FIGURE 31. Feed room at Mt. Shasta Hatchery, 1914. Diet consisted of ground beef liver, clabbered milk, and cooked wheat middlings. Bags in foreground contain wheat

Nutritional Requirements and feeding

DIPAC scholarship – deadline is this Friday!

www.dipac.net

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- NEW! Scholarship Application Bacculaureate 2015 - Word version
- NEW! Scholarship Application Vocational Ed 2015 - Word version
- E-mail the Scholarship Program
- Scholarship Awards

Douglas Island Pink & Chum, Inc.

2697 Channel Drive - Juneau, Alaska 99801
Phone: Toll Free 1-877- 463 - CHUM (2486)
or 907- 463 - 5114 Fax: 907- 463 - 3213

The returns are over and it is now time to analyzes the data and begin forecasting for next year. It is also time to start the meetings schedule. Please keep an eye below for scheduled DIPAC committee meetings.

DIPAC offers two categories of scholarships in 2015

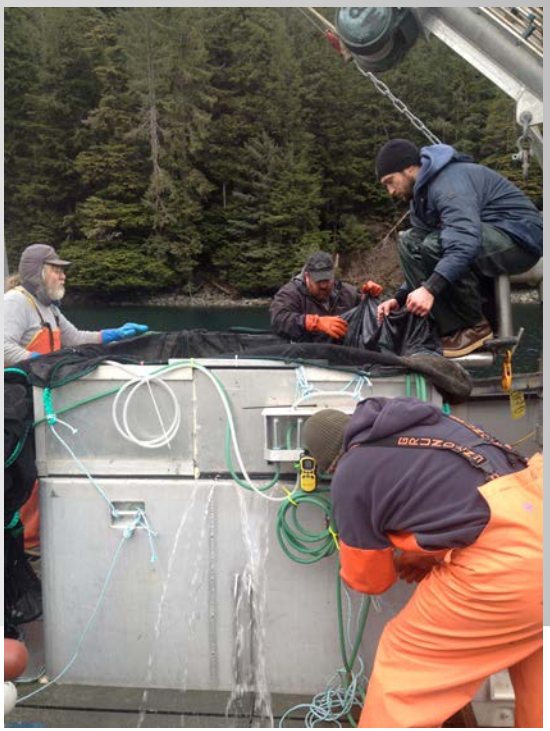
1. Baccalaureate degree (BA or BS) - up to a four-year grant with a total amount of $12,000; BA/BS Program Distribution-First year -$2,000, second and third years - $3,000, fourth year - $4,000.
2. Associate degree or vocational training - up to a two-year grant totaling $6,000 for applicants entering a hatchery technology program or other vocational training that is related to the fishing industry – e.g., engine repair, welding, electronics technician, marine wood construction/repair, Associate Programs including Hatchery Technology, and other vocational education programs- First year- $3,000, second year $3,000.

Both categories of Ladd Macaulay Memorial Scholarships are open to all graduates of high schools in Juneau, Haines, Skagway, Hoonah, Chatham, and Kake School Districts, and graduating home school students residing in Juneau, Lynn Canal, or northern Chatham Straits area. Students pursuing BA/BS degrees in any field of study are encouraged to apply and are eligible to receive these scholarship awards. Applicants who intend to concentrate in fisheries science, natural resource conservation, and related fields will receive particularly close consideration.

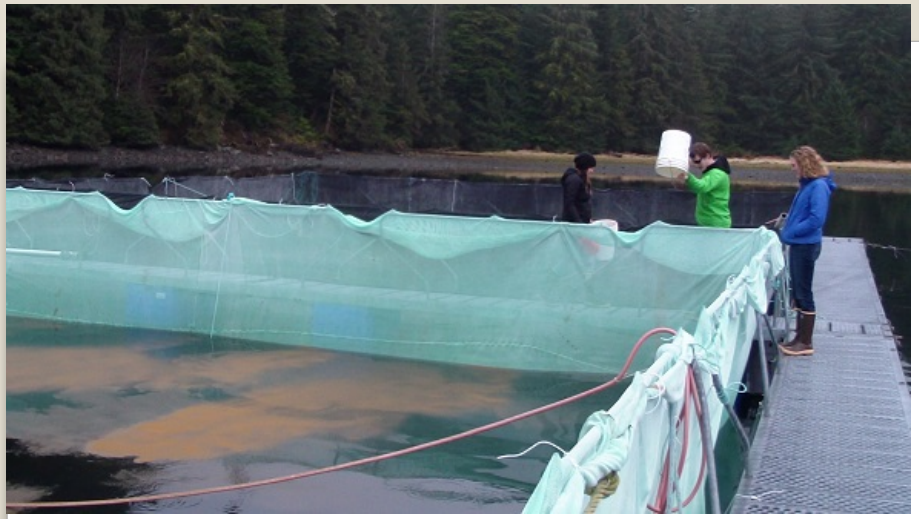
Graduation from the high school programs listed in the preceding paragraph is not required of applicants for hatchery technology programs. However, applicants for the hatchery technology scholarships, if not graduates of the high school programs listed in the preceding paragraph, must have Alaska hatchery work experience or be enrolled or admitted to an accredited hatchery technology program in Southeast Alaska.

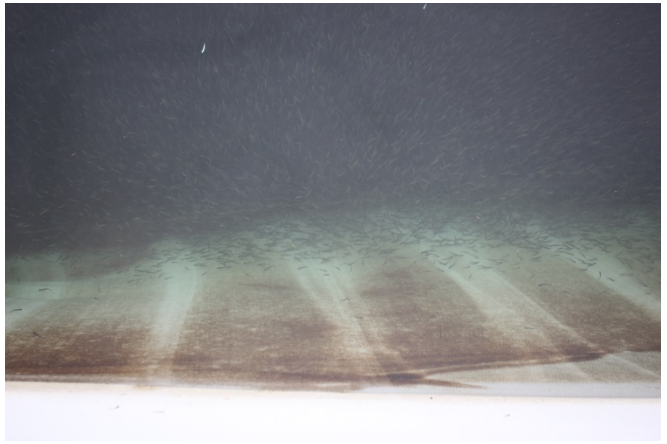
Applications for the Ladd Macaulay Memorial Scholarships will be available at the appropriate local school district offices and on-line at the DIPAC website (www.dipac.net). The two scholarship categories and disbursement amounts are guidelines and are not absolute or guaranteed. The DIPAC Board of Directors will determine the amounts each year based upon the funds available.

Chum transport to a remote rearing site



Visit to Deep Inlet / Feeding





Enthusiasm!

Stuff I want you to know:

- Variables that affect feed types, sizes, quanitities
- What fish need to be healthy
- Types of feeds and how they are made
- How feed is dispensed
- How to calculate how much to feed

Nutritional Requirements of Salmon

- Nutritional needs are well known
- Cold blooded / seasonal patterns of activity
- Also recall that lifestage affects metabolism – why?
- Food intake is important to:
  - Growth
  - Reproduction
  - Maintaining health
  - Meeting energy needs

- What do you think affects the energy requirements in fish?

Factors Affecting Energy Requirements

- Water Temperature
- Fish Size
- Type of Feed
- Species
- Activity
- Light
- Environment

Basic Requirements

- Oxygen
- Water
- Protein
- Lipids (Fat)
- Carbohydrates
- Minerals
- Vitamins

Protein
What is it used for?

Protein

- Protein is used for growth, essential for building and repairing muscle.
- Excess protein is for energy and stored as fat.
- Provides essential amino acids that can not be synthesized by the fish itself.
- Important in the production of:
  - Hormones
  - Digestive enzymes
  - Antibodies

Too much protein?
No such thing……

- Protein requirements vary based upon:
  - Quality and energy content of protein
  - Fish size and age: generally decreases as fish size increases
  - Water temperature
  - Feeding rate (of course!)
- Commercial feeds vary significantly
- The primary factor determining the amount of protein in a diet is the age of the fish:
  - Fry 50 – 55%
  - Smolt 40 – 50%
  - Brood Fish 40 – 50%

Fish feed ingredients - Protein sources

Marine			Terrestrial		
Fish	Feed fisheries	Herring	Plant	Soya	Full-fat soya
		Anchovy			Extracted soya
		Capelin			Soy protein concentrate
		Norway pout		Maize	Maize meal
		Horse mackerel			Maize gluten meal (60%)
		Menhaden		Wheat	Wheat gluten meal
		Sand eel		Rapeseed	Rapeseed meal
		Blue whiting			Rapeseed concentrate
	Food fisheries	By-product meals		Lupins	Lupin seed meal
		Fish protein concentrates		Peas	Pea seed meal
Crustaceans		Shrimp by-product meals			Pea seed concentrate
Other		Krill meal		Sunflower	Sunflower seed meal
		Krill hydrolysates		Cotton	Cotton seed meal
			Animal	Poultry	Poultry meat meal
					Feather meal
				Porcine	Blood meal
			Bio-tec	Yeasts	
				Bacteria	
				Algae	

Why is fishmeal still the main protein source in starter feeds ?

- High protein content in meal
- Ideal amino and profile for fish
- High digestibility of protein
- Supplies essential fatty acids
- High levels of available phosphorous in meal
- Highly palatable
- No anti-nutritional factors
- Excellent processing qualities

Why look for alternatives to fishmeal ?

- Uncertainty over future availability - limited resource
  /
  growing need
- Further instability in cost
- Predictability of raw material quality
- Ethical considerations
- Sustainability
- Content of persistent organic pollutants

What are “lipids”?
Why are they necessary?

Fish feed ingredients – Lipid and carbohydrate sources

Lipids (fats & oils)					Carbohydrates		
Marine			Terrestrial				
Fish	Crude fish oil	Herring	Plant	Rapeseed	Plant	Wheat	Whole wheat
		Anchovy		Soya			Wheat flour
		Capelin		Linseed			Wheat by-products
		Menhaden		Palm		Maize	Maize starch
		Sand eel		Olive		Pulses	Pea starch
Algae		Refined oils		Corn		Potato	Potato starch
Others	Krill	Ax-rich oils	Animal	Poultry fat			
				Lard			

Fat sources

- **Fish oil**
  - Main source at present
  - Future use is potentially restricted – same reasons as fish meal
- **Vegetable oils**
  - Massive potential source
- **Animal by-products**
  - Beef tallow, lard, poultry fat
- **Biotechnological products**
  - Possible to tailor make oils
  - Niche products for marine larval feeds (price)

