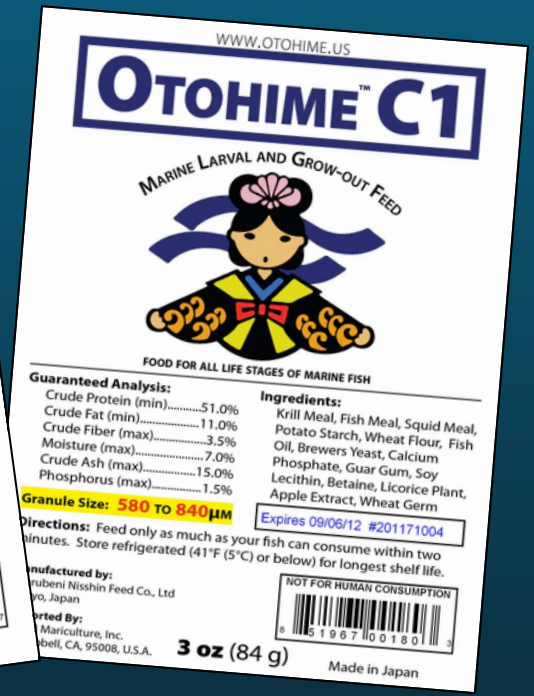
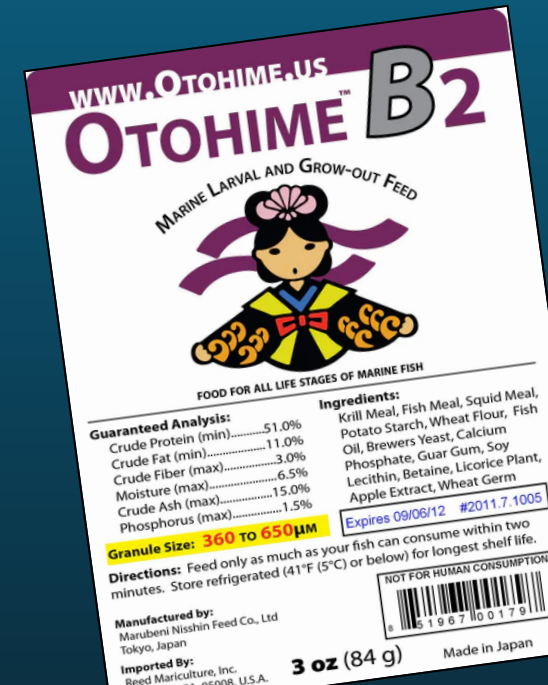
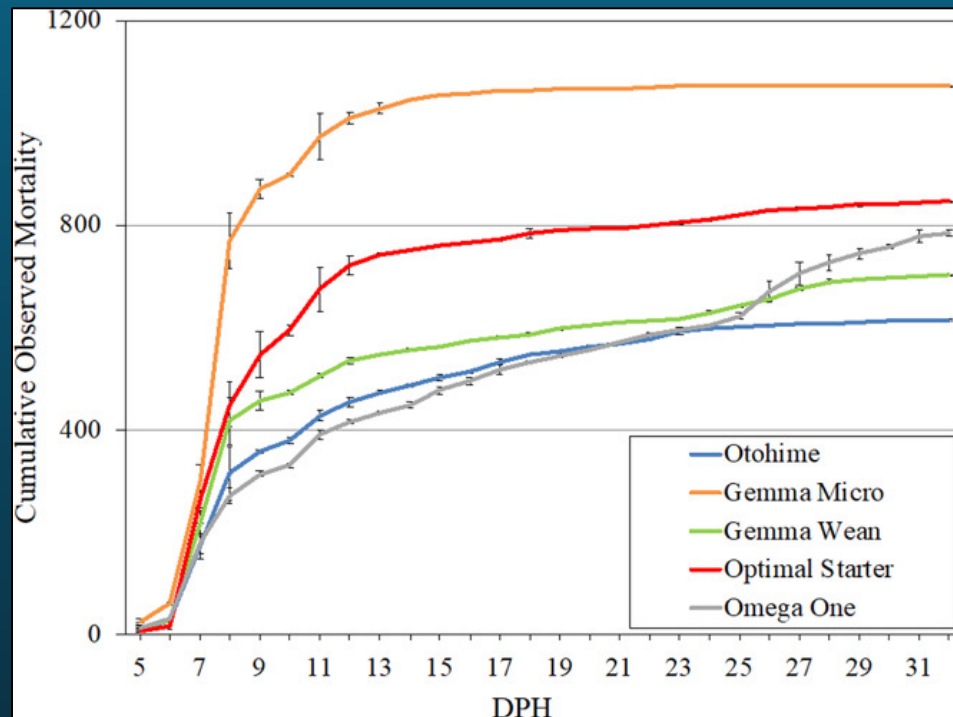
Fish Feed in Aquaculture



