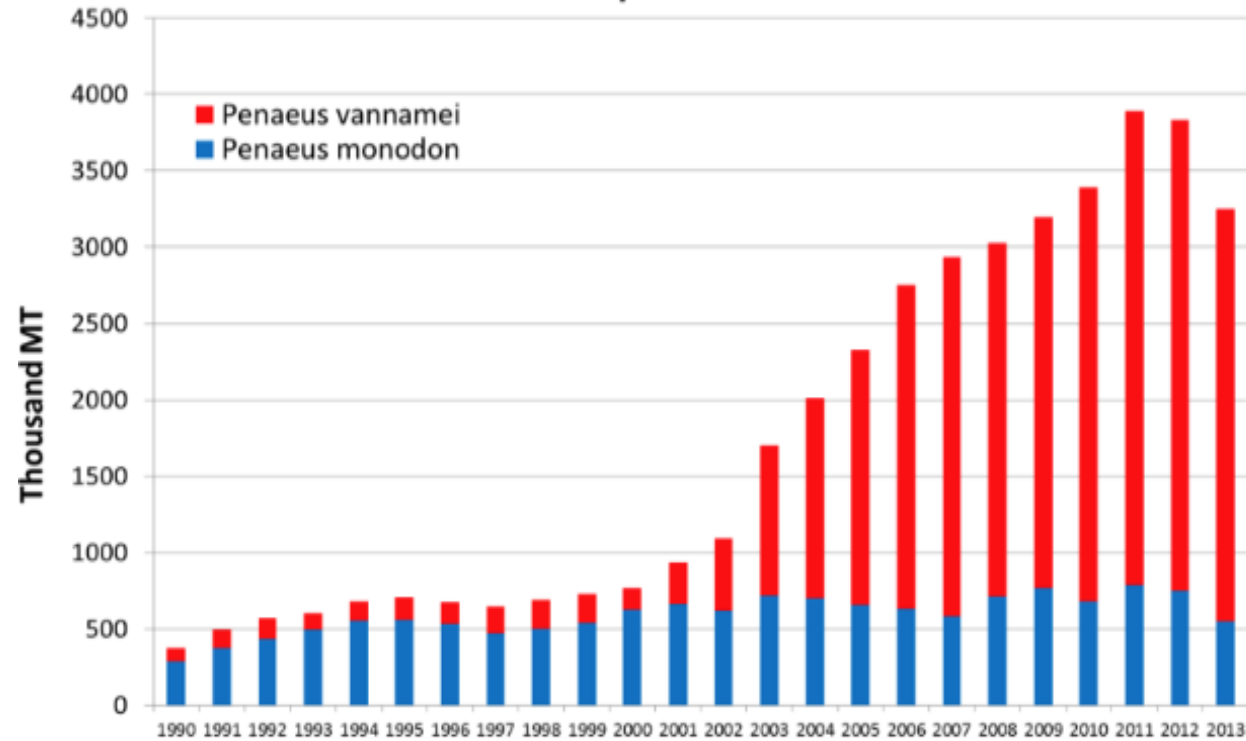




Complete feeds for shrimp larvae and broodstock

Philippe Dhert

Global Farmed Shrimp Production 1990-2013



'85-'94 : explosion of backyard hatcheries

'94-'02 : stagnation diseases

2002- : domestication /industrialisation

- Genetics
- Modernisation of hatcheries
- Selective breeding SPF
- disease prevention



Surprisingly not much progress on nutrition despite

- Lots of diets
- Lots of technologies (flakes, crumbles, granulates, liquid feeds...)