Development of Fish Feeds

Raw fish

↓

Moist

↓

Pelleted

↓

Extruded

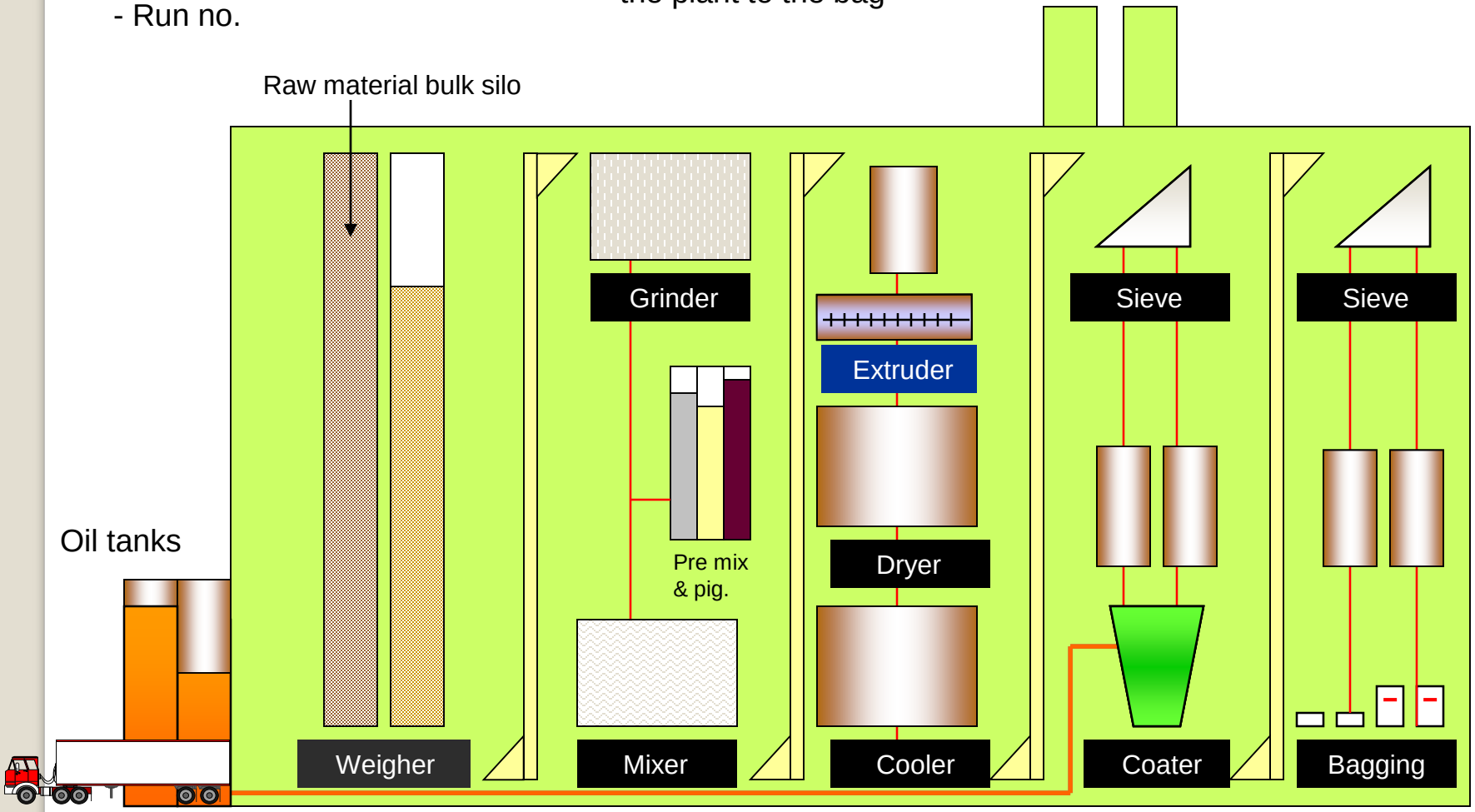
Benefits of Extruded Feed

- Less dust and broken pellets
- More water stable, less leaching
- Slower sinking
- Wider range of diet composition
- Higher nutrient & energy density
- Digestible starches
- Reduces anti-nutritional factors
- Lower FCR
- Easier top-dressing (more specialized feeds)
- Sterilization by extrusion
- Less pollution

Fish feed production today

- Product code
- Formulation
- Run no.

Follows the mixture through the plant to the bag



Raw material intake

Lab: Raw materials database
Supplier, tonnage, test results

- Bag number

Fish Feed Product Summ

	DIET	Mash	# 0	#1	#2	1.2	1.5	2.0	2.5	3.0	4.0	6.0	9.0
STARTER FEED	**BioVita Starter** (Extruded Crumbles)	53 / 18	53 / 18	52 / 20	52 / 20								
	BioClark's Starter (Extruded Crumbles)		53 / 18	52 / 20	52 / 20								
	MicroVita (Micro-Pellets)	MicroVita 0.6 & 0.9 mm are micro-pellets equivalent to #1 & #2 crumbles.		0.6 mm: 52 / 20	0.9 mm: 52 / 20								
FRY FEED	**BioVita Fry**					50 / 22	50 / 22	50 / 22	50 / 22	50 / 22			
	Bio-Olympic Fry					50 / 20	50 / 20	50 / 20	50 / 20	50 / 20			
	BioClark's Fry					47 / 18	47 / 18	47 / 18	47 / 18	47 / 18			
TROUT FEED	**BioTrout**						47 / 24	47 / 24		47 / 24	45 / 24	43 / 24	40 / 24
BROOD FEED	**BioBrood**										48 / 20	48 / 20	48 / 20
LTY FEED *	**BioPro 2** * NEW (Health Promoting Diet)		53 / 18	52 / 20	52 / 20	50 / 22	50 / 22	50 / 22	50 / 22	50 / 22			
	BioSupreme * (Transfer Diet)	★ 1.2 & 1.5 mm BioSupreme are available seasonally. Please place orders prior to January 15 for spring deliveries.				★ *Seasonal* 50 / 20	★ *Seasonal* 50 / 20	50 / 20	50 / 20	50 / 20			

Fat

- The primary function of fat is to provide energy for use by the body.
- Primary sources are fish and vegetable oils
- Insulates and cushions organs.
- The most concentrated energy food source, more than double that of protein or carbohydrate.
- Fish that do not get enough energy from fat will use protein and carbohydrate to form fat.
- Fat aids in the absorption of fat soluble vitamins.
- Fat content in the diet of salmon should be 5 – 20%.

What are carbohydrates used for?

Carbohydrates

- Carbohydrates are a source of energy in the form of glucose (sugar) and glycogen
- Range in diet from 9 – 12% and do not provide a major source of energy.
- Excess carbs go to fat eventually

Fatty liver

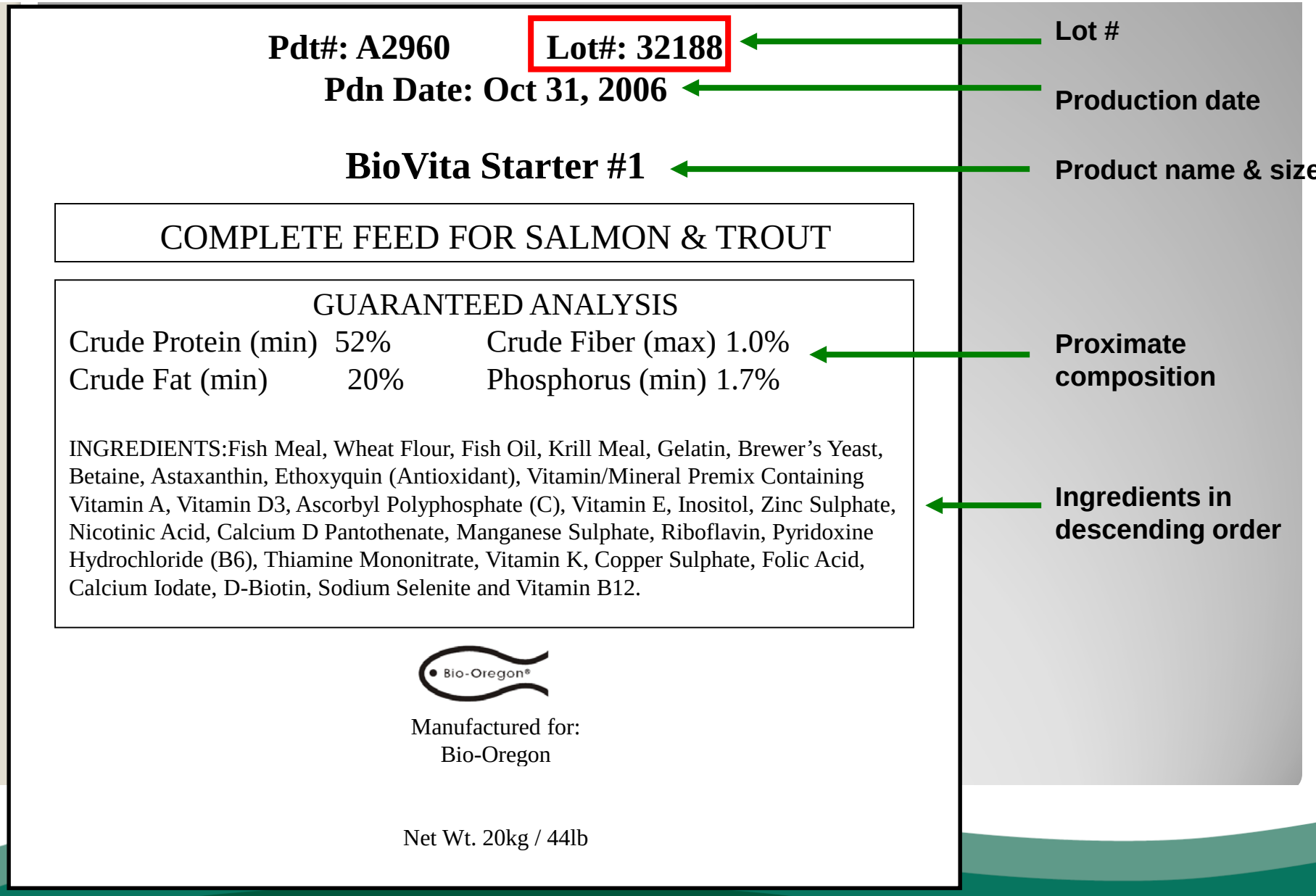
Normal liver

How about minerals? Which ones?

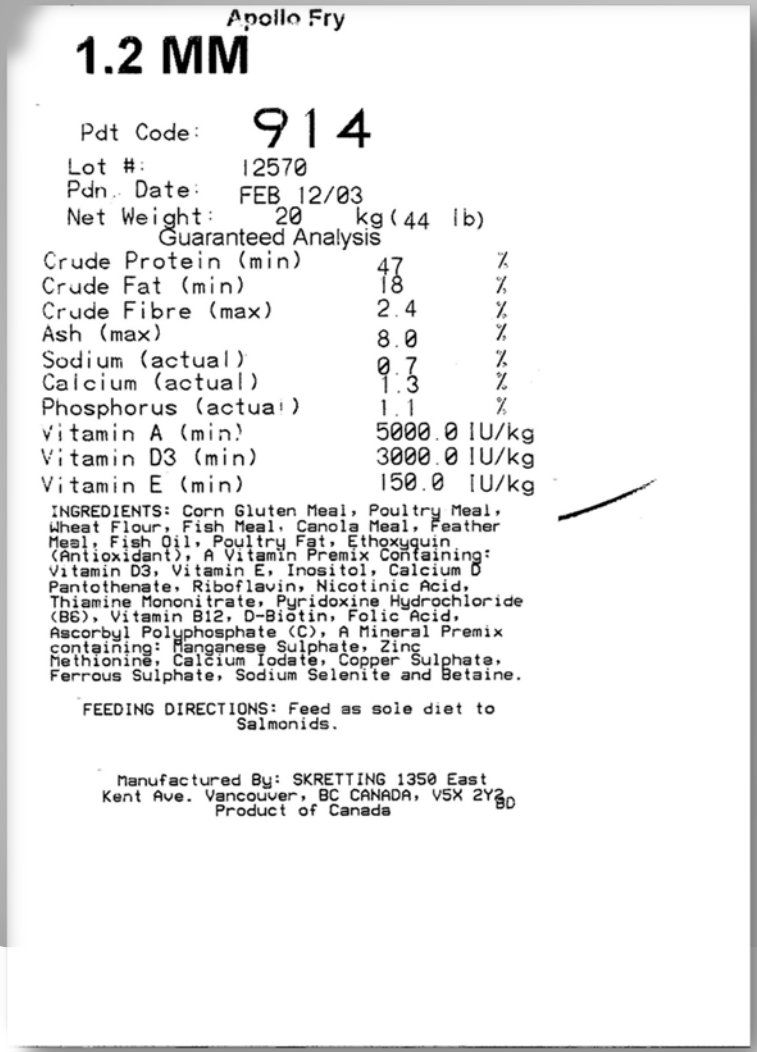
Minerals & Vitamins

- Two main minerals important to fish are Calcium and Phosphorous.
- Iron is considered an essential mineral
- Minerals are important for:
  - Bone formation
  - Growth
  - Osmo-regulation
- Vitamins – essential for overall bodily function
- Commercial feeds provide overall good nutrition