- Among the most significant costs for aquaculture operations
- Rely on too few manufacturers for certain species/lifestages
 - Otohime for larviculture diets
- Often find a diet you like using and it shortly becomes unavailable or difficult to source
 - Skretting/Bio Oregon Walleye Grower
 - BioKyowa (FFK)
 - Optimal Feeds

Larval percid diets

- Formerly used BioKyowa (FFK) exclusively
 - Import banned due to bovine spongiform encephalopathy concerns
- Otohime is currently the best option (Fischer et al. 2022)
 - Only one supplier, potential for future ban or supply shortages



Otohime

WWW.OTOHIME.US
OTOHIME™ B2

MARINE LARVAL AND GROW-OUT FEED



FOOD FOR ALL LIFE STAGES OF MARINE FISH

Guaranteed Analysis:

Crude Protein (min).....51.0%
Crude Fat (min).....11.0%
Crude Fiber (max).....3.0%
Moisture (max).....6.5%
Crude Ash (max).....15.0%
Phosphorus (max).....1.5%

Ingredients:

Krill Meal, Fish Meal, Squid Meal,
Potato Starch, Wheat Flour, Fish
Oil, Brewers Yeast, Calcium
Phosphate, Guar Gum, Soy
Lecithin, Betaine, Licorice Plant,
Apple Extract, Wheat Germ

Granule Size: 360 TO 650µm

Expires 09/06/12 #2011.7.1005

Directions: Feed only as much as your fish can consume within two minutes. Store refrigerated (41°F (5°C) or below) for longest shelf life.

Manufactured by:

Marubeni Nisshin Feed Co., Ltd
Tokyo, Japan

Imported By:

Reed Mariculture, Inc.
Campbell, CA, 95008, U.S.A.

NOT FOR HUMAN CONSUMPTION



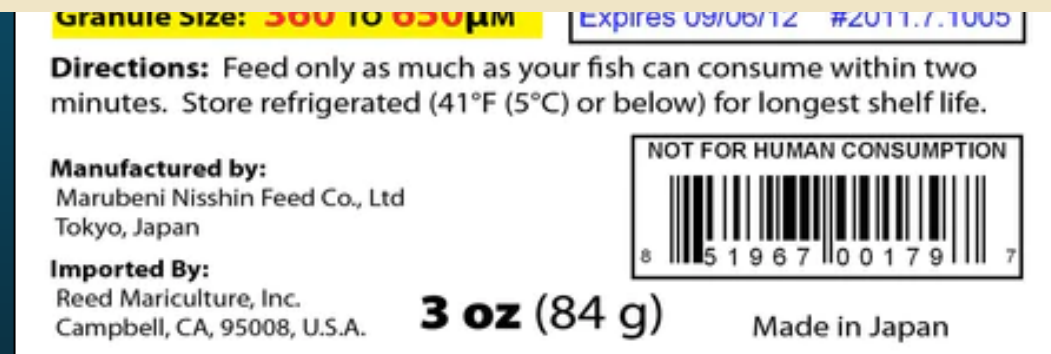
3 oz (84 g)