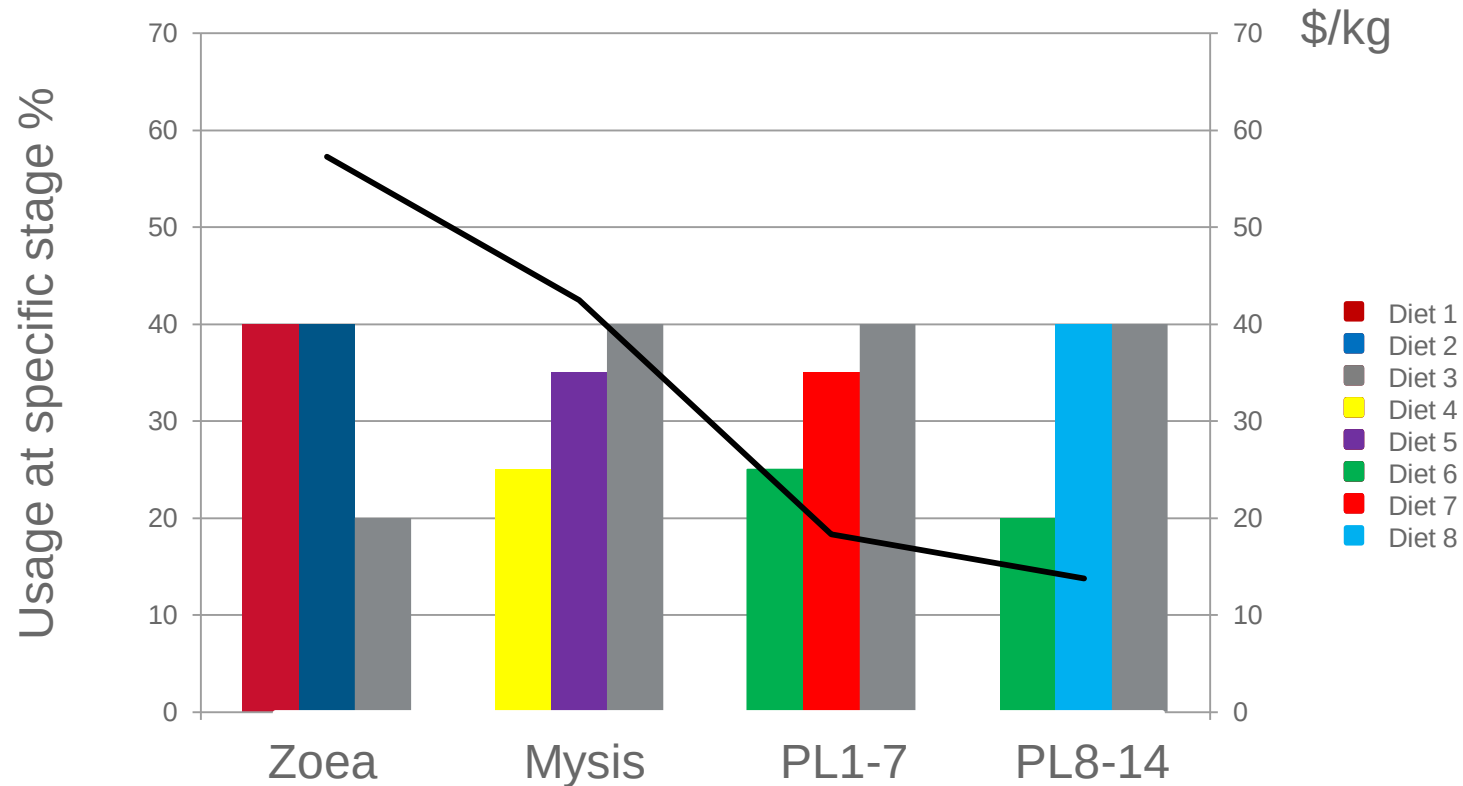


Wouters and Fegan, Global Aquaculture Alliance 2004

Estimated Composition	Zoea-Mysis Feeds	Number Samples	Postlarvae Feeds	Number Samples
Protein (% of dry weight)	45-57	11	43-60	41
Lipid (%)	10-29	11	3-19	40
Ash (%)	7-18	11	5-16	38
Starch (%)	2-12	6	1-21	19
Fiber (%)	—	3	1.2-9.4	12
Moisture (%)	3-8	9	3-11	33
HUFA (mg/g)	2.5-3	7	2-3	13
DHA (mg/g)	1.3-2	7	0.14-1.3	23
EPA (mg/g)	1.1-5	7	0.12-6	22
Vitamin C (mg/kg)	1,000-4,500	5	975-4,500	14
Vitamin E (mg/kg)	400-500	5	150-500	15
Calcium (%)	—	—	0.7-5	10
Phosphorus (%)	—	—	0.5-2.1	10

Table 1. Estimated composition of dry commercial shrimp feeds for Zoea-mysis and postlarvae.

Cocktail example



Results in

- Unclear nutritional conditions
- Poor physical conditions (different particle sizes, more fines)
- Difficult to work on repeatable output
- Risk for mistakes, difficult logistics, hidden costs,

4

-

Is it not time to correct this situation?

- Is it not time to evaluate the nutritional requirements of larval shrimp taking into consideration new opportunities in:
 - - nutrition
 - - physical
 - - microbiology
- Tackle these points together and look to their synergetic effect rather than adding “magic solutions”