Clear labeling - if it's in the feed it's on the label



Feed Labels – Important to read



Apollo Fry

1.2 MM

Pdt Code: 914
Lot #: 12570
Pdn. Date: FEB 12/03
Net Weight: 20 kg (44 lb)

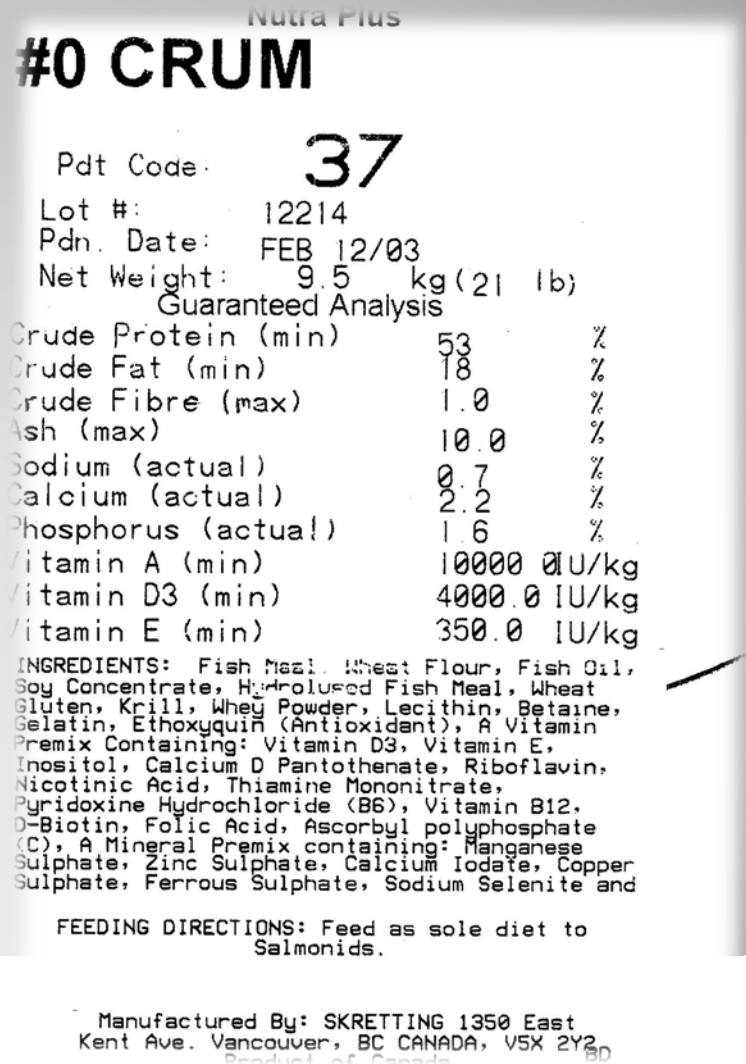
Guaranteed Analysis

Crude Protein (min)	47	%
Crude Fat (min)	18	%
Crude Fibre (max)	2.4	%
Ash (max)	8.0	%
Sodium (actual)	0.7	%
Calcium (actual)	1.3	%
Phosphorus (actual)	1.1	%
Vitamin A (min)	5000.0	IU/kg
Vitamin D3 (min)	3000.0	IU/kg
Vitamin E (min)	150.0	IU/kg

INGREDIENTS: Corn Gluten Meal, Poultry Meal, Wheat Flour, Fish Meal, Canola Meal, Feather Meal, Fish Oil, Poultry Fat, Ethoxyquin (Antioxidant), A Vitamin Premix Containing: Vitamin D3, Vitamin E, Inositol, Calcium D Pantothenate, Riboflavin, Nicotinic Acid, Thiamine Mononitrate, Pyridoxine Hydrochloride (B6), Vitamin B12, D-Biotin, Folic Acid, Ascorbyl Polyphosphate (C), A Mineral Premix containing: Manganese Sulphate, Zinc Methionine, Calcium Iodate, Copper Sulphate, Ferrous Sulphate, Sodium Selenite and Betaine.

FEEDING DIRECTIONS: Feed as sole diet to Salmonids.

Manufactured By: SKRETTING 1350 East Kent Ave. Vancouver, BC CANADA, V5X 2Y2 BD
Product of Canada



Nutra Plus

#0 CRUM

Pdt Code: 37
Lot #: 12214
Pdn. Date: FEB 12/03
Net Weight: 9.5 kg (21 lb)

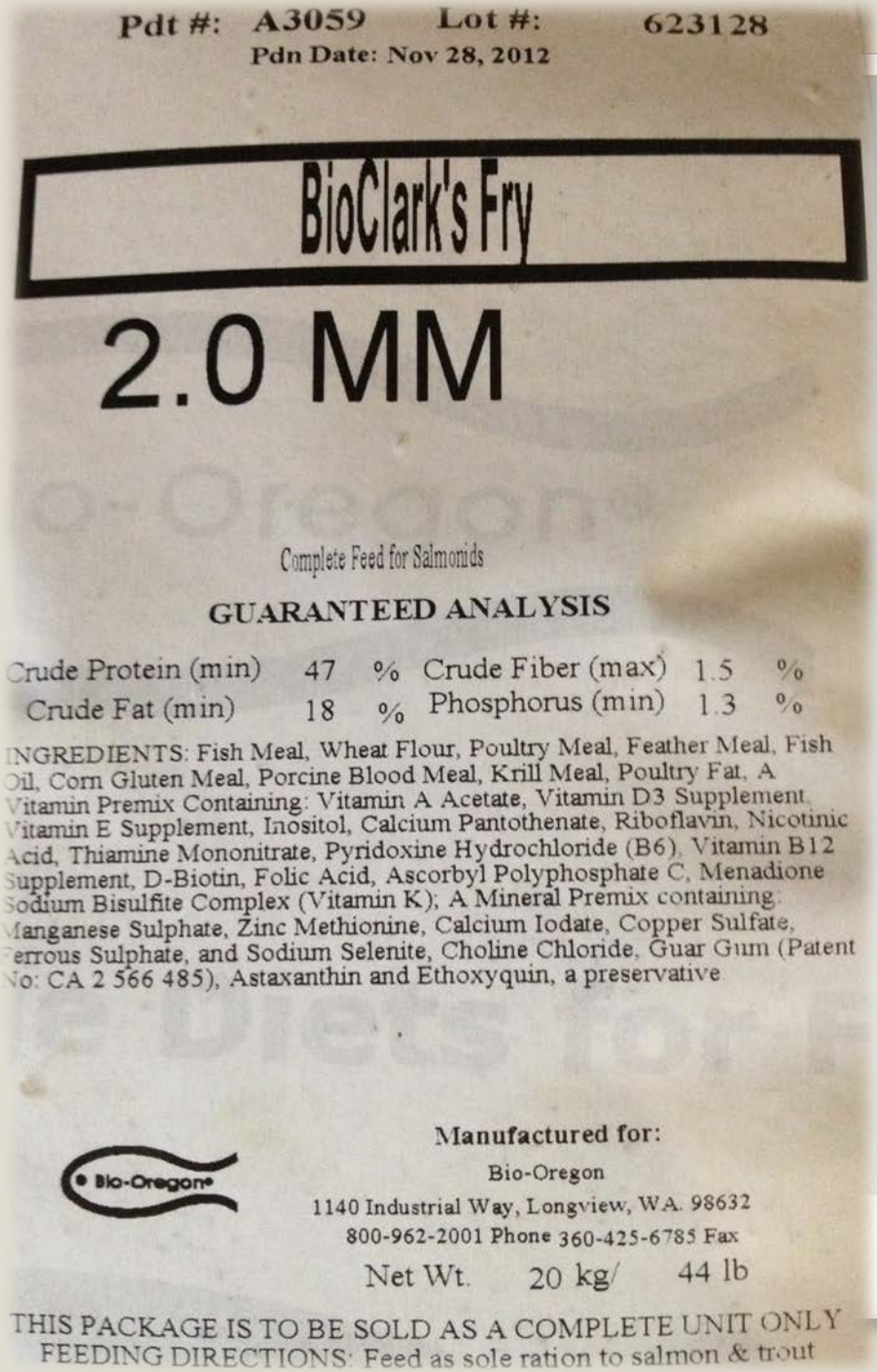
Guaranteed Analysis

Crude Protein (min)	53	%
Crude Fat (min)	18	%
Crude Fibre (max)	1.0	%
Ash (max)	10.0	%
Sodium (actual)	0.7	%
Calcium (actual)	2.2	%
Phosphorus (actual)	1.6	%
Vitamin A (min)	10000.0	IU/kg
Vitamin D3 (min)	4000.0	IU/kg
Vitamin E (min)	350.0	IU/kg

INGREDIENTS: Fish Meal, Wheat Flour, Fish Oil, Soy Concentrate, Hydrolused Fish Meal, Wheat Gluten, Krill, Whey Powder, Lecithin, Betaine, Gelatin, Ethoxyquin (Antioxidant), A Vitamin Premix Containing: Vitamin D3, Vitamin E, Inositol, Calcium D Pantothenate, Riboflavin, Nicotinic Acid, Thiamine Mononitrate, Pyridoxine Hydrochloride (B6), Vitamin B12, D-Biotin, Folic Acid, Ascorbyl polyphosphate (C), A Mineral Premix containing: Manganese Sulphate, Zinc Sulphate, Calcium Iodate, Copper Sulphate, Ferrous Sulphate, Sodium Selenite and

FEEDING DIRECTIONS: Feed as sole diet to Salmonids.