Made in Japan

Otohime

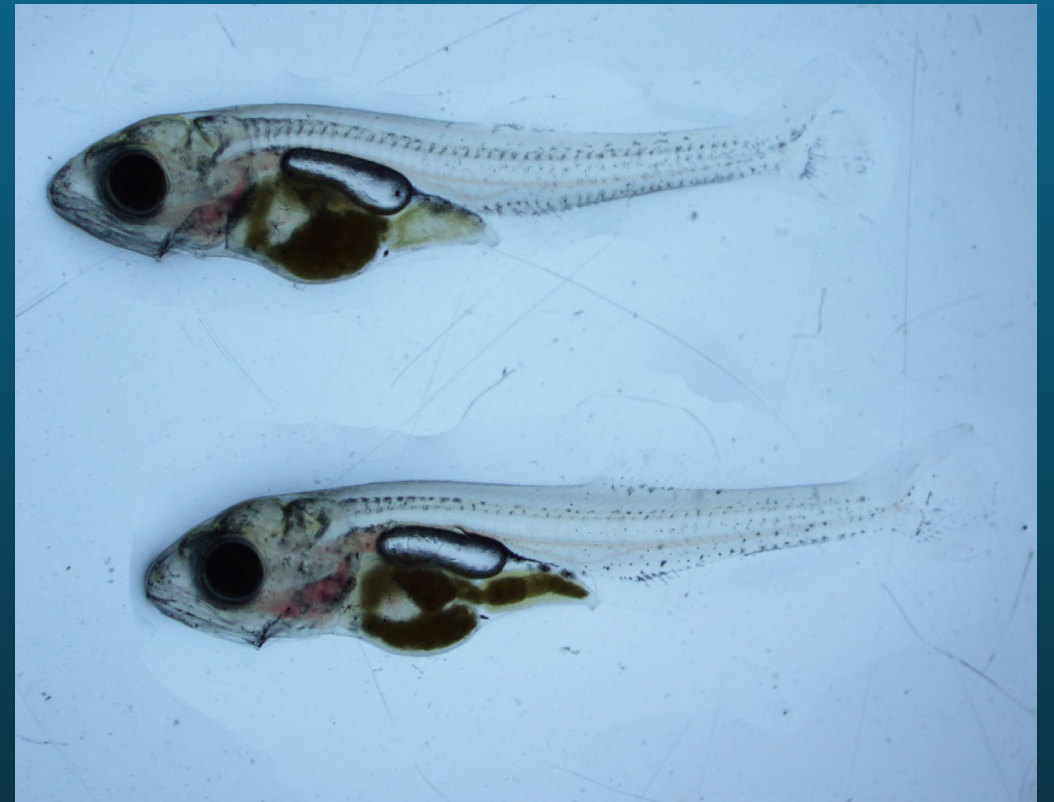
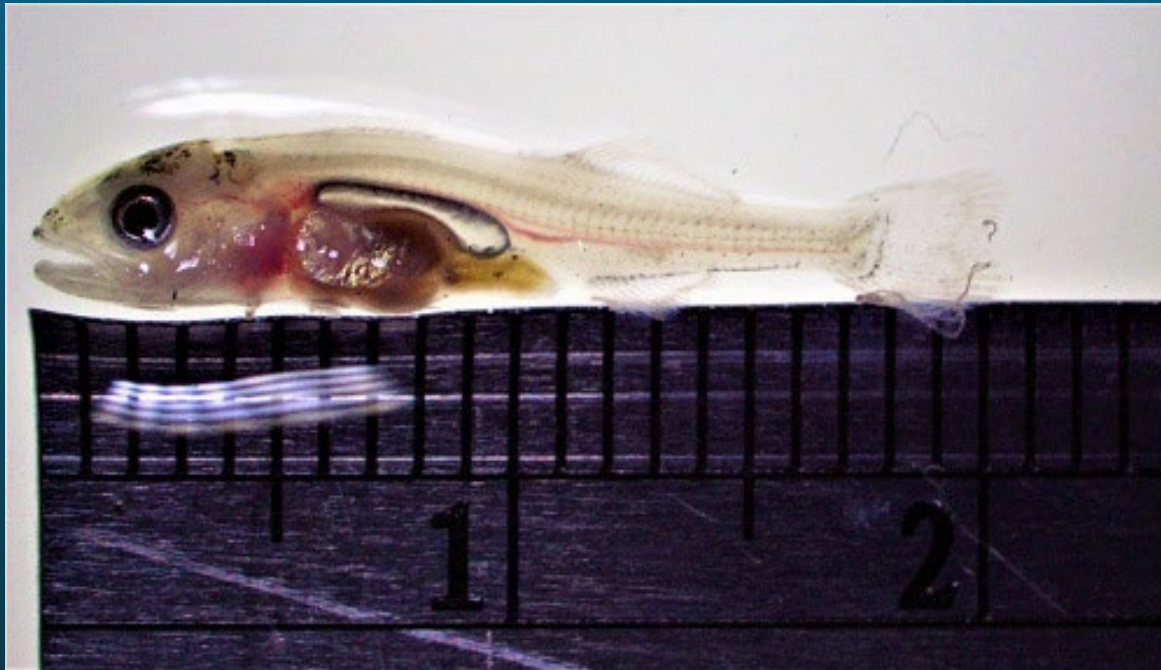


- Need to develop a replacement diet
 - Possibly better suited to the species we rear
- Identify which components are actually most important for larval fish



Larval diets

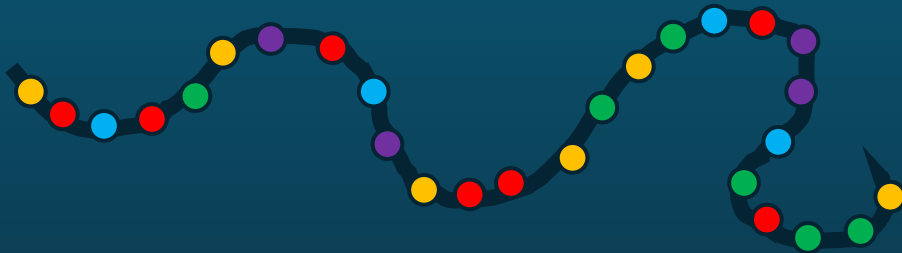
- Larval fish have very limited gut capacity
 - Not all protein sources are readily digestible
 - Protein size, solubility, amino acids, MW, etc. matter