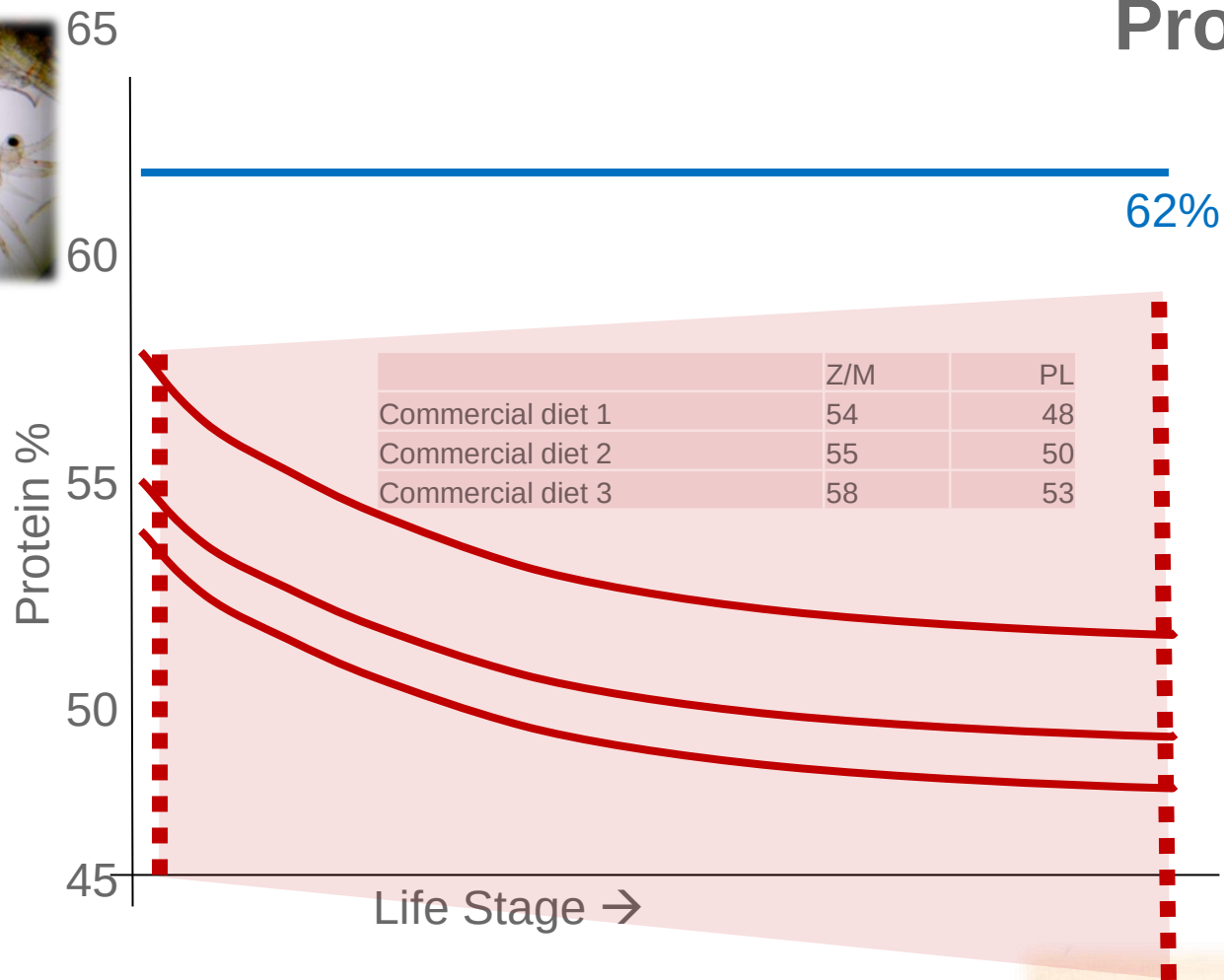
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Typical Hatchery Feeding Approach



Algae : Mechanisms improving larval performance

Nutrition : proteins, nucleic acids, fats, polysaccharides
and a variety of minerals : Enhancement of digestion
Increased action of digestive enzymes
Synergy with nutrients, mechanical action,...

-Stimulatory feeding : molecules isolated from algae
(AA, inosine 5-monophosphate,...)

- chemical stimulation : digestive capacity
(Munilla-Moran and Stark, 1989)
- stimulation of digestive functions (enzyme production)
(Cahu et al. 1998).

-Bacterial conditioning :

- Leaching of prebiotic molecules (J. Courtois, 2009)
- Antimicrobial components (Kellam and Walker, 1989)
- Water quality (Shioda et al., 1997)
- Quorum sensing suppression (Natrash et al., 2011)

