

The true contribution of marine ingredients:
**optimising human nutrition
within global constraints**



IFFO

THE MARINE INGREDIENTS ORGANISATION

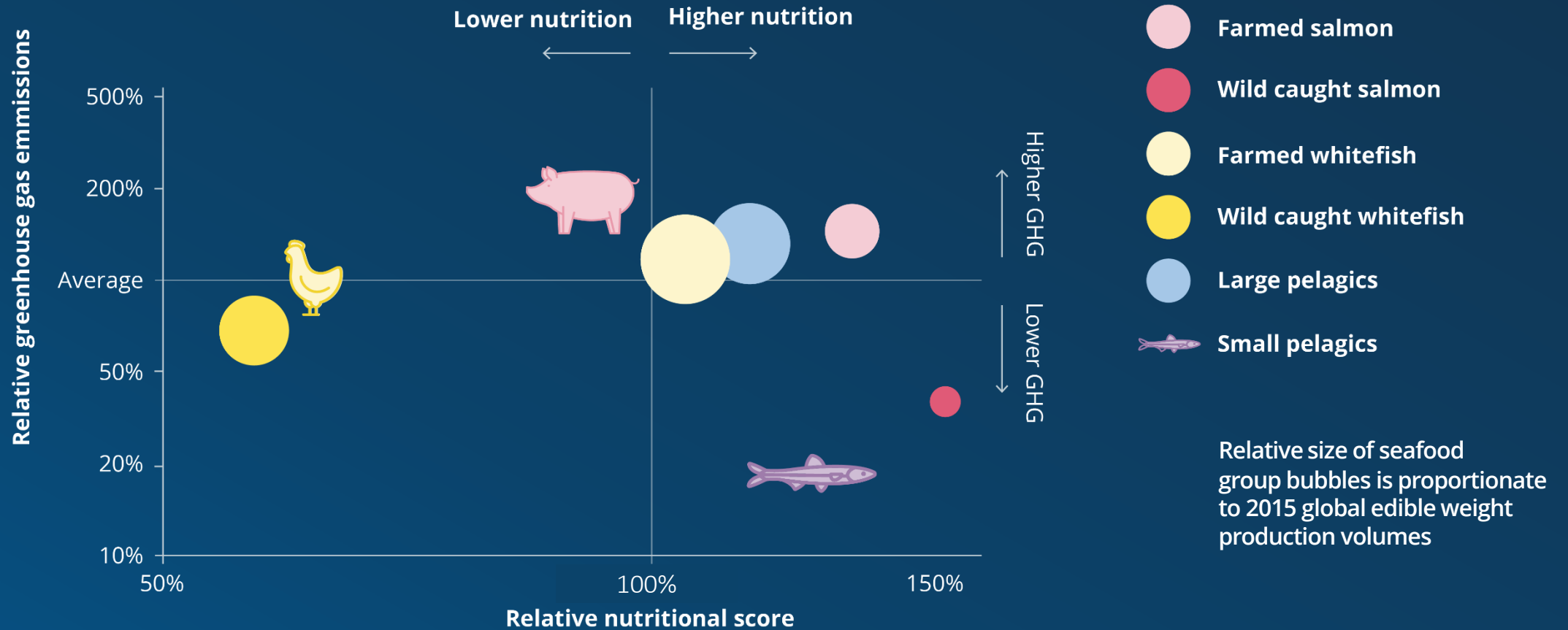
A secure future relies on both nutritious and sustainable foods