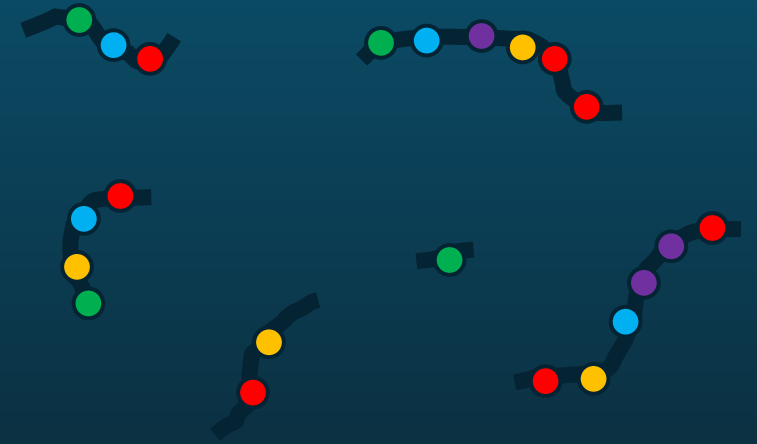
Larval diet trials

- Larval fish have very limited gut capacity
 - Not all protein sources are readily digestible
- Hydrolyzing proteins in fish diets can improve digestibility

Intact Protein



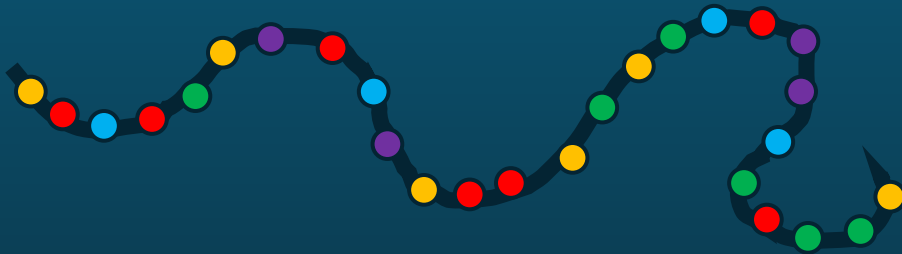
Hydrolyzed Protein



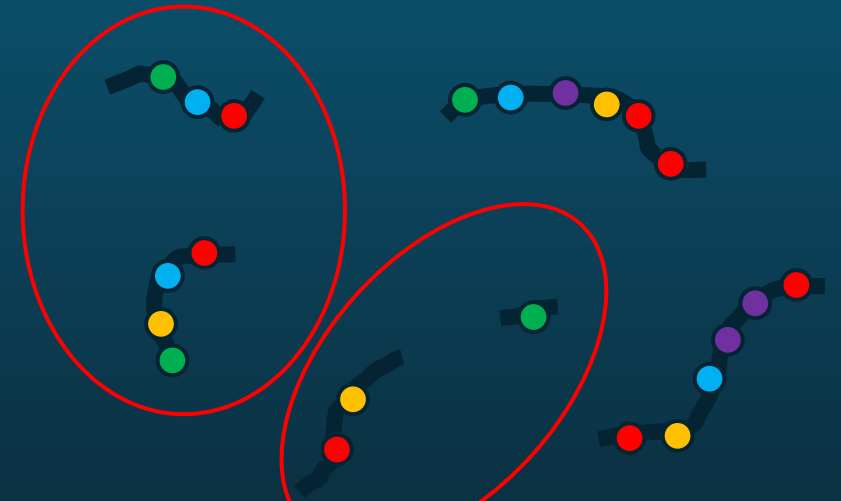
Larval diet trials

- Larval fish have very limited gut capacity
 - Not all protein sources are readily digestible
- Hydrolyzing proteins in fish diets can improve digestibility
 - Only some hydrolysates may be optimal