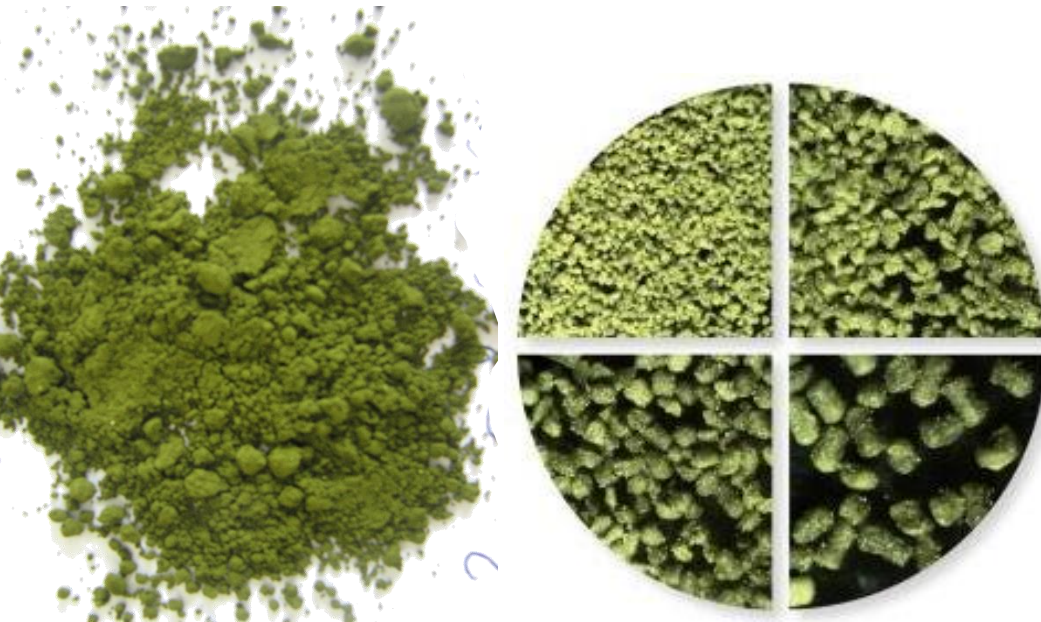


Algae : Mechanisms improving larval performance

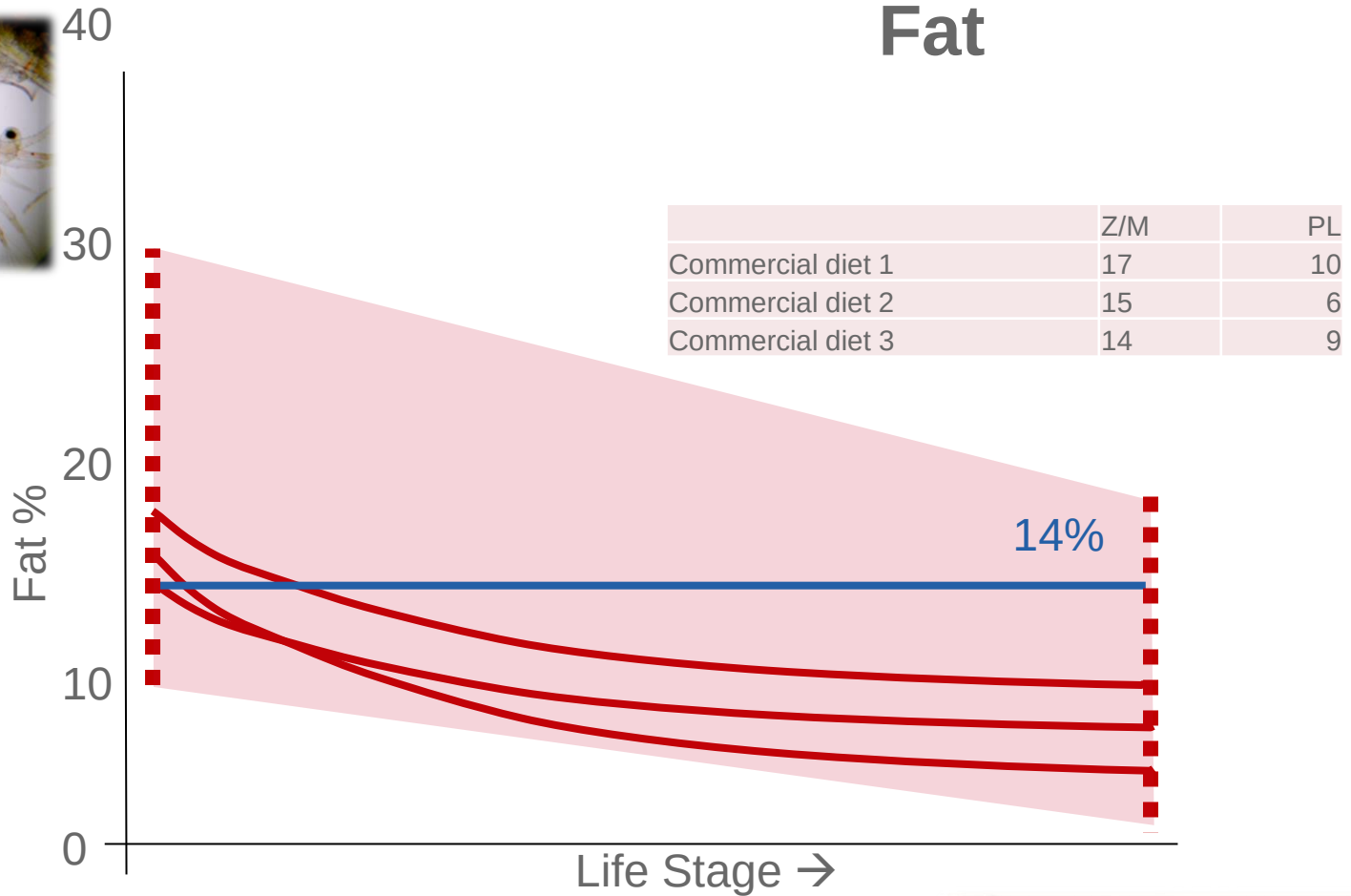
Co-feeding micro-particulate diets with algae.