Climate friendly



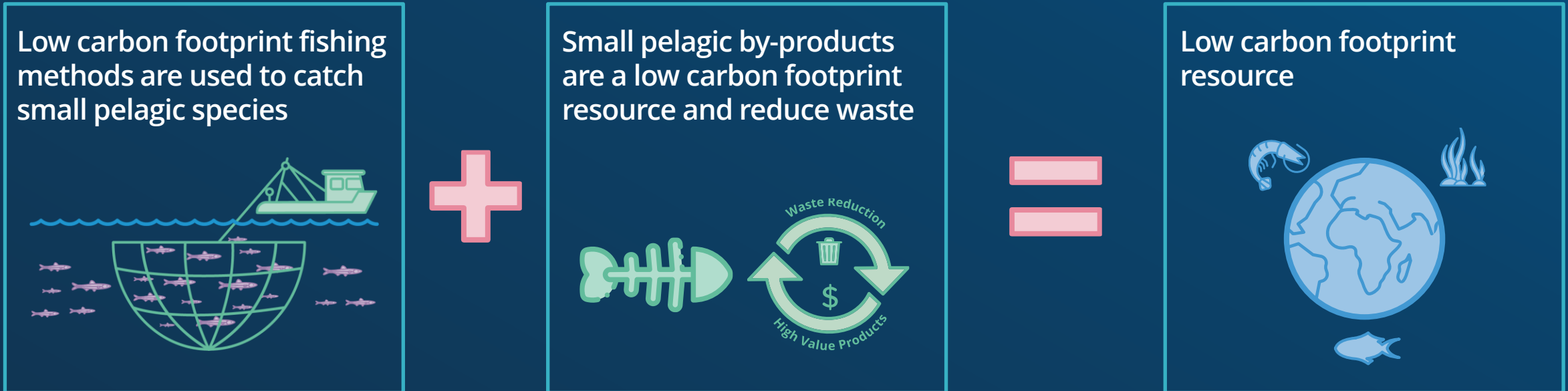
Nutrient rich

Small pelagic species are top performers in both dimensions: climate and nutrition



Source: Bianchi, M., Hallström, E., Parker, R.W.R. et al. Assessing seafood nutritional diversity together with climate impacts informs more comprehensive dietary advice. Commun Earth Environ 3, 188 (2022). <https://doi.org/10.1038/s43247-022-00516-4>