Manufactured By: SKRETTING 1350 East Kent Ave. Vancouver, BC CANADA, V5X 2Y2 BD



Pdt #: A3059 Lot #: 623128
Pdn Date: Nov 28, 2012

BioClark's Fry

2.0 MM

Complete Feed for Salmonids

GUARANTEED ANALYSIS

Crude Protein (min)	47	%	Crude Fiber (max)	1.5	%
Crude Fat (min)	18	%	Phosphorus (min)	1.3	%

INGREDIENTS: Fish Meal, Wheat Flour, Poultry Meal, Feather Meal, Fish Oil, Corn Gluten Meal, Porcine Blood Meal, Krill Meal, Poultry Fat, A Vitamin Premix Containing: Vitamin A Acetate, Vitamin D3 Supplement, Vitamin E Supplement, Inositol, Calcium Pantothenate, Riboflavin, Nicotinic Acid, Thiamine Mononitrate, Pyridoxine Hydrochloride (B6), Vitamin B12 Supplement, D-Biotin, Folic Acid, Ascorbyl Polyphosphate C, Menadione Sodium Bisulfite Complex (Vitamin K); A Mineral Premix containing: Manganese Sulphate, Zinc Methionine, Calcium Iodate, Copper Sulfate, Ferrous Sulphate, and Sodium Selenite, Choline Chloride, Guar Gum (Patent No: CA 2 566 485), Astaxanthin and Ethoxyquin, a preservative

Manufactured for:
Bio-Oregon
1140 Industrial Way, Longview, WA. 98632
800-962-2001 Phone 360-425-6785 Fax

Net Wt. 20 kg/ 44 lb

THIS PACKAGE IS TO BE SOLD AS A COMPLETE UNIT ONLY
FEEDING DIRECTIONS: Feed as sole ration to salmon & trout

Modern Feeds

- There are essentially two types of feed manufactured today for Pacific Salmon
  - Dry
  - Semi-Moist – a thing of the past!
- Dry feeds usually have a moisture content of 8-10% and are the most commonly used.
  - They are convenient to store, freezing is not required and have a long shelf life.
  - Shelf life varies between diet and moisture content but generally 6 months is easily attained with all except high moisture content feeds .
- Semi-Moist will be as high as 15-20% yet will not require freezing for storage (up to 90 days).
- Truly moist feeds are not commonly used in Pacific salmon culture, they need to be frozen – a thing of the past for Pacific Salmon.

The Players -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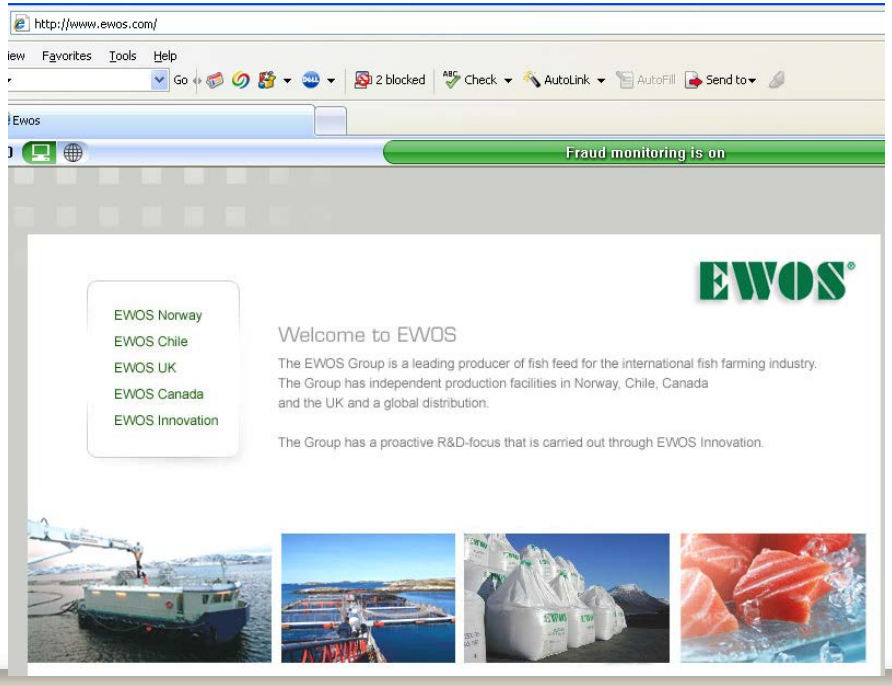
Feed Catalogue
A copy of the Skretting Canada Feed Catalogue is attached as a pdf file for downloading.
Please click on the picture.
Outstanding nutrition and services from Skretting
Bio-Oregon®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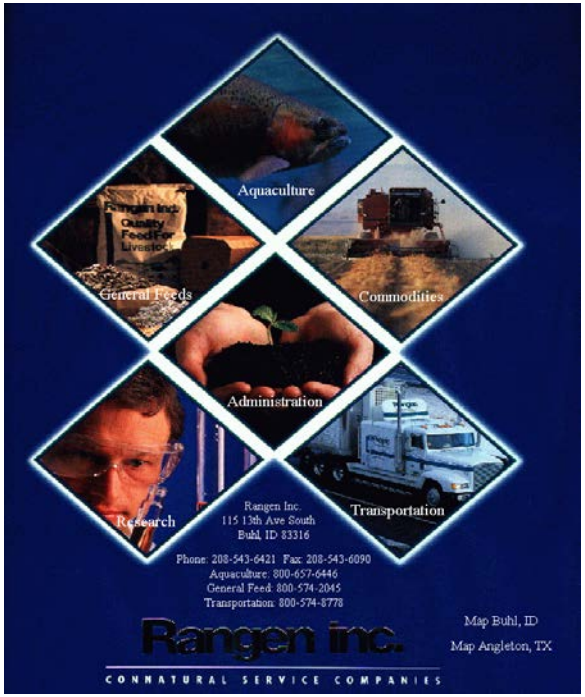
EWOS Innovation
Welcome to EWOS
The EWOS Group is a leading producer of fish feed for the international fish farming industry.
The Group has independent production facilities in Norway, Chile, Canada
and the UK and a global distribution.
The Group has a proactive R&D-focus that is carried out through EWOS Innovation.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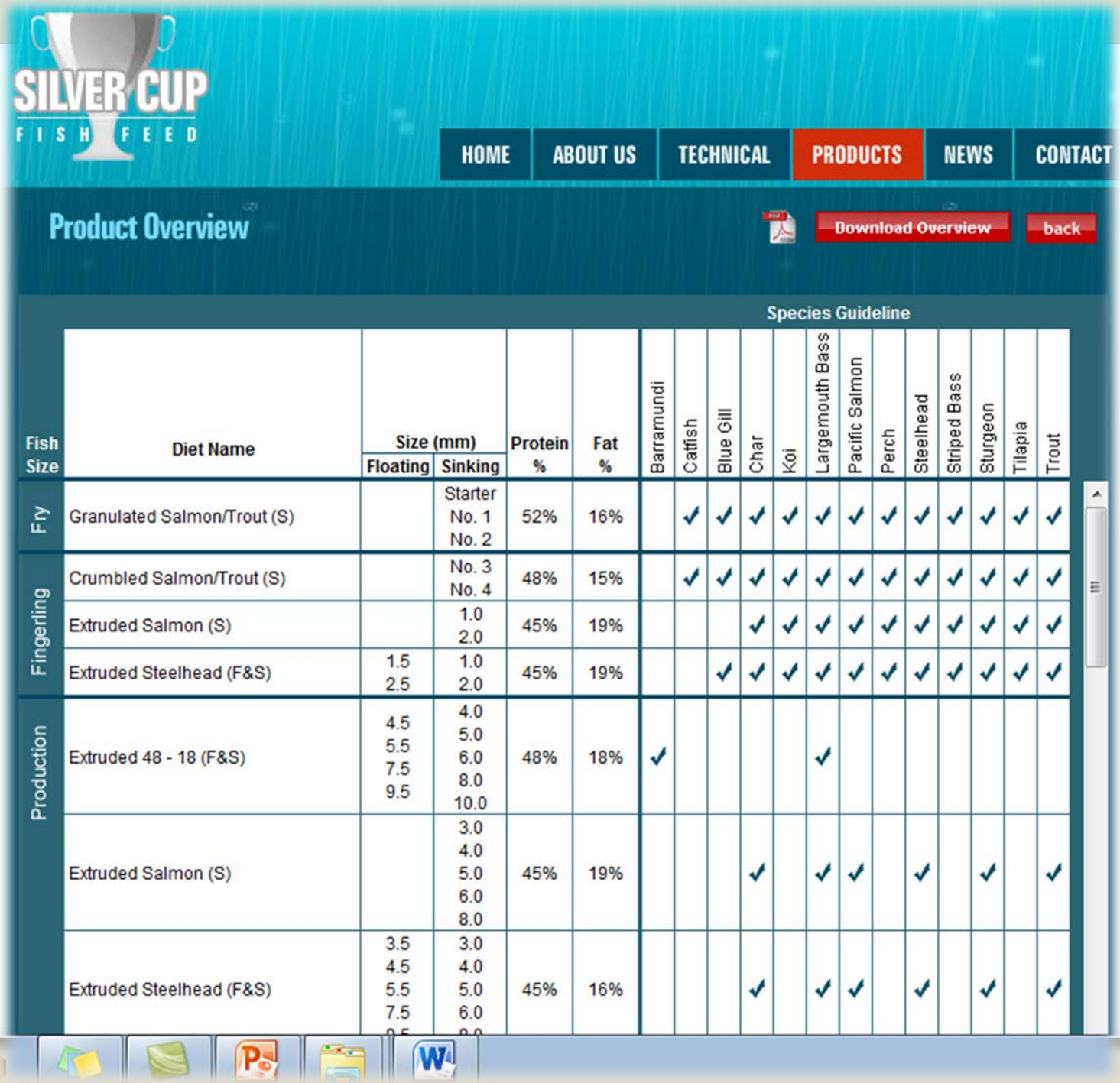


Fish Size	Diet Name	Size (mm) Floating	Size (mm) Sinking	Protein %	Fat %	Species Guideline: Barramundi	Catfish	Blue Gill	Char	Koi	Largemouth Bass	Pacific Salmon	Perch	Steelhead	Striped Bass	Sturgeon	Tilapia	Trout
Fry	Granulated Salmon/Trout (S)		Starter No. 1 No. 2	52%	16%		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fingerling	Crumbled Salmon/Trout (S)		No. 3 No. 4	48%	15%		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Extruded Salmon (S)		1.0 2.0	45%	19%				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Extruded Steelhead (F&S)	1.5 2.5	1.0 2.0	45%	19%			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Production	Extruded 48 - 18 (F&S)	4.5 5.5 7.5 9.5	4.0 5.0 6.0 8.0 10.0	48%	18%	✓					✓							
	Extruded Salmon (S)		3.0 4.0 5.0 6.0 8.0	45%	19%				✓		✓	✓		✓		✓		✓
	Extruded Steelhead (F&S)	3.5 4.5 5.5 7.5	3.0 4.0 5.0 6.0	45%	16%				✓		✓	✓		✓		✓		✓

Updated Feb 2011

BioVita Starter

A Premium Starter Feed for Freshwater Fishery Applications

BioVita Starter is a premium all fish meal, all fish oil, extruded dry fish feed for rearing fry, fingerling, and juvenile salmon and trout. The primary source of protein in this feed is premium fishmeal. It is supplemented with marine fish oil while vitamins, minerals and astaxanthin are incorporated at optimal levels to help assure healthy fish. Beta-glucans are also included to stimulate the immune system and counter-act stress while palatability is enhanced with natural flavors.