Lazo et al. Aquaculture Vol188 sept 2000

Inclusion of algae results in several process advantages and results in an improvement of the physical characteristics of the products



Typical Hatchery Feeding Approach



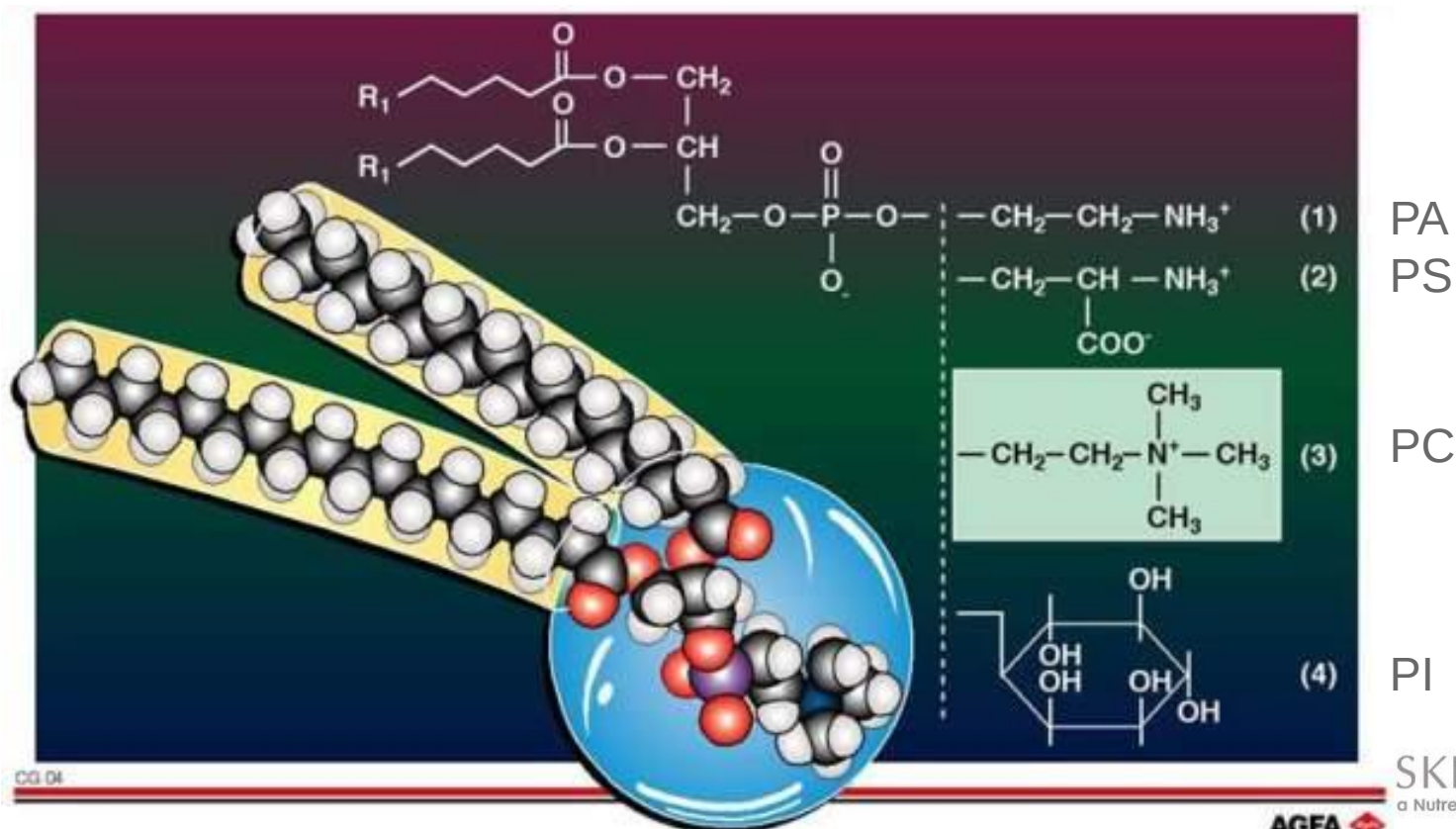
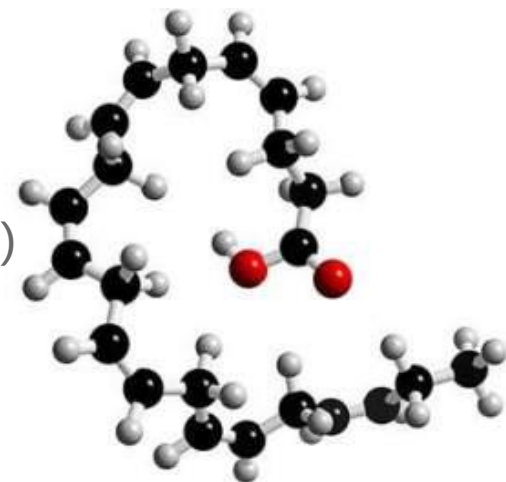
Keep fat levels as low as possible