Small pelagic species have a low carbon footprint



Small pelagic species are one of Nature's best nutrient sources

Digestibility

Immune Function

Fertility

Vision

Meat Quality

Growth

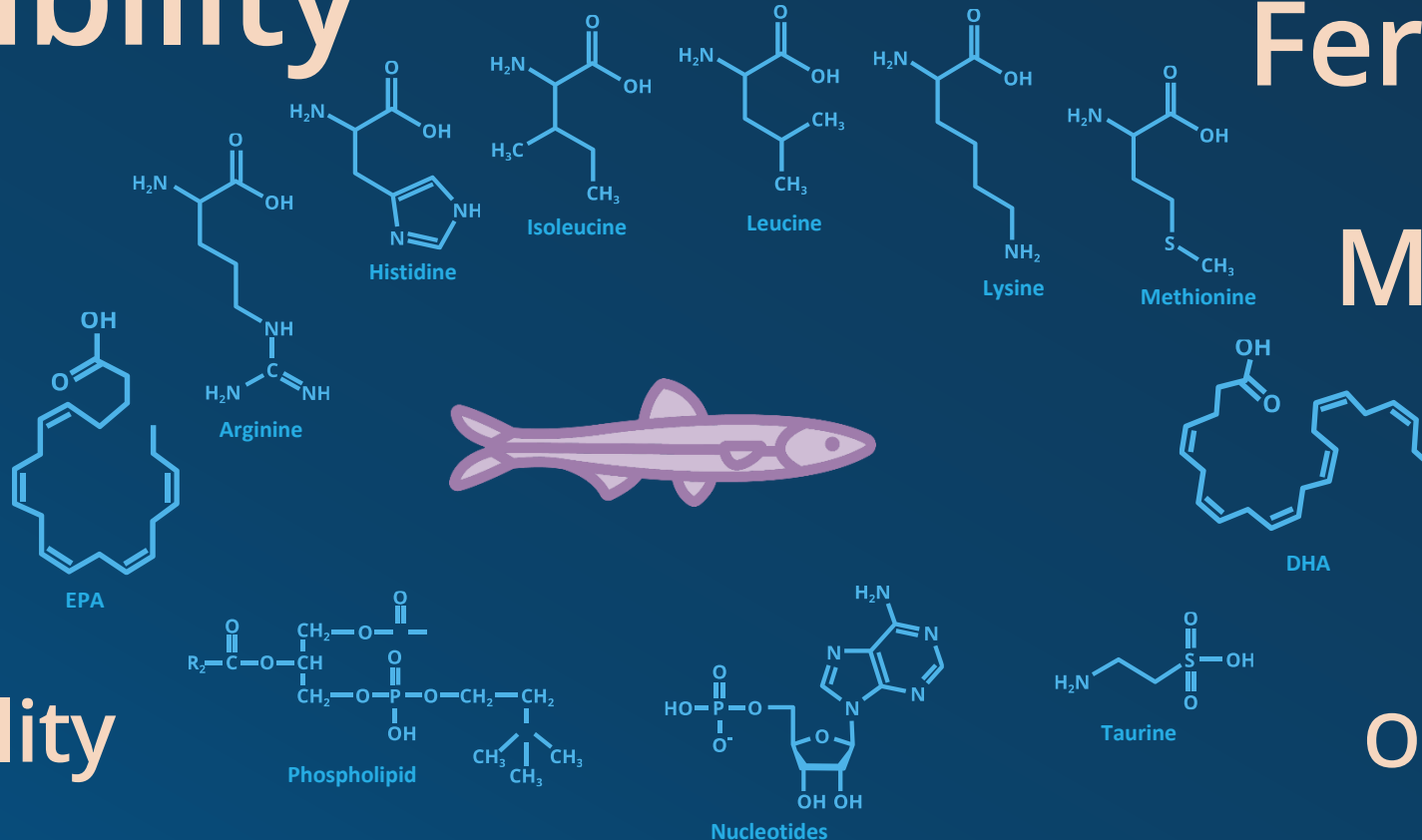
Welfare

Egg Quality

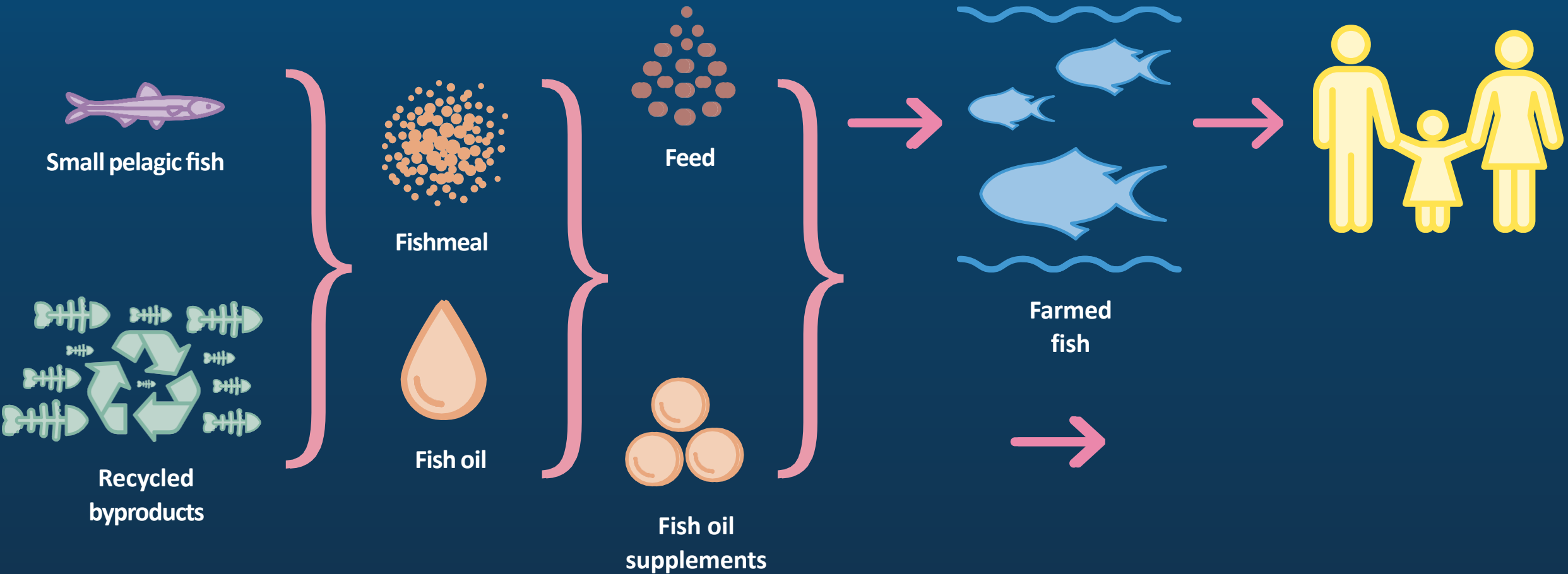
Osmoregulation

Palatability

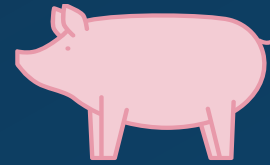
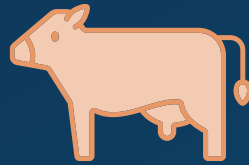
Disease Resistance



Where do we get small pelagic species from in our diets?