- Highly digestible all fishmeal and fish oil diet promotes early growth and low FCR and excellent water quality
- Natural palatability enhancers and prime fishmeals ensure active feeding
- #0 floats well to train first feeders, sizes #1 and #2 sink progressively faster
- Optimal particle size distribution providing overlap between sizes minimizes pin-heading
- BioVita contains beta-glucans and a high level of vitamins to stimulate the immune system and ensure a healthy start

Composition

								FISH SIZE	
Feed Size	Particle Size (mm)	Protein Min.	Oil Min.	Moisture Max.	Fiber Max.	Ash Max.	DE MJ/kg	Grams	# Fish/LB
Mash	0.25-0.4	53%	18%	8.5%	1.0%	12%	18.9	< 0.15	> 3000
#0	0.3-0.6	53%	18%	8.5%	1.0%	12%	18.9	0.15 – 0.8	3000-570
#1	0.4-1.0	52%	20%	8.5%	1.0%	12%	19.3	0.8 – 1.5	570 - 300
#2	0.8-1.4	52%	20%	8.5%	1.0%	12%	19.3	1.5 – 3.0	300 - 150

BioClark's Starter

A Sustainable Starter Feed for Enhancement Applications

Bio-Oregon continues the Clark legacy with the introduction of a new highly palatable starter diet, which combines traditional dietary values with an increasing requirement for sustainable fish feeds. Natural palatability enhancers, high quality prime fish meals and fish oils ensure an active feed response while an enhanced vitamin pack helps to get fish off to a healthy start. Bio-Oregon has carried out extensive research work on alternative raw materials and only the most tried and tested have been incorporated into BioClark's Starter. BioClark's Starter is ideal as a sustainable starter feed for all enhancement hatcheries and is formulated for salmonids to include Pacific Salmon, Steelhead and Trout.

- Natural palatability enhancers ensure an active first feed response
- Highly digestible premium fish meals and fish oil promote increased feed intake and growth
- Select use of alternative raw materials provides improved raw material and price stability
- BioClark's Starter contains beta-glucans and a high level of vitamins to stimulate the immune system and ensure a healthy start
- Free flowing crumbles with optimal particle size distribution and sinking profile

Composition

								FISH SIZE	
Feed Size	Particle Size (mm)	Protein Min.	Oil Min.	Moisture Max.	Fiber Max.	Ash Max.	DE MJ/kg	Grams	# Fish/LB
#0	0.3 - 0.6	53%	18%	8.5%	1%	12%	18.8	0.15 - 0.8	3000-57
#1	0.4 - 1.0	52%	20%	8.5%	1%	12%	19.2	0.8 - 1.5	570 - 30
#2	0.8 - 1.4	52%	20%	8.5%	1%	12%	19.2	1.5 - 3.0	300 - 15

STARTER FEED FOR ENHANCEMENT HATCHERIES

EWOS enhancement starter feeds (micro and natura) are excellent feeds that allow salmonid hatchery managers to achieve optimal results, according to local production strategy and environmental conditions. The EWOS starter diets cover early stages of the freshwater production cycle for all salmonids. These diets provide an excellent start for first feeding fish.

Key features of **EWOS micro crumble feeds** are:

- Suitable for all pacific salmon and trout species
- Balanced amino acid profile for optimum protein utilisation
- Uses only premium marine ingredients and LT fish meal, to maximize feed digestibility
- Slow sinking crumbles with high water stability (less effort required to keep tanks clean)
- Uniform size distribution - Available in sizes #0, #1, #2 crumbles and 1.2 mm pellets
- Carefully considered feed size progression ensures smooth transition between products
- Easy to integrate with EWOS transfer feeds
- Nucleotides are added as a standard in all micro feeds

Key features of **EWOS natura crumble feeds** are:

- Formulated specifically for pink and chum salmon
- Balanced amino acid profile for optimum protein utilisation by target species
- Uses quality fish meals and oils as well as other suitable alternative ingredients
- Slow sinking crumbles with high water stability (less effort required to keep tanks clean)
- Uniform size distribution - Available in sizes #0, #1, #2 crumbles and 1.2 mm pellets
- Carefully considered feed size progression ensures smooth transition between products
- Nucleotides are added as a standard in all natura crumble feeds

GROWER FEEDS FOR FRESH WATER

EWOS fresh water grower diets (pacific, calform and vita) have been specifically formulated to address the nutritional requirements of fresh water fish. When used after the appropriate EWOS micro or transfer diets for juveniles, EWOS grower feeds provide dynamic options in feed selection to achieve the program targets set for the hatchery.

Key features of **EWOS pacific** are:

• Especially suited for pacific salmonids and trout (steelhead)
• Premium ingredients and a balanced protein: energy ratio matches the biological and nutritional requirements ensuring excellent feed conversion and water quality
• High protein and moderate fat levels along with premium fish meal ensures good growth and excellent body conformation
• Available as a sinking or floating feed

Key features of **EWOS calform** are:

• calform delivers a slow-sinking/floating diet suitable for trout (steelhead)
• High quality fish meal and highly digestible ingredients ensures good feed conversion and excellent water quality
• The calform formulation is based on extensive fresh water and commercial culture experience.
• Expanded pellet technology results in a slow sinking and floating pellet. This allows the fish culturist to monitor feeding response and to minimize waste
• Floatation increases with pellet size.

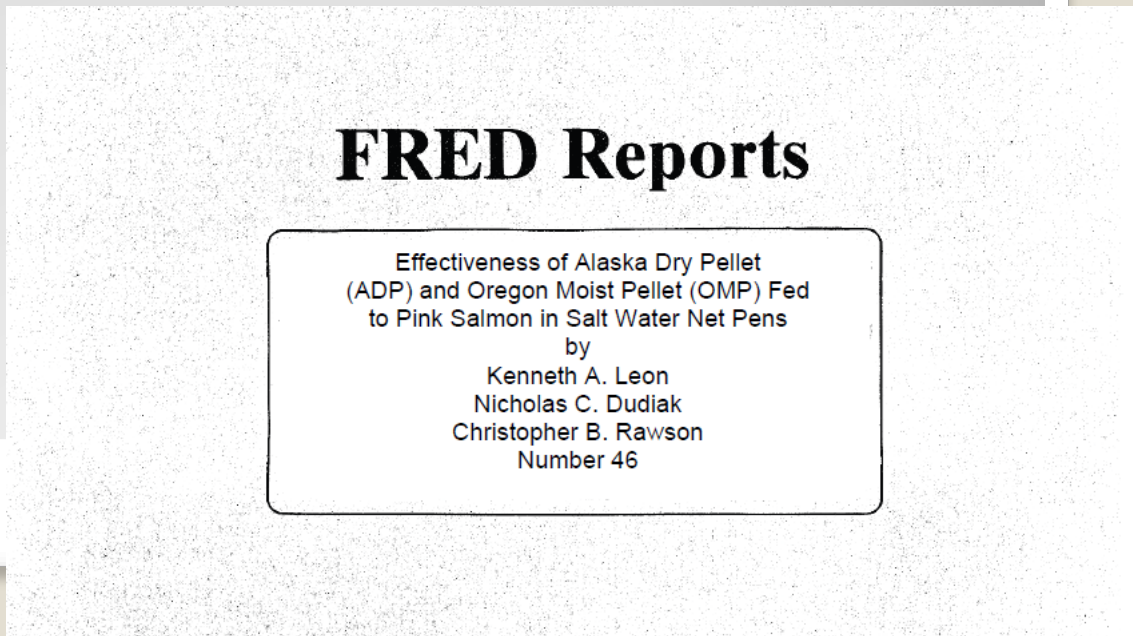
Key features of **EWOS vita** are:

• Especially suited for bass and sturgeon
• Contains a balanced protein: energy ratio to match biological and nutritional requirements
• Provides moderately high protein, low fat levels and a moderately high level of fish meal substitution

All fresh water grower feeds are available in sizes 4, 5, 7, and 9 mm pellets.

Moist Feeds – a thing of the past

- Up to 35% water – do we need to ship water to AK?
- The more “fluff” in food, the less digestible nutrition
- Had to keep frozen



- Feeds are formulated to:
  - Be nutritionally complete
  - Provide optimum growth
  - Produce healthy fish fit to compete in the wild
  - Minimize unusable fines that degrade water quality
  - Minimize excess nutrients released to the environment
  - Stable during storage to prevent rancidity from oxidation of oils in the feed.
  - To sink at varying rates of speed (or float!)

BioDry 1000 Low Phosphorus

Description

BioDry 1000LP (Low Phos
phosphorus & low-pollutio
formulated to reduce the a
discharged into the aquati
feed contains less than 1%
is popular with certain stat
hatcheries where phospho
Phosphorus) is also ideal
concern.

Feed Size

1.2 mm Pellet

1.5 mm Pellet

STARTER FEED FOR ENHANCEMENT HATCHERIES

EWOS enhancement starter feeds (micro and natura) are excellent feeds that allow salmonid hatchery managers to achieve optimal results, according to local production strategy and environmental conditions. The EWOS starter diets cover early stages of the freshwater production cycle for all salmonids. These diets provide an excellent start for first feeding fish.

Key features of **EWOS micro crumble feeds** are:

- Suitable for all pacific salmon and trout species
- Balanced amino acid profile for optimum protein utilisation
- Uses only premium marine ingredients and LT fish meal, to maximize feed digestibility
- Slow sinking crumbles with high water stability (less effort required to keep tanks clean)
- Uniform size distribution - Available in sizes #0, #1, #2 crumbles and 1.2 mm pellets
- Carefully considered feed size progression ensures smooth transition between products
- Easy to integrate with EWOS transfer feeds
- Nucleotides are added as a standard in all micro feeds

Key features of **EWOS natura crumble feeds** are:

- Formulated specifically for pink and chum salmon
- Balanced amino acid profile for optimum protein utilisation by target species
- Uses quality fish meals and oils as well as other suitable alternative ingredients
- Slow sinking crumbles with high water stability (less effort required to keep tanks clean)
- Uniform size distribution - Available in sizes #0, #1, #2 crumbles and 1.2 mm pellets
- Carefully considered feed size progression ensures smooth transition between products
- Nucleotides are added as a standard in all natura crumble feeds

Feed Storage and Handling

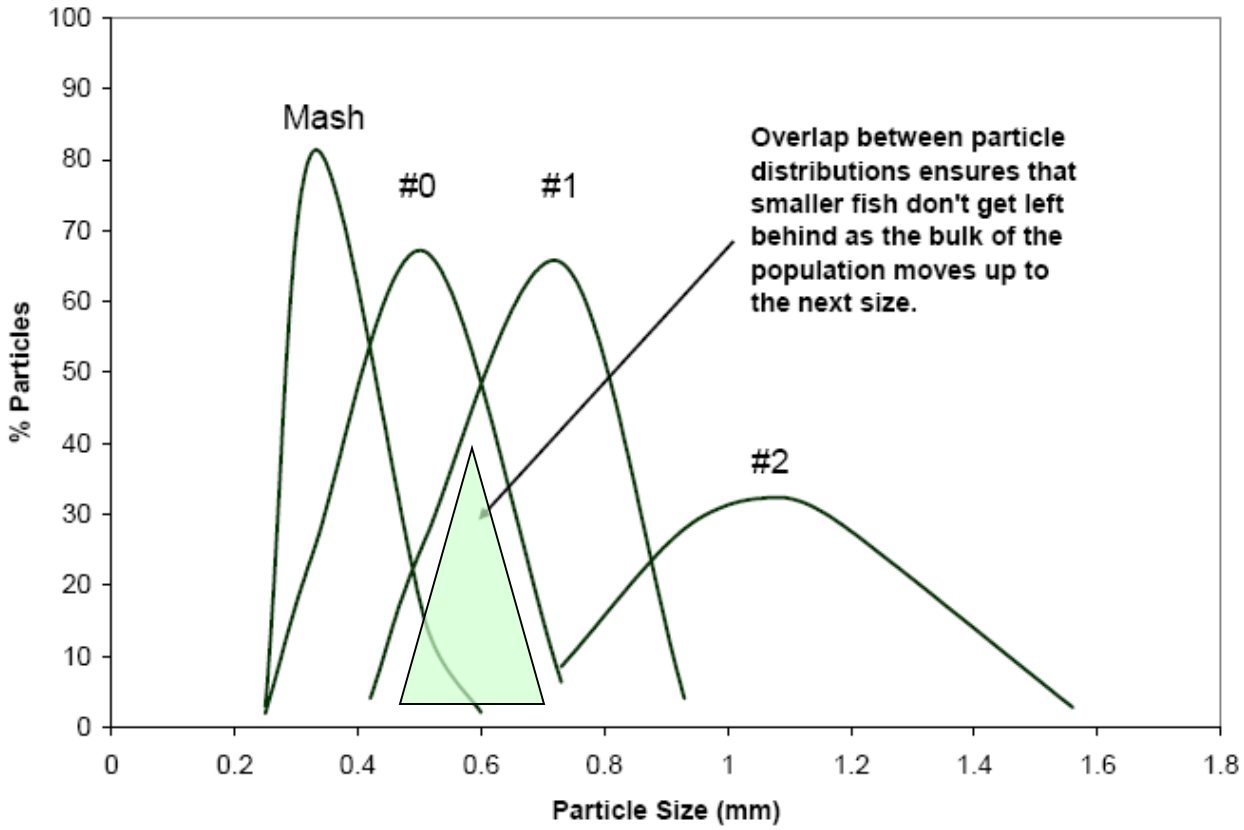
- Minimize handling
- Cool, dry, up off the ground – mold!
- Protect from rain, moisture during the day
- Do not exceed the manufacturers recommended shelf life (check labels!)
- In the old days: moist and semi-moist diets had limited shelf life