Concentrated DHA oils

- Use of high quality concentrated oils (high DHA/EPA ratio)
- TGL, PL (most digestible positions)

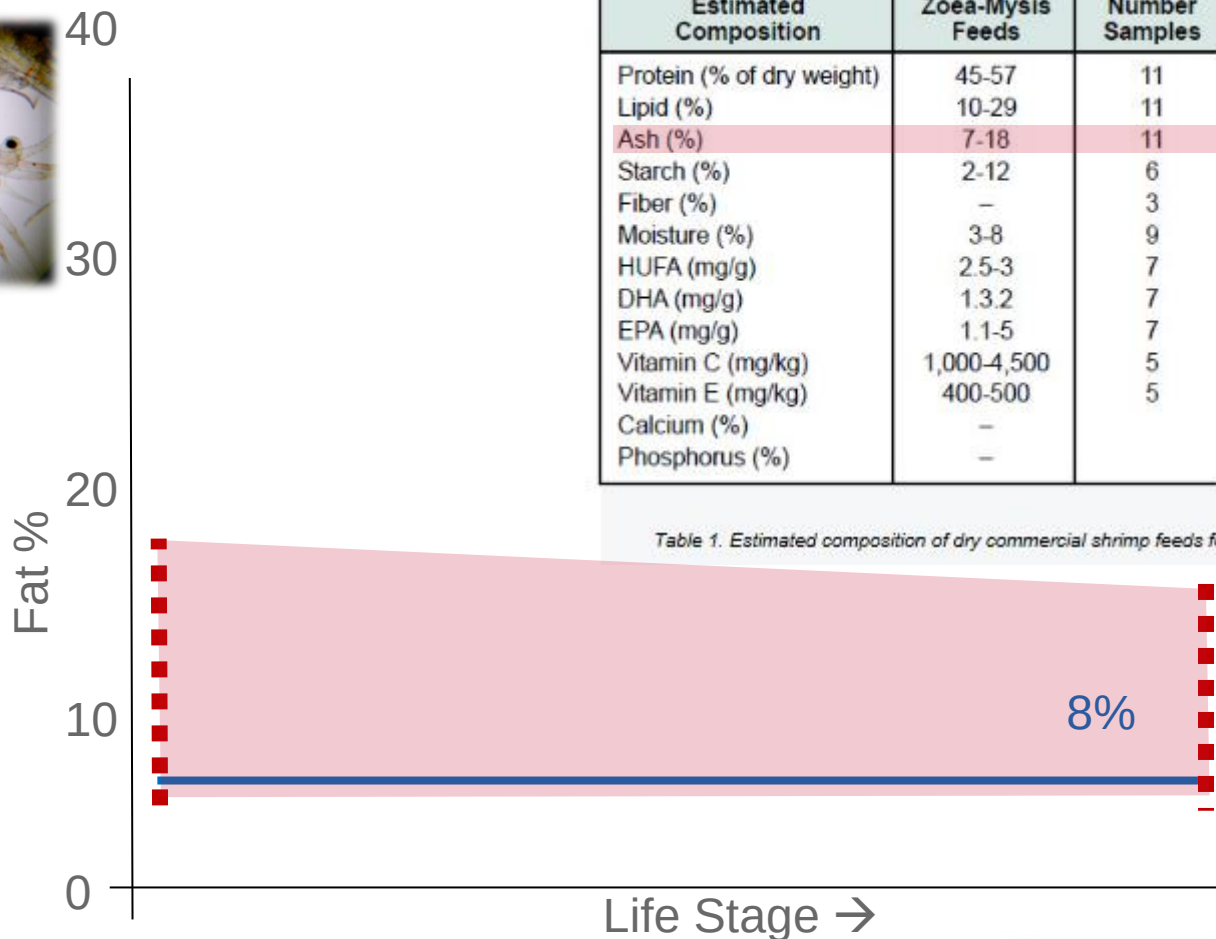
Phospholipids

- Use of phospholipids as substitution for cholesterol



Typical Hatchery Feeding Approach

Ash

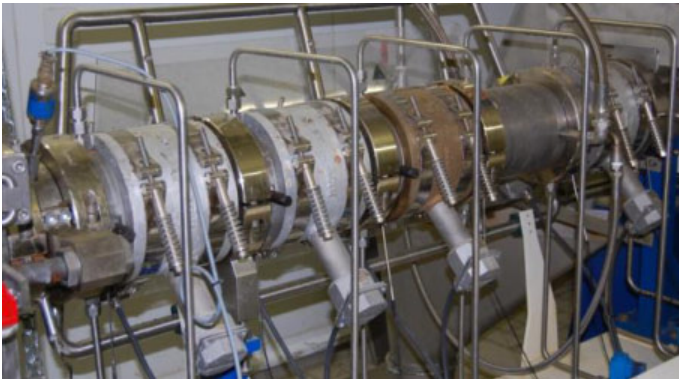


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Cold & Micro Extrusion, Spheronization



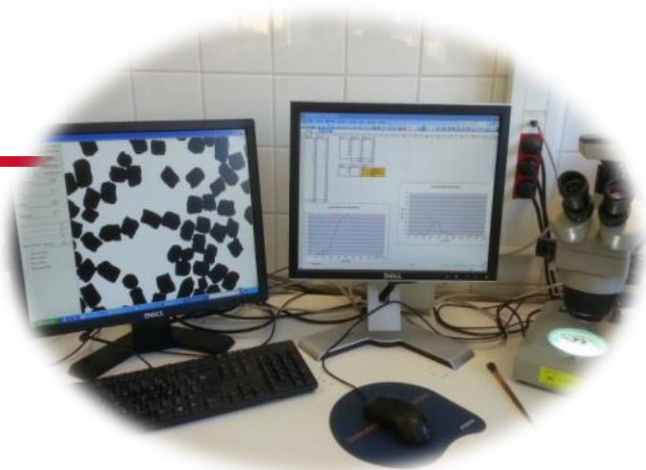
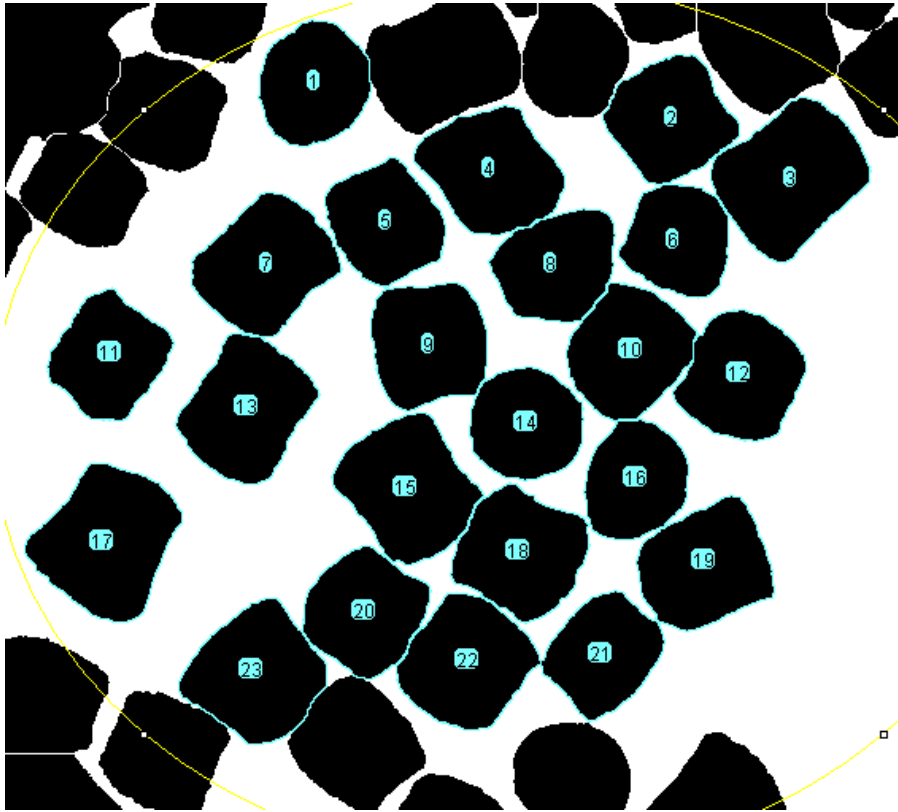
- Decreased protein denaturation
 - Increased attractability
 - Increased digestibility
- Softer particles
- Increased water stability



Size Classification and quality control



Image analysis as QC tool



- Average (length, area, perimeter, particle numbers)
- Standard deviation
- Minimize dust



All diets analyzed on conformity of material to QC restrictions



Advanced larval & post larval nutrition for shrimp

PL is Skretting's high quality shrimp starter diet designed to offer advanced nutrition to shrimp hatcheries. **PL**, with its unique innovative marine algal blend, is produced with a sophisticated technology utilising low temperatures to ensure maximal nutrient availability, freshness and stability.