Farmed fish is the most resource-efficient animal protein on the planet



Feed Conversion Ratio

6–10

2.7–5

1.7–2

1.2–1.5



Fresh Water
in litre

9,463

13,249

7,570

1



Carbon Footprint
g of CO₂ eq per g of edible protein

5.9

1.3

0.9

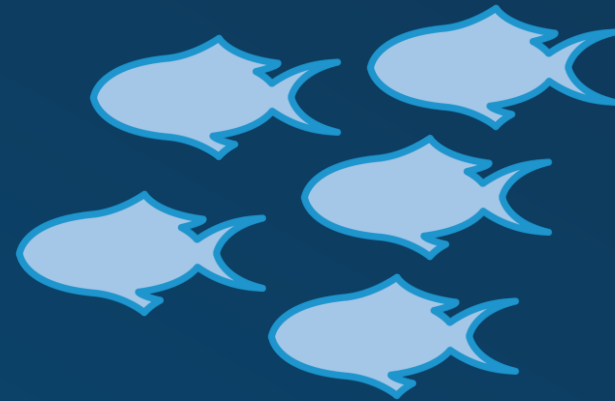
0.6

Fishmeal and fish oil's most strategic use in food production is in aquaculture

1 kg



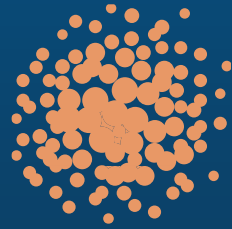
5 kg



Whole fish & by-products used to produce fishmeal and fish oil

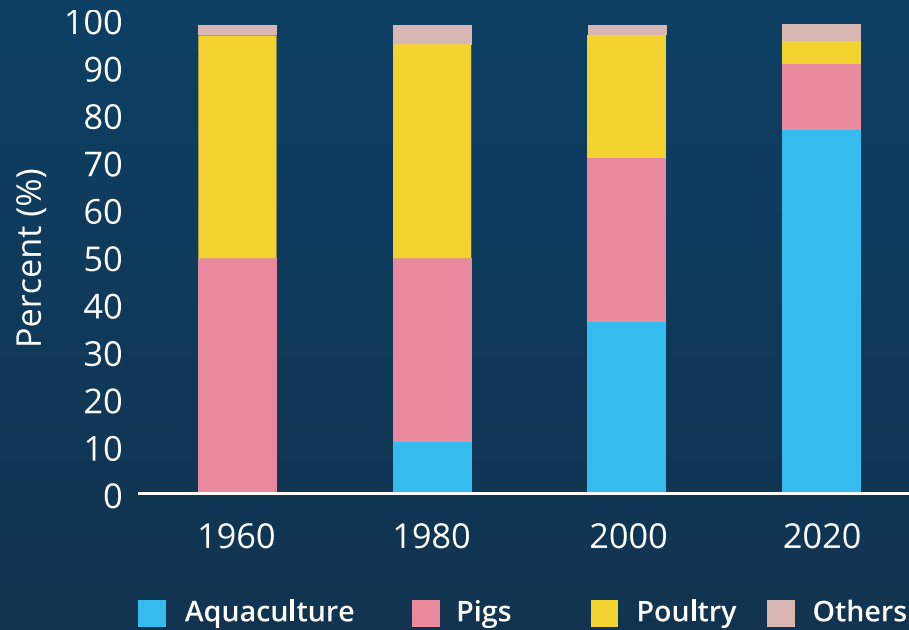
Contribute to producing farmed fish

Aquaculture is the most effective way to use the nutrients that small pelagic species contain



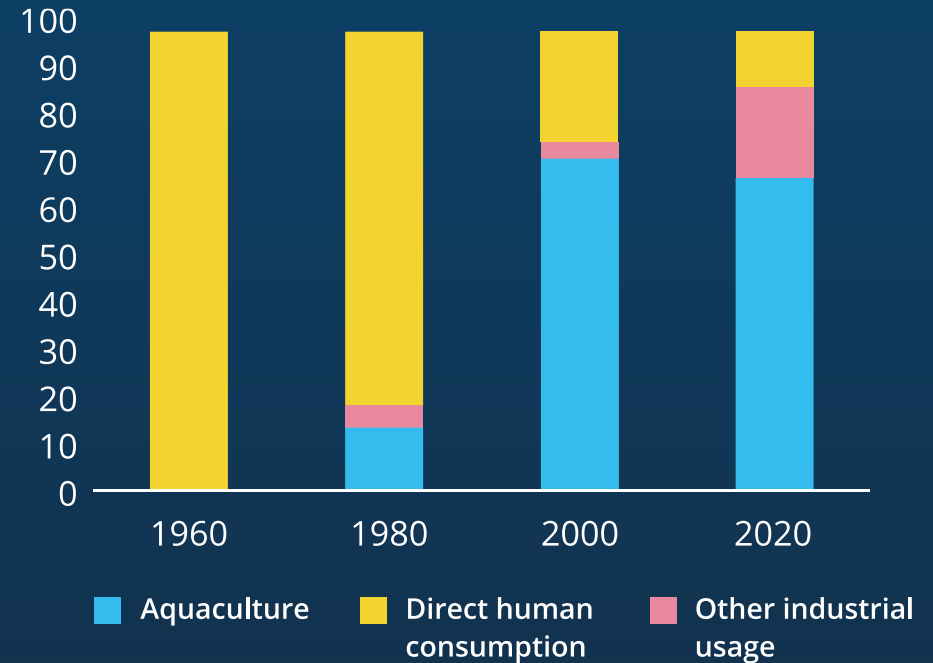
Fishmeal

From pigs and chicken feed to aquafeed



Fish oil

From discard to aquafeed and human health



Small pelagic species have specific features...