Feed Sizes

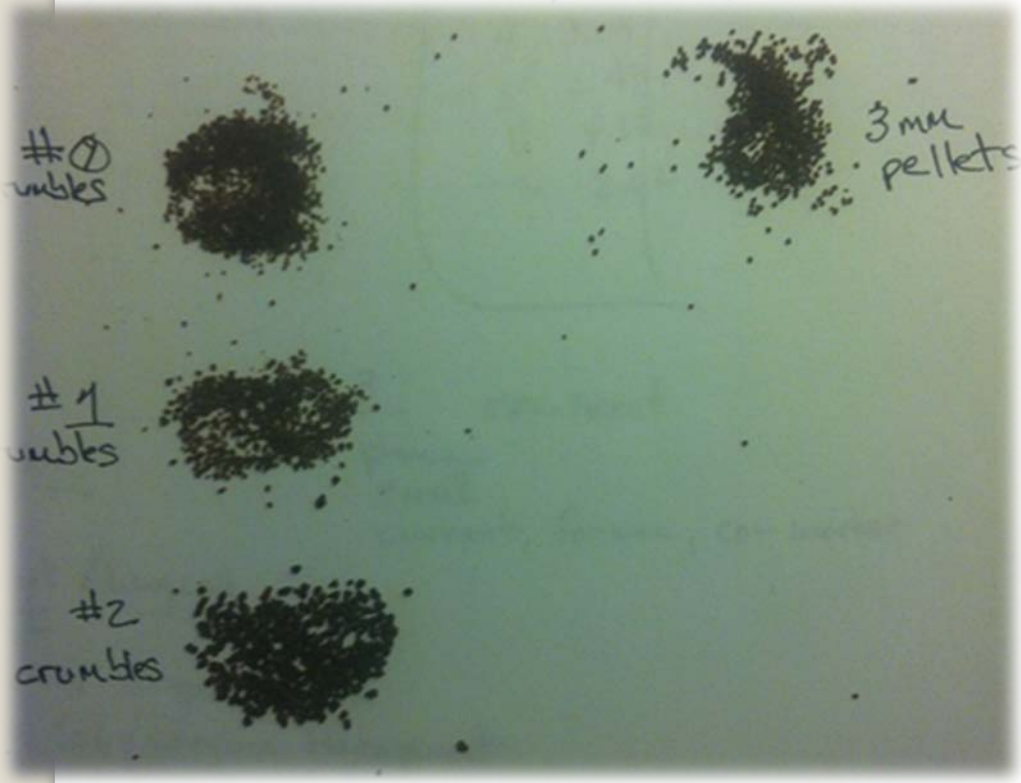
- As fish increase in size, pellet size increases.
- Pellet size can ace out smaller fish
- Follow mfgr guidelines but observation by fish culturists is the key
- Starter feeds or crumbles are crushed and sifted
- Starter feeds are usually fed to fish 1.0 gram or smaller.

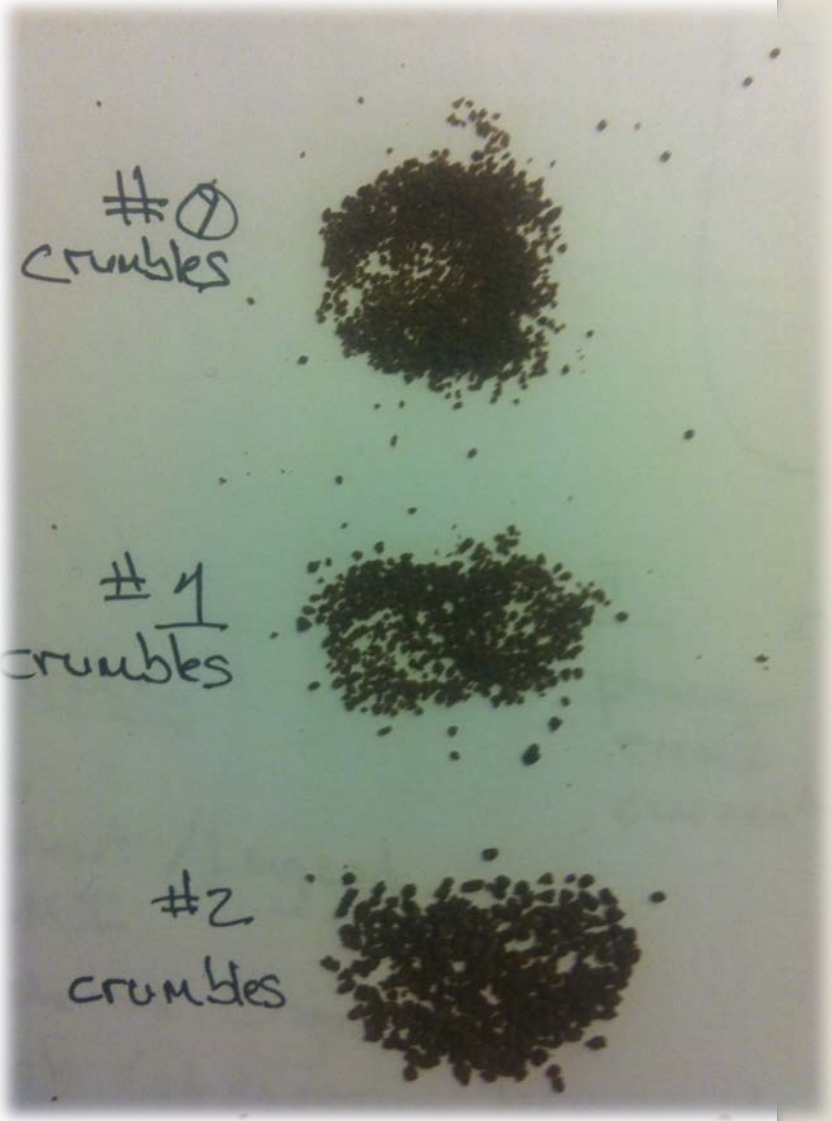
Bio-Oregon Starter Feed

- Sizing and density are carefully controlled to promote maximum feed intake.
- Each particle size is designed to have an overlap in distribution



Crumbles – a range of sizes





- Watch for
  - Feed sizing
  - Feed types – there are many!
  - Feed guidelines

Tour of feed brochures – watch the YouTube videos – they're awesome!!

Feeding Methods

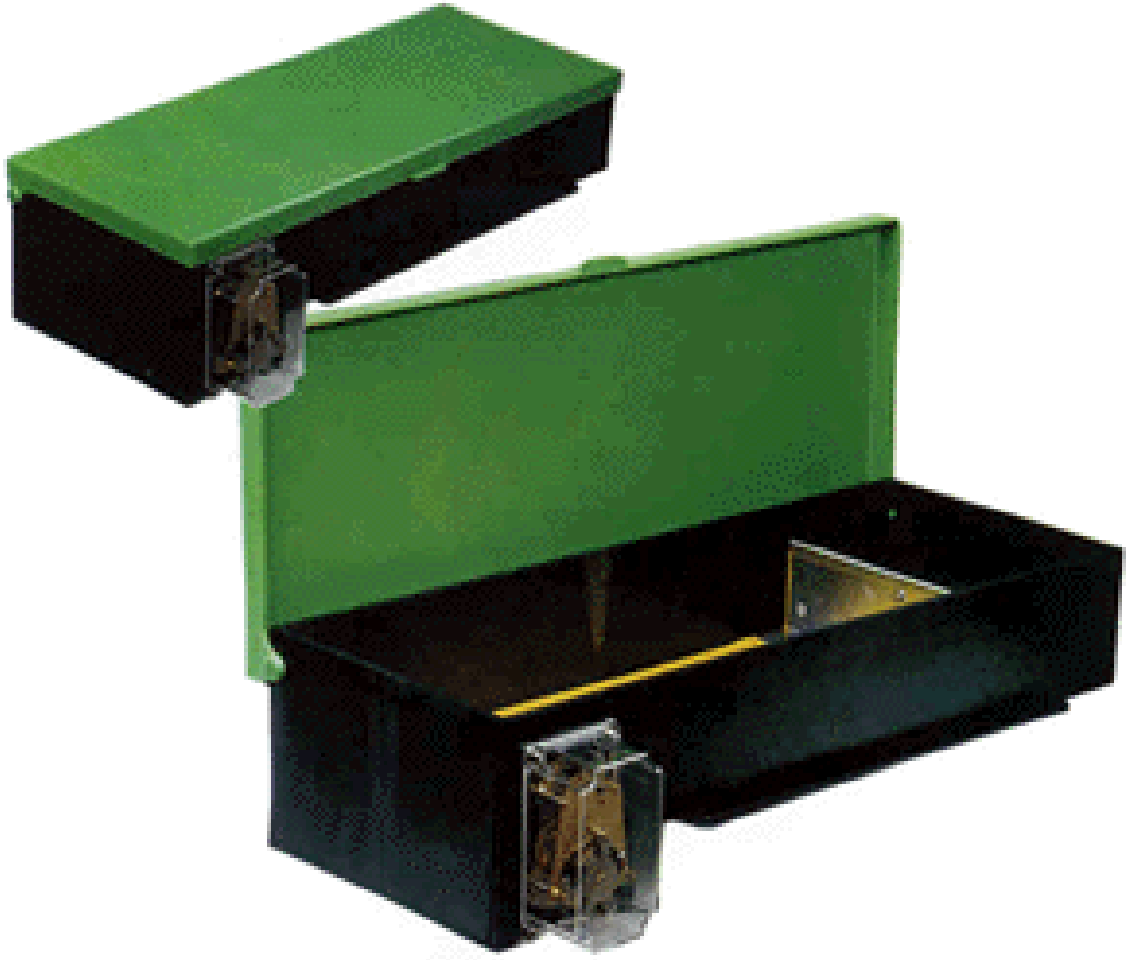
- Hand
  - No equipment required
  - Easy to observe response
  - Little waste if done properly
    - Labor intensive
    - Workday only
- Auto
  - Saves labor, unmanned
  - Feed often and longer
  - Can be used to supplement hand feeding
    - No observed response
    - Can be wasteful if not properly managed