Intact Protein

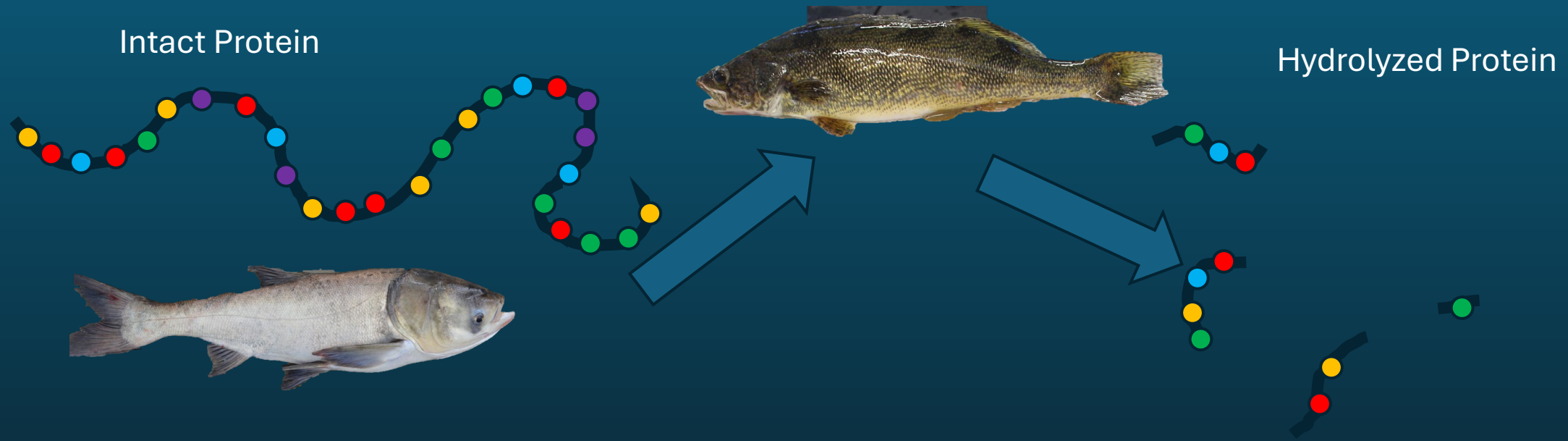


Hydrolyzed Protein

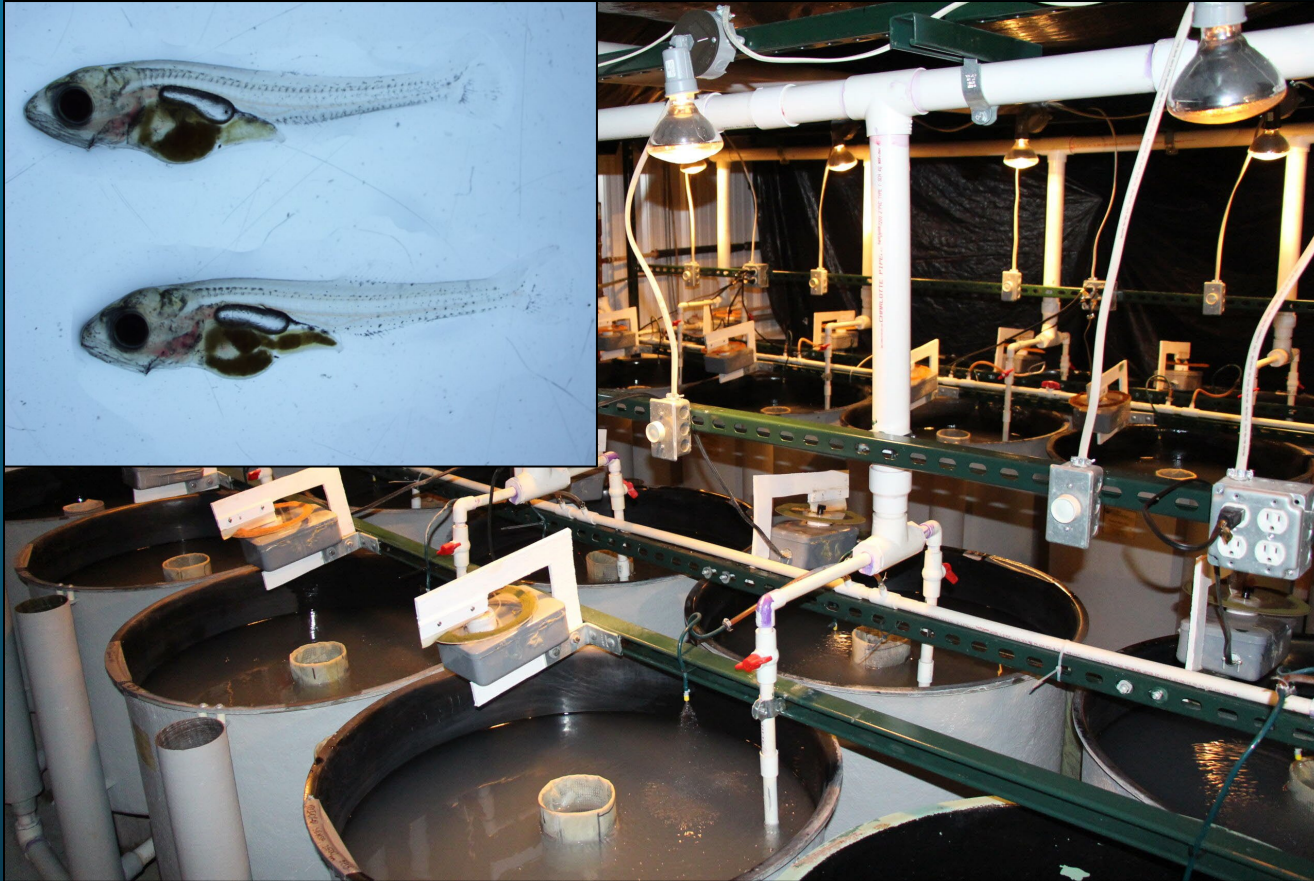


Larval diet trials – Diet Preparation

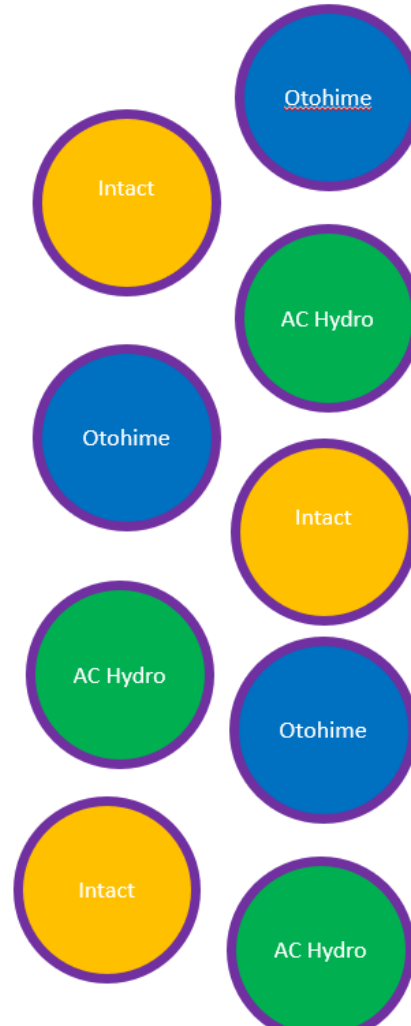
- Furthermore, using digestive enzymes from the guts of adult fish of the same species may allow for a tailored collection of hydrolyzed proteins most suited for the larvae