Short life



**Finite
resource**

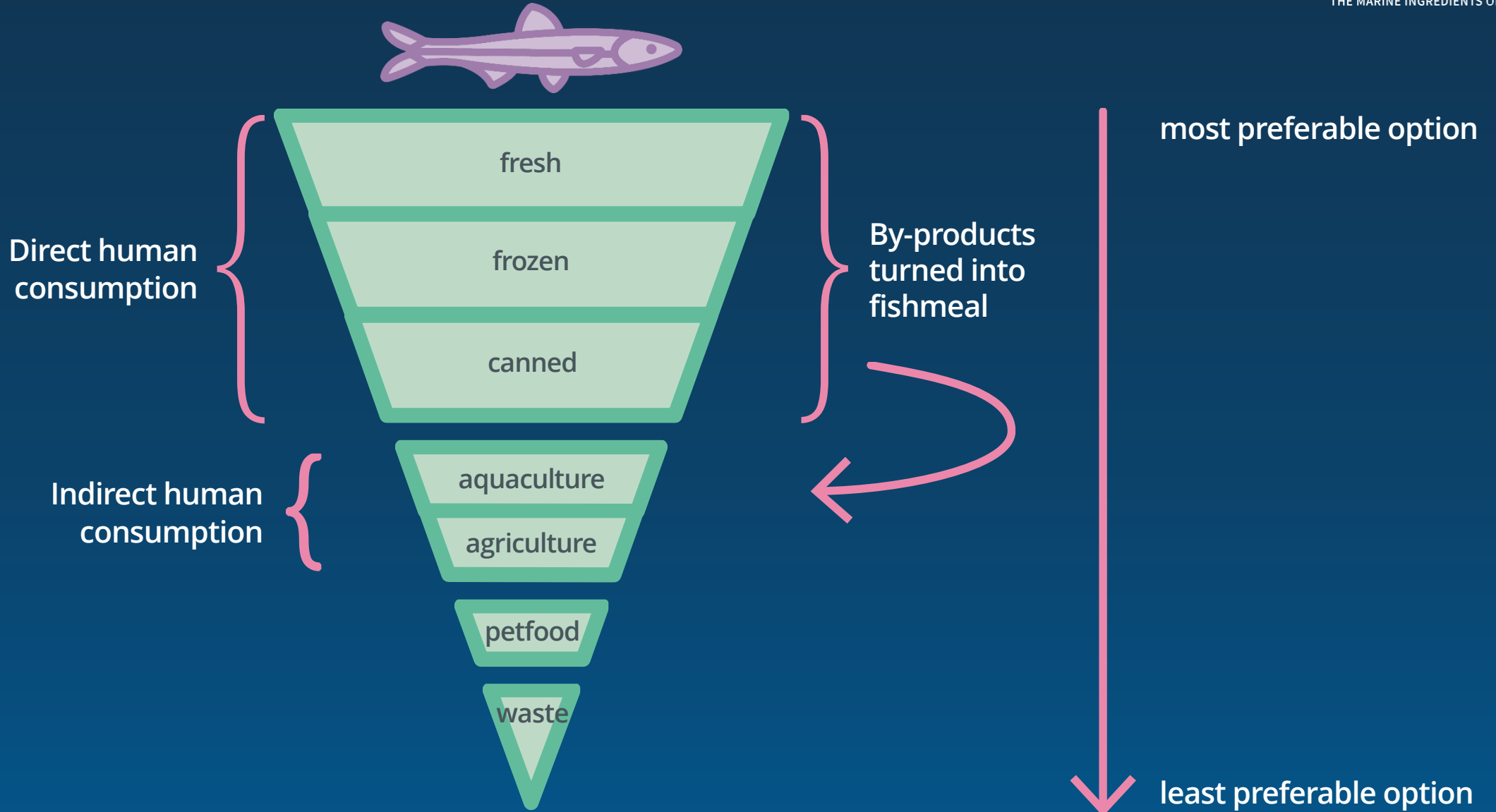


Seasonal harvesting



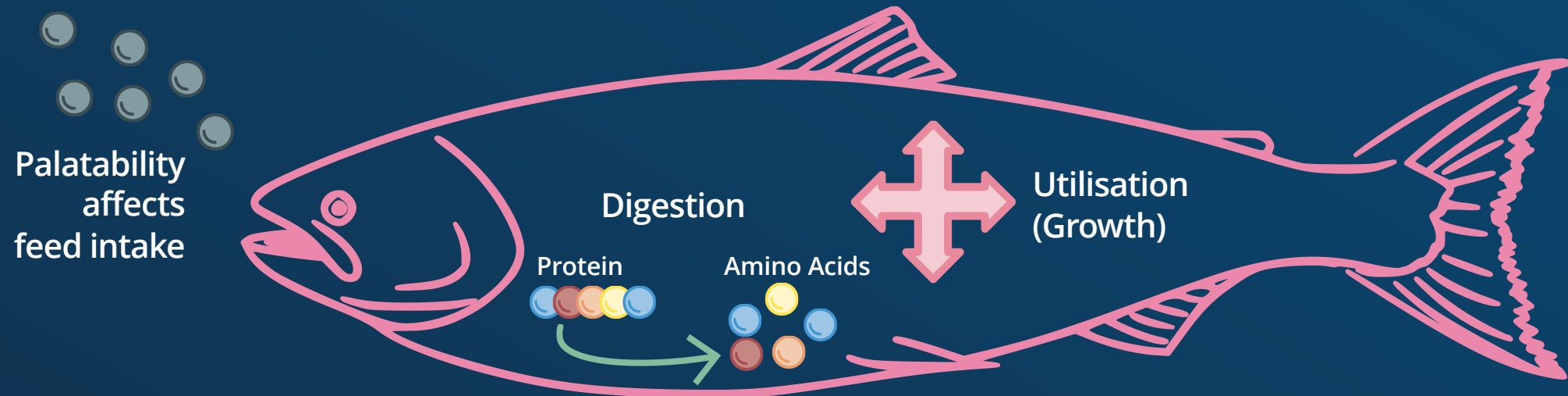
**Exceptional
nutritional properties**

... which limit the way they can be used



Fishmeal and fish oil accentuate the palatability of feed...

Palatability determines how much the fish eats, the first and most important hurdle for feed.



... and provide many other benefits

Phospholipids are a type of fat rich within fishmeal. Phospholipids enhance the use of the super-nutrients EPA and DHA.

Phospholipids



Omega-3 are in abundance in the fats within fishmeal, including the super-nutrients EPA and DHA. These nutrients are an essential component of a healthy and balanced diet for all animals, but especially farmed fish.

Omega-3



Amino Acids are protein's building blocks and an essential part of the diet. Fishmeal contains them in an abundance and in a balance that fit precisely the requirements for fed aquatic species.

Amino Acids



Minerals: Calcium (Ca), phosphorus (P), magnesium (Mg), potassium (K), and selenium (Se)