- Demand
  - Little wasted food
  - Longer feeding day
  - Can be used to supplement hand feeding
  - Easier on oxygen demand and does not disturb fish
    - Promotes size variation in the raceway
    - No observed response

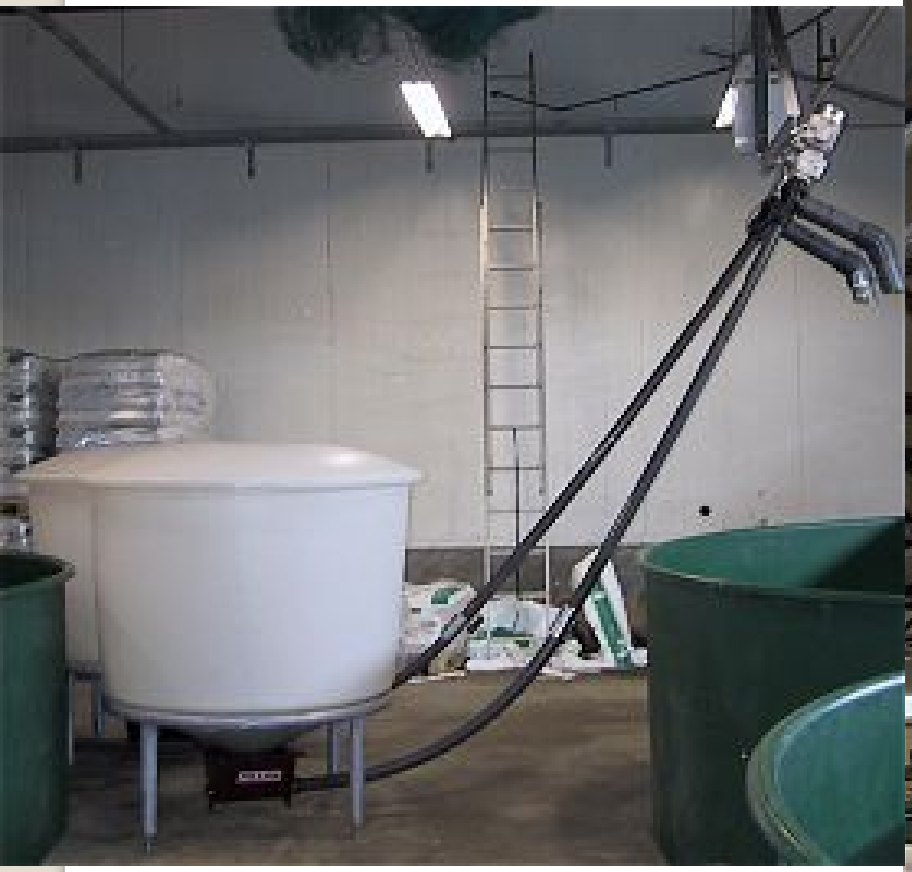

FEEDERS
BY Sweeney

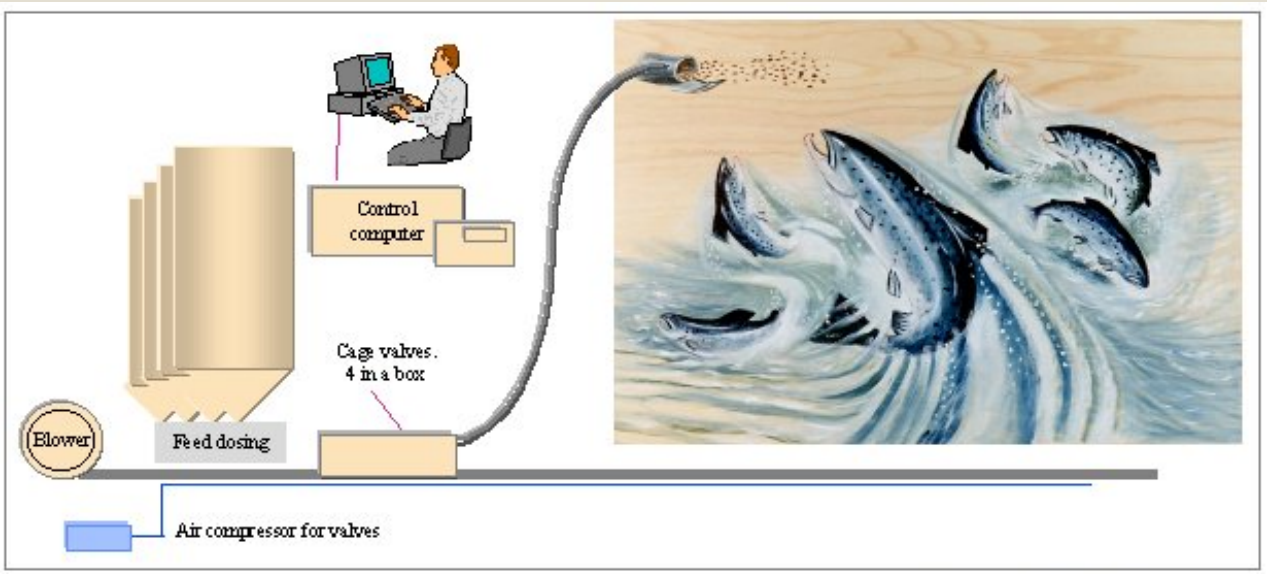

Sweeney


Sweeney



http://www.youtube.com/watch?v=BDxNQUYSOhI





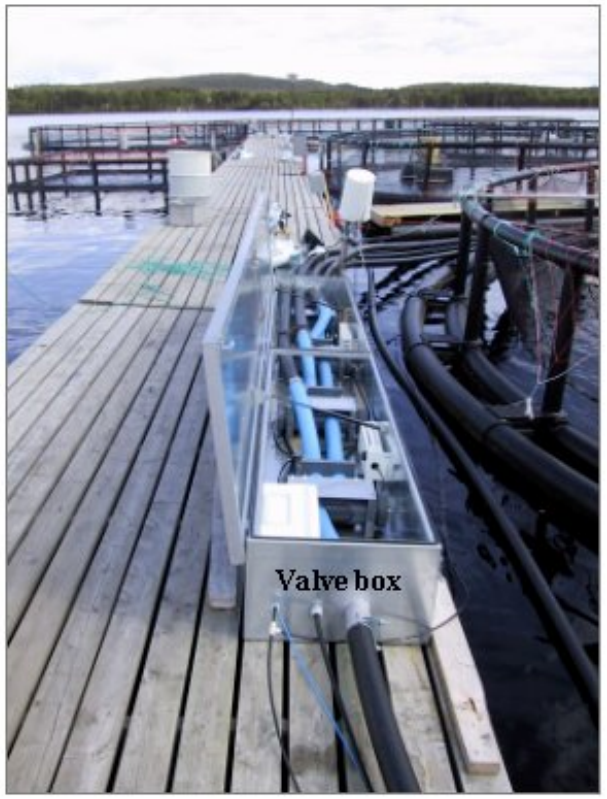
The Arvotec Pipe Feeding System is designed for high capacity feeding at ponds, tanks and cages. The single pipeline system is simple and reliable.

Technical Specifications:

- Standard blower - 5.5 kW, 3 phase
- Up to 4 different feed types
- Max. pipe length - 300 m with std. blower
- 32 cages in each standard system
- Feeding rates up to 4200 kg/12h with standard system

Options:

- Feeding related to temperature and oxygen
- System can be doubled or tripled for large farms
- Sensors for malfunctions and low silo levels
- High capacity dosing units available to increase feeding speed
- High capacity blowers available to enable high feeding rates



gmt

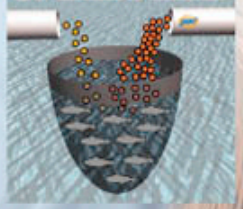
GaelForce Marine Technology

Specialists in
Centralised Feed Systems

Feeders for:

- salmon farms
- trout farms
- seabream/seabass farms
- halibut/turbot farms
- hatcheries

Industrial Design
Unique software with Ethernet network



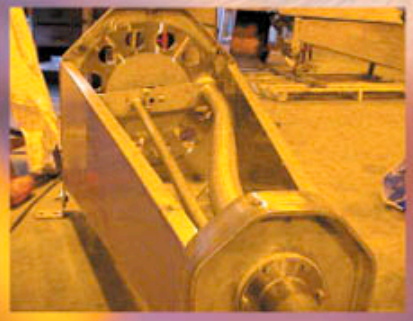
New!

SPEED**FEED** **Automatic speed of feed control**

VARI**FEED** **Variable speed of feed control**

MIX**FEED** **Mix from two silos into one feed pipe**

GMT AS offers a newly developed feed system for all kinds of fish farms. With feeding capacities in a range of 10 KGs to 10 tons per hour, the automatic system can cover most needs in modern fish farming.
The GMT feed system is designed to perform reliably and consistent over many years and is therefore built of industrial components throughout. The software is unique and offers new features that will help you feeding the fish better.

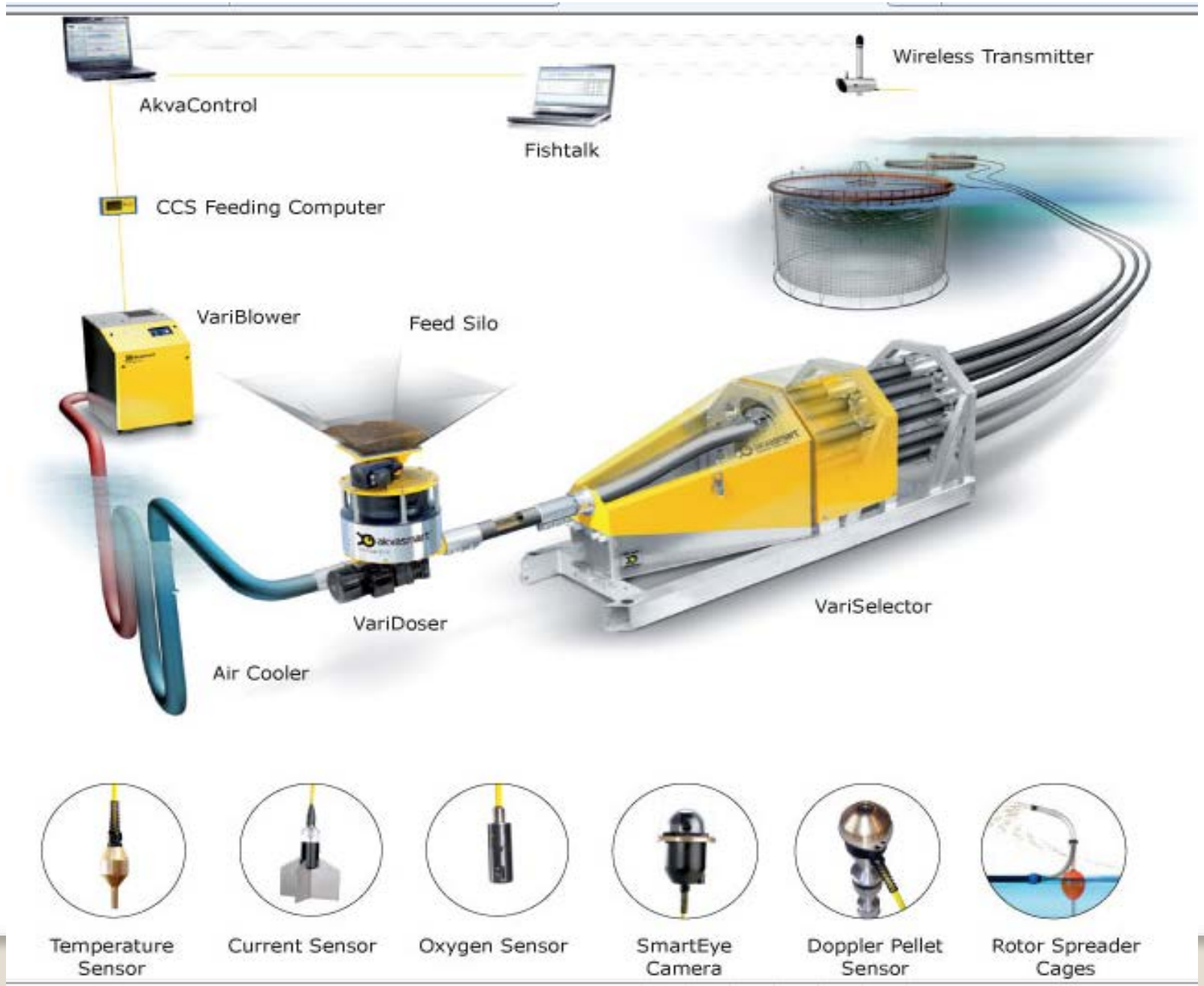


Ask us for a quotation or contact us to discuss your feed system requirements.