Larval diet trials – Larval culture

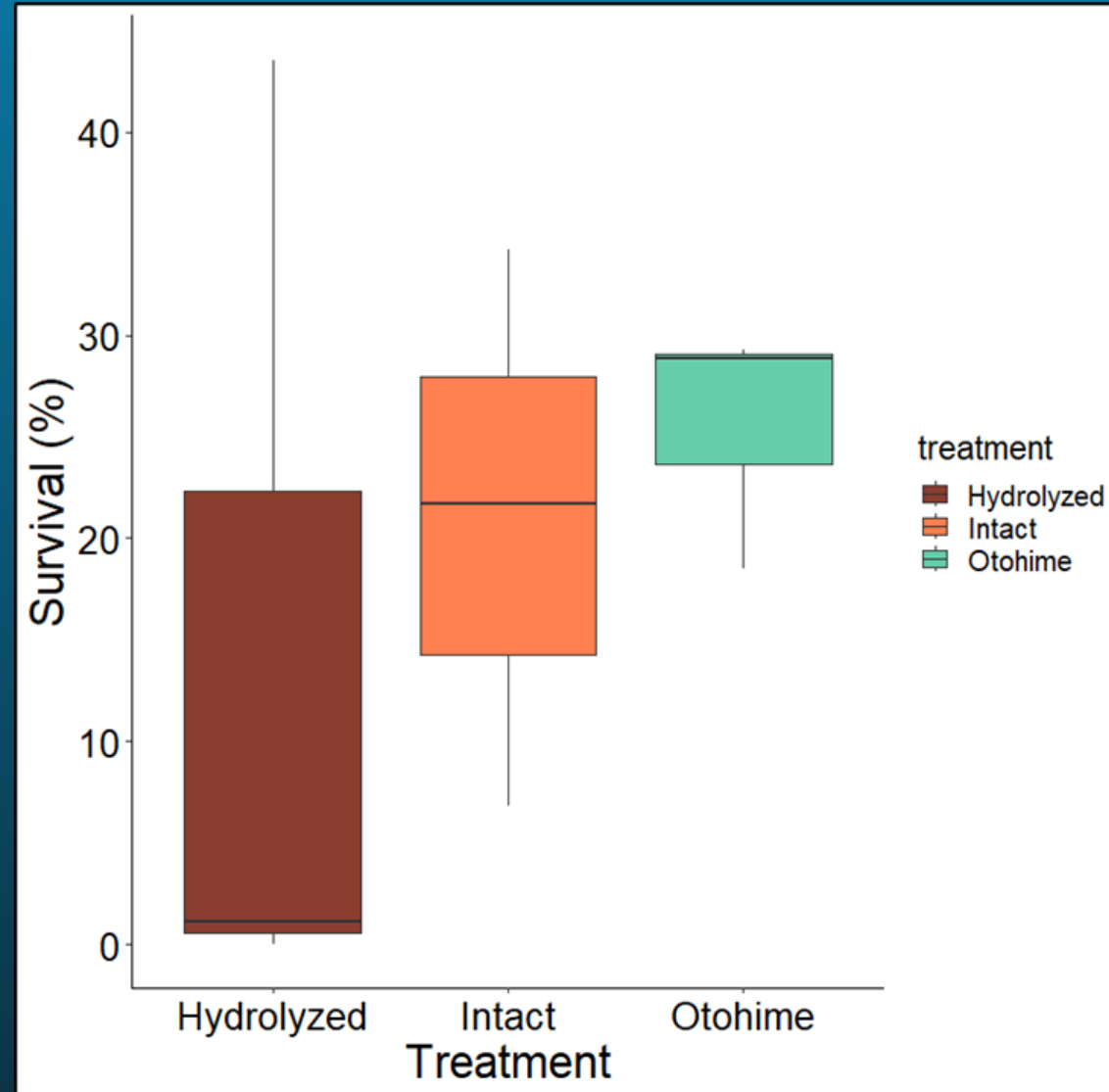


Bank A – First Feeding Trials

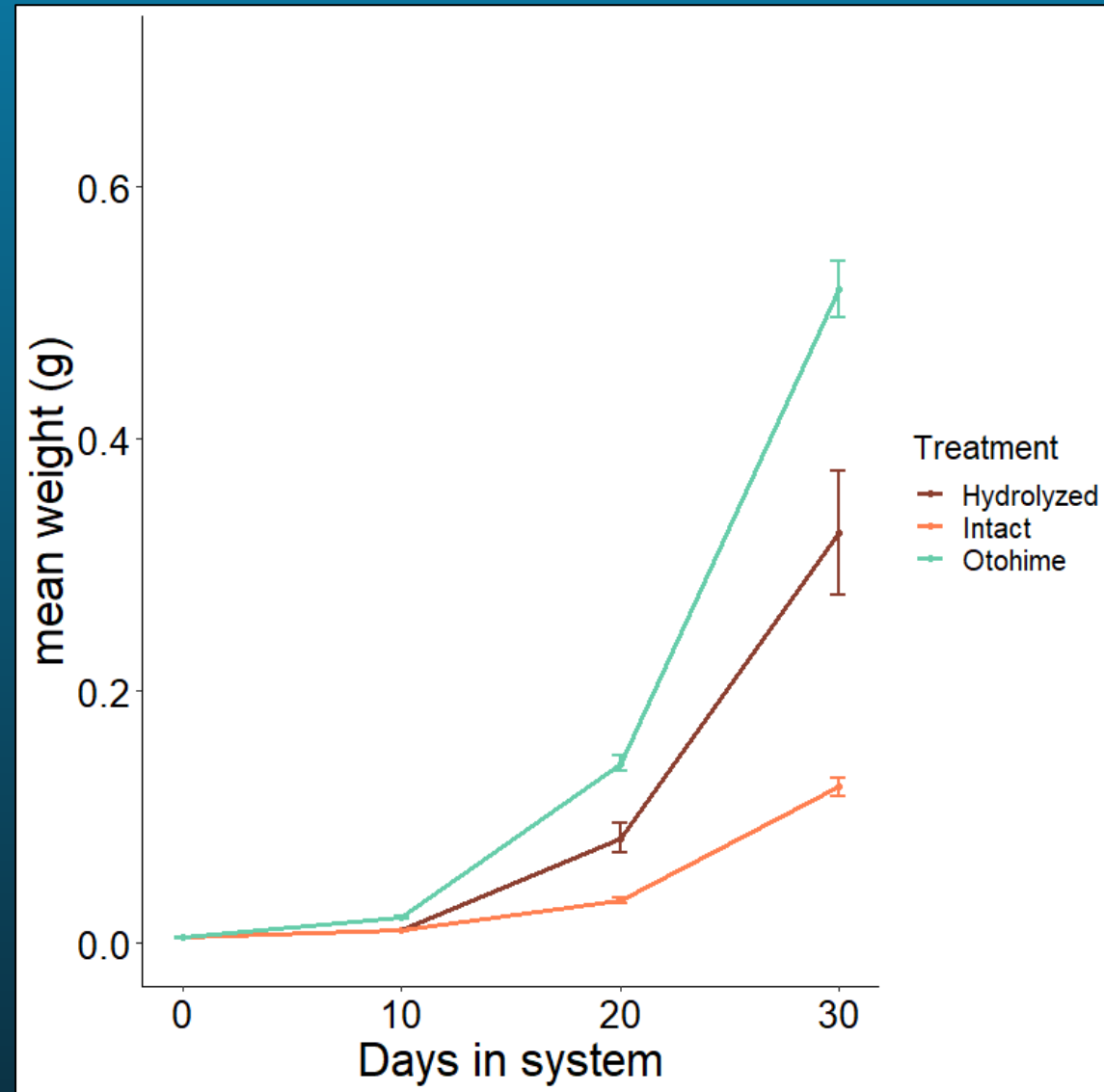


- Survival after 30 days
- Growth rates
- Presence of deformities

Larval diet trials - Survival

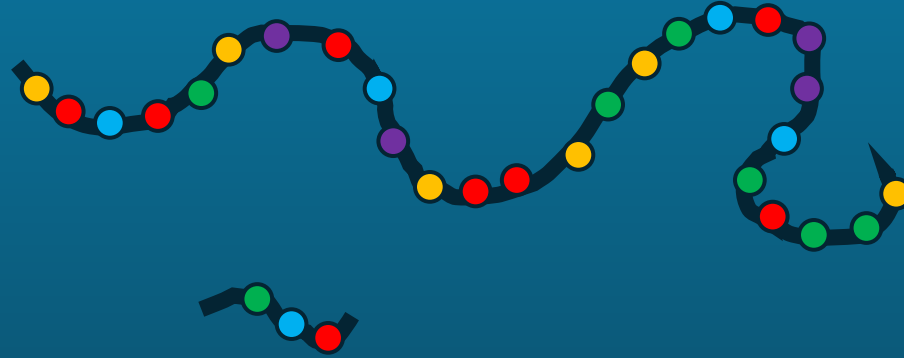


Larval diet trials - Growth



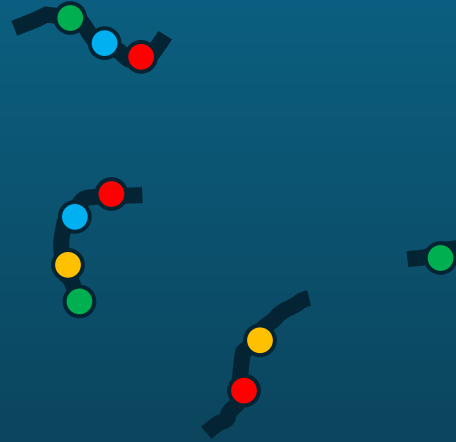
Larval diet trials - Deformities

Intact Protein