Vitamins: Vitamin A, vitamin D, vitamin E, vitamin K, as well as vitamins B1, B2, B6 and B12

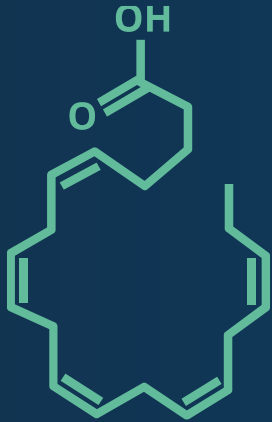
Micronutrients



Marine ingredients are used strategically to provide well rounded nutrition in aquatic diets

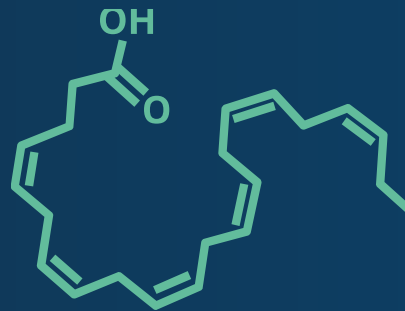
Omega-3s play a specific role but not all of them are equal

Long-chain omega-3s



EPA

20 carbon
5 double bonds



DHA

22 carbon
6 double bonds

Short-chain omega-3s



ALA

(Omega 3)

EPA and DHA work together to support the normal growth and support neurological health, eyes (retina), nervous system, cardiovascular system and maintain normal triglyceride levels.

Short-chain omega 3s are found in plant sources. They do not provide the same health benefits and are not efficiently converted by the consumer into essential EPA & DHA.

Among omega-3s, EPA and DHA have the most health benefits

Fertility

Heart Health

Disease Resistance

Welfare

Neurological Health

Growth

Immune

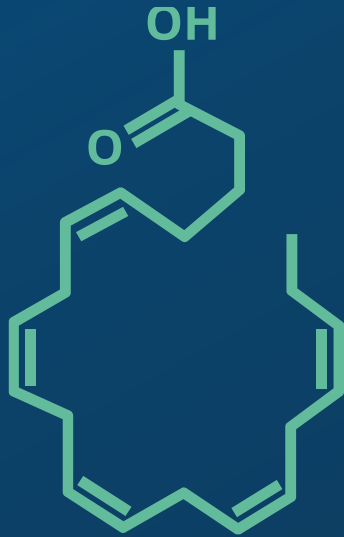


EPA

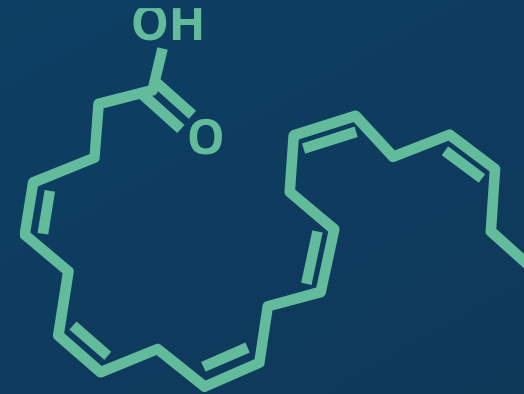


DHA

Fish oils contained in fatty fish are the most effective way to get EPA and DHA...