KAESER KOMPRESSOREN · MITSUBISHI · SEW EURODRIVE · Telemecanique · LÖNNE

Design: Brandmaker

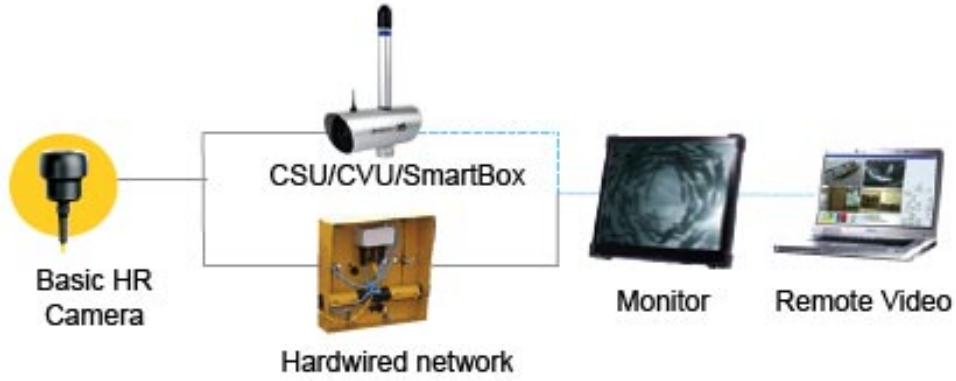
http://www.akvagroup.com/index.cfm?id=202635

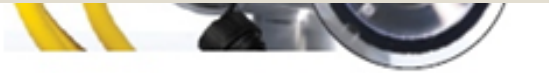


camera is built into the top of the Basic HR housing.

The robust urethane underwater cable includes a waterproof connection plug.

Basic HR Feeding Camera flow chart:





The CSU can easily transmit vital information from up to three cameras or environmental sensors.

Looking straight up towards the bright surface makes it easy to spot uneaten pellets.

A wide range of stationary and waterproof porable monitor control systems are available for the Basic HR cameras.

Feed Rates and Calculations

Feed The Gain!

Coho **240,000 @ 13 gram RV = 150m3**

Previous period sample data DSGR=1.5% FCR=1.5:1

Date	Fish Size gm	Amt to Feed	Feed Size	Temp. C	Date	Fish Size	Amt to Feed	Feed Size	Temp. C
1-Apr	13.0			7.2	23-Apr				7.8
2-Apr				7.2	24-Apr				7.8
3-Apr				7.2	25-Apr				7.8
4-Apr				7.2	26-Apr				11
5-Apr				7.2	27-Apr				11
6-Apr				7.2	28-Apr				11
7-Apr				7.2	29-Apr				11
8-Apr				7.2	30-Apr				11
9-Apr				7.2	1-May				12
10-Apr				7.2	2-May				12
11-Apr				7.2	3-May				12
12-Apr				7.2	4-May				12
13-Apr				7.2	5-May				12
14-Apr				7.2	6-May				12
15-Apr				7.2	7-May				12
16-Apr				7.2	8-May				12
17-Apr				7.2	9-May				12
18-Apr				7.8	10-May				13
19-Apr				7.8	11-May				13
20-Apr				7.8	12-May				13
21-Apr				7.8	13-May				13
22-Apr				7.8	14-May				13

Notes - 4/26 transferred to Saltwater Net pen

Calculated amt to based on manufacturers chart plus past experience. Or other parameters.

Feed size - manufacturer recommendation

Feeding Guide [1]

We suggest using this guide to select feed size and calculate daily amounts to feed. Departure from our recommendations may be necessary, but should not be considered until experience indicates results will be satisfactory.

Fish Size		Crumble	Water Temperature							
			F35.6	39.2	42.8	46.4	50.0	53.6	57.2	60.8
Weight (g)	Fish/lb	Size [1] (mm)	C 2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0
1.0-1.4	454-324	1.0	0.5	0.9	1.5	2.1	2.7	3.2	3.8	4.0
1.4-2.4	324-189	1.3	0.5	0.9	1.4	2.0	2.6	3.0	3.6	3.8
2.4-5.0	189-91	1.5	0.4	0.8	1.4	1.9	2.4	2.8	3.4	3.6
5.0-8.5	91-53	2.0	0.4	0.8	1.3	1.8	2.2	2.6	3.2	3.4
8.5-12.5	53-36	2.5	0.4	0.8	1.3	1.6	2.0	2.4	3.0	3.2
12.5-20.0	36-23	3.0	0.3	0.7	1.2	1.5	1.9	2.3	2.9	3.1
20.0-30.0	23-15	3.0	0.3	0.7	1.2	1.4	1.8	2.1	2.7	2.9
30.0-45.0	15-12	4.0	0.3	0.7	1.1	1.4	1.6	2.0	2.5	2.6
45.0-75.0	12-6.5	4.0	0.3	0.7	1.1	1.3	1.5	1.9	2.3	2.4

1 % to feed: kg (lbs)feed per 100 kg (lbs)fish per day.

EWOS Canada Ltd.

Recommended Feeding for Pacific Salmonids
EWOS micro, transfer, smolt, alpha, pacific and vita

Enh - Pacific 02-00

Feeding rates (% biomass / day) for fish size ranges (in grams and fish per pound) as follows															
EWOS Feed			EWOS micro			micro, smolt& pacific	EWOS transfer, smolt, alpha, pacific and vita* (*EWOS vita is not available as a 1.5mm short-cut pellet)								
Feed Size			#0	#1	#2	1.2 mm	1.5 mm short-cut	1.5 mm	2.0 mm			3.0mm			
Min. Fish Weight grams			0	0.2	1.5	3	5	12	25	40	50	80	110	150	200
Minimum fish per pound				*2270*	*302*	*151*	*91*	*38*	*18*	*11*	*9*	*6*	*4*	*3*	*2.5*
Max. Fish Weight grams			0.2	1.5	3	5	12	25	40	50	80	110	150	200	250
Maximum fish per pound			*2270*	*302*	*151*	*91*	*38*	*18*	*11*	*9*	*6*	*4*	*3*	*2.5*	*2*
WATER TEMPERATURE Celsius & Fahrenheit	1 - 2	34-36	1.07	1.03	0.99	0.95	0.79	0.72	0.67	0.64	0.61	0.44	0.25	0.18	0.14
	2 - 3	*36-37*	*1.30*	*1.19*	*1.12*	*1.08*	*1.02*	*0.93*	*0.82*	*0.78*	*0.74*	*0.56*	*0.37*	*0.24*	*0.22*
	3 - 4	37-39	1.70	1.36	1.26	1.25	1.23	1.12	1.00	0.96	0.94	0.72	0.49	0.35	0.29
	4 - 5	*39-41*	*1.85*	*1.49*	*1.38*	*1.34*	*1.32*	*1.26*	*1.14*	*1.11*	*1.09*	*0.89*	*0.62*	*0.43*	*0.36*
	5 - 6	41-43	2.00	1.62	1.51	1.45	1.40	1.35	1.23	1.20	1.19	0.98	0.71	0.52	0.43
	6 - 7	*43-45*	*2.11*	*1.72*	*1.56*	*1.49*	*1.44*	*1.39*	*1.28*	*1.28*	*1.23*	*1.06*	*0.80*	*0.62*	*0.54*
	7 - 8	45-46	2.22	1.86	1.64	1.56	1.51	1.44	1.36	1.33	1.28	1.14	0.95	0.77	0.65
	8 - 9	*46-48*	*2.41*	*2.11*	*1.80*	*1.64*	*1.60*	*1.48*	*1.44*	*1.38*	*1.36*	*1.22*	*1.05*	*0.84*	*0.72*
	9 - 10	48-50	2.61	2.40	1.94	1.73	1.67	1.56	1.50	1.44	1.41	1.28	1.14	0.88	0.78
	10 - 11	*50-52*	*2.78*	*2.59*	*2.06*	*1.84*	*1.76*	*1.63*	*1.56*	*1.48*	*1.46*	*1.33*	*1.24*	*0.94*	*0.86*
	11 - 12	52-54	2.93	2.78	2.23	1.95	1.85	1.71	1.61	1.54	1.51	1.44	1.30	1.03	0.93
	12 - 13	*54-55*	*3.13*	*2.97*	*2.40*	*2.16*	*2.01*	*1.80*	*1.67*	*1.58*	*1.53*	*1.50*	*1.36*	*1.12*	*1.02*
	13 - 14	55-57	3.29	3.16	2.58	2.38	2.18	1.83	1.72	1.64	1.58	1.53	1.42	1.14	1.03
	14 - 15	*57-59*	*3.45*	*3.35*	*2.84*	*2.59*	*2.43*	*1.95*	*1.78*	*1.73*	*1.69*	*1.56*	*1.48*	*1.15*	*1.05*
	15 - 16	59-61	3.56	3.49	2.98	2.72	2.44	1.95	1.78	1.71	1.64	1.53	1.48	1.11	0.99
	16 - 17	*61-63*	*3.07*	*3.03*	*2.49*	*2.30*	*2.10*	*1.77*	*1.62*	*1.55*	*1.49*	*1.43*	*1.29*	*0.93*	*0.83*

The above figures are meant as a recommendation only, actual feeding rates will vary by site and species.

EWOS Canada
Main Office 7721 - 132nd Street, Surrey, BC, V3W 4M8 Customer Service: 800-663-0476 Orders Fax: 866-287-4422
Campbell River Office #212 - 1720 - 14th Ave, Campbell River, BC, V9W 8B9 Phone: 888-673-9993 Fax: 250-286-0788

Let's do some calculations!!!!!

- Fish avg wt = 2g
- 3,000,000 fish
- Biomass = ?
- Feed rate = 1% body weight per day
- How much to feed each day?

- Fish avg wt = 12g
- 220,000 fish
- Biomass = ?
- Feed rate = 2.25%
- How much to feed per day?