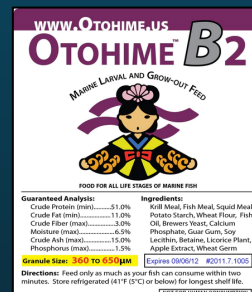
11%

Intact Protein



0%

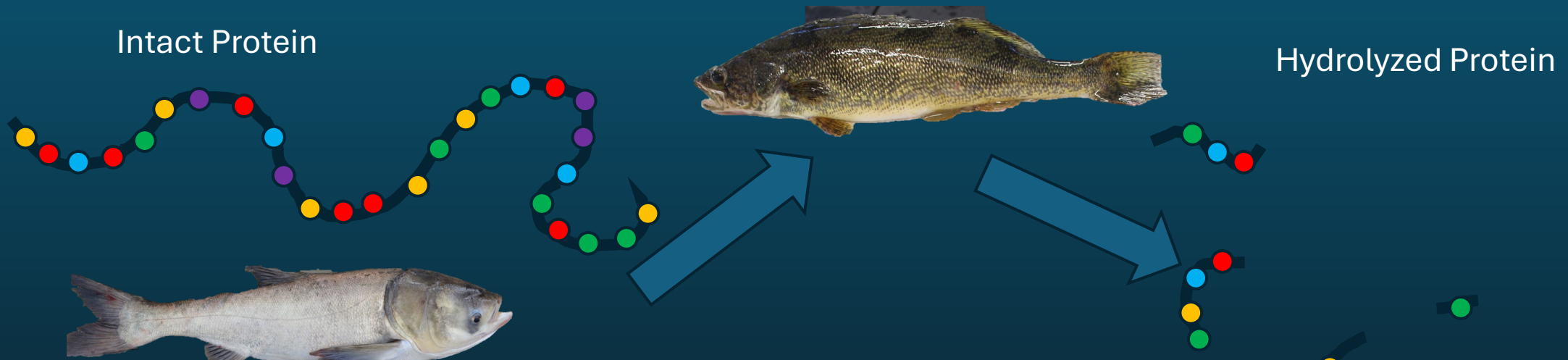
Otohime



0%

Larval diet trials – Findings

- Species-specific hydrolysates perform better than non-hydrolyzed fishmeal protein
- Hydrolysates in larval diets are not the solution alone
 - Palatability
 - Other nutrients
 - Visual appeal



Thank you!

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