EPA
20 carbon
5 double bonds



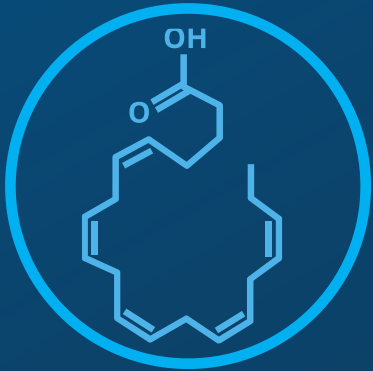
DHA
22 carbon
6 double bonds

Up to $\frac{1}{3}$ of fish oil is EPA & DHA

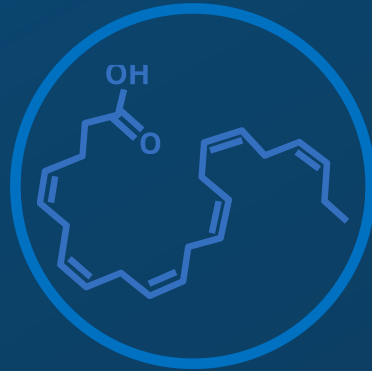
All animals (including humans) need EPA & DHA

Although we need them to be healthy, our body does not readily produce them at significant levels.

EPA



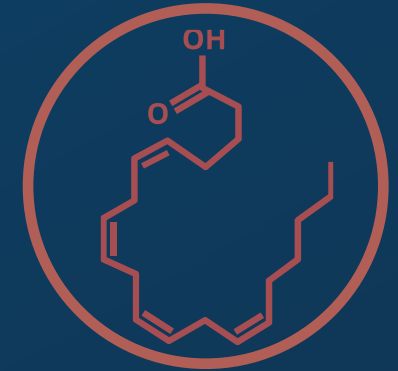
DHA



Omega-3



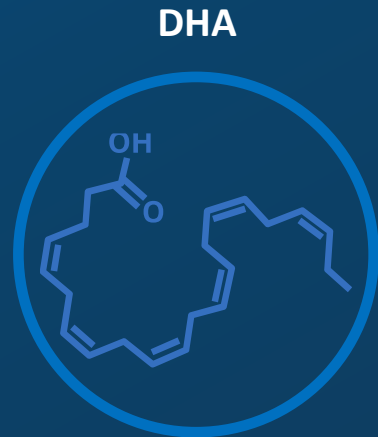
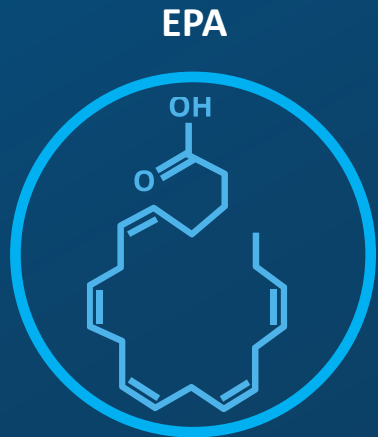
ARA