PL is part of Skretting's Spectrum portfolio of feeds for marine hatcheries.

Composition

	PL 0	PL 1	PL 2	PL 3	PL 4
	Z1-M1	M1-PL1	PL1-PL7	PL7-PL15	PL15-PL30
Size (µm)	10-100	100-200	200-300	300-500	500-800
Protein (%)	62	62	62	62	62
Lipids (%)	14	14	14	14	14
Phospholipids (%)	15	15	15	15	15
Cholesterol (mg/kg)	3300	3300	3300	3300	3300
N-3 HUFA (mg/g DW)	30	30	30	30	30
DHA/EPA	1.7	1.7	1.7	1.7	1.7
Ash (%)	8	8	8	8	8
Fibre (%)	0.2	0.2	0.2	0.2	0.2
Phosphorus (%)	1.1	1.1	1.1	1.1	1.1
Vitamin A (IU/kg)	15.000	15.000	15.000	15.000	15.000
Vitamin D3 (IU/kg)	1.800	1.800	1.800	1.800	1.800
Vitamin E (ppm)	250	250	250	250	250
Vitamin C (ppm)	1000	1000	1000	1000	1000

Conclusion on PL diets from users in Asia & S. America

- Positive results obtained in very different rearing conditions around the world
- A single diet (PL) performs as well as various cocktail mixes
- High protein diets with a balanced protein/fat ratio show an increased growth and health condition of PL's
- A diet produced outside the biohasard zone (EMS,...) is seen as an advantage for biosecurity



Vitalis 2.5

Marine Hatchery Diets

Broodstock diet

Vitalis 2.5

A complete nutritional solution for broodstock shrimps

Shrimp broodstock nutrition and biosecurity are well known for being essential parameters in successful shrimp hatchery propagation. **Vitalis 2.5** has been developed to partially replace the use of moist feeds while at the same time providing the correct level of essential nutrients in a stable form.

Vitalis 2.5 should be fed ad libitum year round.

Ingredients

Please refer to product label.

Composition

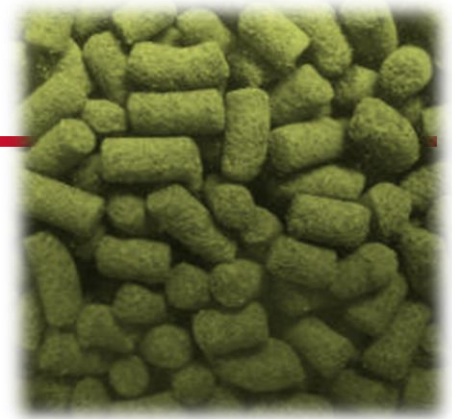
	Vitalis 2.5
Size (mm)	2.5
Proteins (%)	59
Lipids (%)	11
Ash (%)	11.5
Fiber (%)	0.3
Phosphorus (%)	1.3
Vitamin A (IU/kg)	20,000
Vitamin D3 (IU/kg)	2,500
Vitamin C (ppm)	1,000
Vitamin E (ppm)	600

Please refer to label for detailed product composition.

Storage & Packaging

Vitalis 2.5 has a shelf life of 24 months from date of manufacture and should be stored in a cool (max 20°C), dark and dry place. Once open, **Vitalis 2.5** should be utilised within 1 month and kept sealed in a refrigerator.

Vitalis 2.5 is packed in special aluminium/polyethylene 10kg bags under modified atmosphere conditions.



Broodstock

- Little or no formulated diets are used
- Belief in live feed (frozen oysters, squid and especially fresh Polychaetes caught locally)



Freezer



Feed Prep



Broodstock

- Results in poor water quality and a serious biohazard



Brood tanks



Broodstock

Shrimp Broodstock?

Aim of this study

- Formulate a single diet that covers all the nutrient requirements for shrimp broodstock
- Find an alternative for the cocktail feeding based on trash fish
- Reduce the biohazard of trash fish and reduce diseases due to nutritional deficiency and direct contamination
- Create a more sustainable way to keep broodstock in a standardised and reproducible way



Conclusion on Vitalis 2.5 from users in Asia & S. America

- Positive results obtained in very different rearing conditions around the world
- A single diet (Vitalis 2.5) can partially substitute trash fish
- Egg and nauplii production are similar as with trash fish
- Water quality is seriously improved
- A diet produced outside the biohazard zone (EMS,...) is seen as an advantage for biosecurity

Conclusion

- Skretting can offer an innovative range of products based on:
 - exclusive raw materials
 - new concepts inspired on natural concepts
 - knowledge and experience of a large team of researchers, veterinarians, feed manufactures, commercials, ...
 - open to listen to you and to develop new products according to your needs