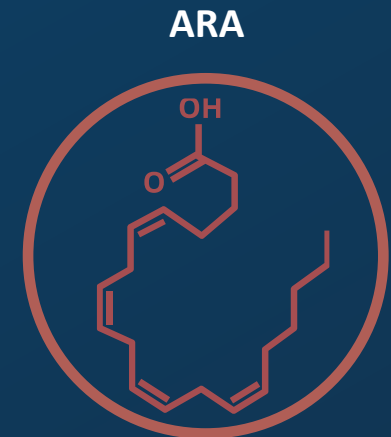
Omega-6

Keeping the balance: a key challenge

Omega-6 intake now exceeds omega-3 by over 20-fold



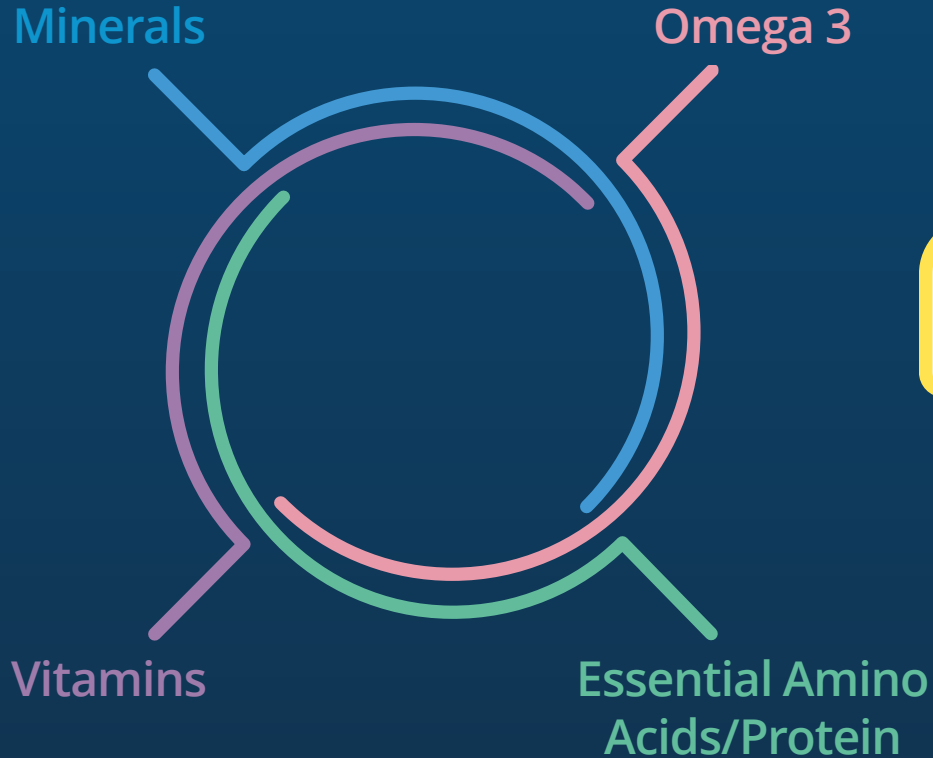
Omega-3



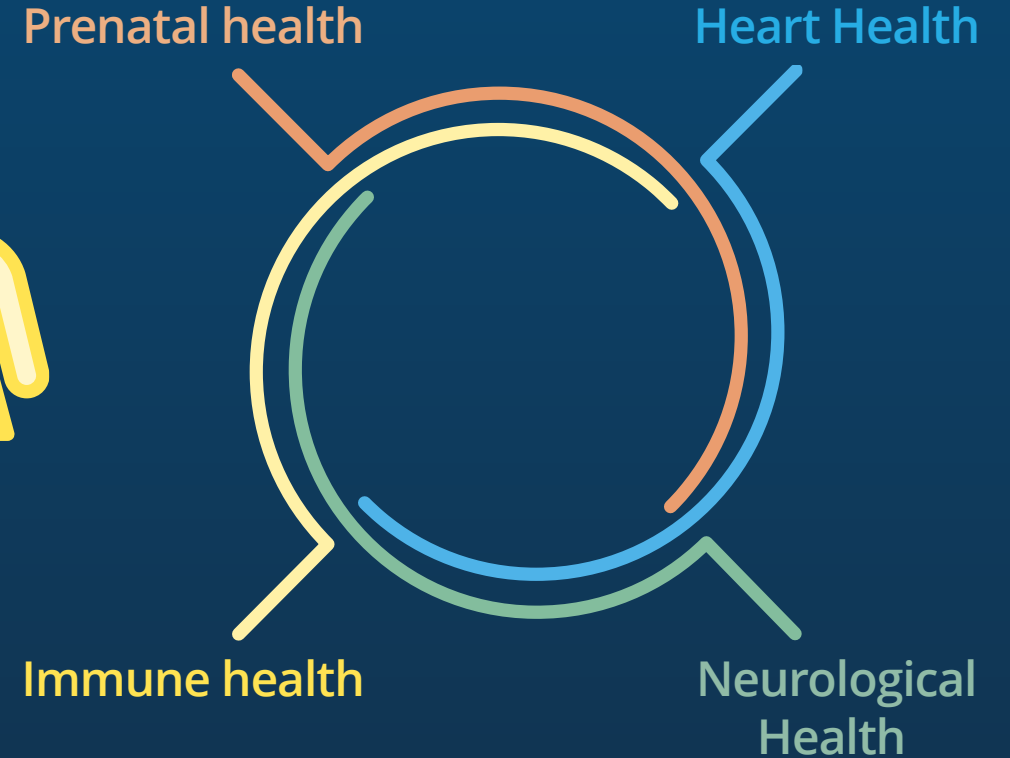
Omega-6

Humans benefit directly and indirectly from fishmeal and fish oil

Nutritional properties



Health benefits



“Fishmeal and fish oil are still considered the most nutritious and most digestible ingredients for farmed fish, as well as the major source of omega-3 fatty acids.”

**Food and Aquaculture organisation:
State of the World's Fisheries and Aquaculture, 2022**

www.iffo.com



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